SOLICITATION, OFFER, AND AWARD (Construction, Alteration, or Repair)	1. SOLICITATION NUMBER	2. TYPE OF SOLICITATION	3. DATE ISSUED	PAGE OF PAGES
	DACW67-00-B-0014	☒ SEALED BID (IFB) ☐ NEGOTIATED (RFP)	February 2, 2000	1 of 121

IMPORTANT - The "offer" section on the reverse must be fully completed by the offeror.

4. CONTRACT NUMBER	5. REQUISITION/PURCHASE REQUEST NUMBER	6. PROJECT NUMBER
DACW67-00-C-0013	W68MD9-9337-3179	

7. ISSUED BY	CODE	8. ADDRESS OFFER TO
Seattle District, Corps of Engineers ATTN: CENWS-CT-CB PO Box 3755 Seattle, WA 98124-3755	W68MD9	Seattle District, Corps of Engineers PO Box 3755 ATTN: CENWS-CT-CB Seattle, WA 98124-3755 HAND CARRY: Preston Conference Room 4735 East Marginal Way South Seattle, WA 98134-2385 BID OPENING ROOM: Preston Conference Room

9. FOR INFORMATION CALL	A. NAME	B. TELEPHONE NUMBER (Include area code) (NO COLLECT CALLS)
	See Information Page inside Front Cover	See Information Page inside Front Cover

SOLICITATION

NOTE: In sealed bid solicitations "offer" and "offeror" mean "bid" and "bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying number, date):

Furnish all labor, materials and equipment and perform all work for MISSOULA TECHNOLOGY & DEVELOPMET CENTER, MISSOULA, MT in accordance with the attached Contract Clauses, Special Clauses, Technical Specifications and Drawings.

1. Solicitation No. DACW67-00-B-0014 dated 2 February 2000 with 8 amendments thereto.
2. Wage Determaination No. MT 000033.
3. Drawings as listed in Section 00800.
4. See Page 00010-2(a) for alterations to the Contract.

NOTE: Award will be made pursuant to the Small Business Competitive Development Program.

11. The Contractor shall begin performance within 10 calendar days and complete it within * calendar days after receiving

☐ award, ☒ notice to proceed. This performance period is ☒ mandatory, ☐ negotiable. (See * Paragraph SC-1, 00800)

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE PAYMENT BONDS? (If "YES," indicate within how many calendar days after award in Item 12B.)

☒ YES ☐ NO

12B. CALENDAR DAYS: 10

13. ADDITIONAL SOLICITATION REQUIREMENTS.

1. Sealed offers in original and 1 copies to perform the work required are due at the place specified in Item 8 by local time APRIL 7, 2000 (date). If this is a sealed bid solicitation, offers will be publicly opened at that time. 2:00 p.m. (hour)

Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

An offer guarantee ☒ is, ☐ is not required.

All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

Offers providing less than 90 calendar days for Government acceptance after the date offers are due will not be considered and will be rejected.

OFFER *(Must be fully completed by offeror)*

14. NAME AND ADDRESS OF OFFEROR *(Include ZIP Code)*

SWANK ENTERPRISES
P.O. BOX 568
VALIER, MT 59486
Tax ID No: 81-0302197 DUNS No: 04-521-5795
eMail: swank@3rivers.net

15. TELEPHONE NUMBER *(Include area code)*: (406) 279-3241 | FAX: (406) 279-332

16. REMITTANCE ADDRESS *(Include only if different than Item 14)*

CODE CAGE 1EZ86 FACILITY CODE CEC 15250593K

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government in writing within 90 calendar days after the date offers are due. *(Insert any number equal or greater than the minimum requirement stated in 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)*

AMOUNTS ▶ See page 2b

18. The offeror agrees to furnish any required performance and payment bonds.

19. ACKNOWLEDGEMENT OF AMENDMENTS
(The offeror acknowledges receipt of amendments to the solicitation - give number and date of each)

AMENDMENT NO.	1	2	3	4	5	6	7	8		
DATE	3/2/00	3/8/00	3/15/00	3/16/00	3/21/00	3/24/00	3/29/00	3/31/00		

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER *(Type or print)*: DEREK SWANK, VICE-PRESIDENT

20B. SIGNATURE: Derek Swank

20C. OFFER DATE: APRIL 7, 2000

AWARD *(To be completed by Government)*

21. ITEMS ACCEPTED

0001 through 0009

22. AMOUNT: $7,148,150.00

23. ACCOUNTING AND APPROPRIATION DATA: See Alterations Page

24. SUBMIT INVOICES TO ADDRESS SHOWN IN *(4 copies unless otherwise specified)* ▶ ITEM 26

25. OTHER THAN FULL AND OPEN COMPETITION PURSUANT TO ☐ 10 U.S.C. 2304(c)( ) ☐ 41 U.S.C. 253(c)( )

26. ADMINISTERED BY CODE

Fairchild Resident Office
USAED Seattle
PO Box 1929
Airway Heights, WA 99001

27. PAYMENT WILL BE MADE BY

US Army Corps of Engineers Finance Center
CEFC-AO-P
5722 Integrity Drive
Millington, TN 38054-5005

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28. NEGOTIATED AGREEMENT *(Contractor is required to sign this document and return copies to the issuing office.)* Contractor agrees to furnish and deliver all items or perform all work requirements identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications incorporated by reference in or attached to this contract.

☒ 29. AWARD. *(Contractor is not required to sign this document.)* Your offer on this solicitation is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN *(Type or print)*

30B. SIGNATURE

30C. DATE

31A. NAME OF CONTRACTING OFFICER *(Type or print)*: JANET L.OLSON

31B. UNITED STATES OF AMERICA BY Janet L. Olson

31C. AWARD DATE: 3MAY00

STANDARD FORM 1442 BACK (REV. 4-85)

ALTERATIONS IN CONTRACT (FAR 52.252-4)(APR 1984)

Portions of this contract are altered as follows:

1. Pursuant to the clause in Section 00100, 52.214-5000, "Apparent Clerical Mistakes" (MAR 1999-EFARS)", of the solicitation, corrections to the bid schedule as detailed below are hereby accepted and incorporated in this contract:

ITEM NO. 0003AB, Page 2b - The correct Unit Price and Extended Amount should read as follows:

003AB	100 LF	$52.50	$5,250.00

The TOTAL BASE ITEMS Amount, Page 2b, should read as $6,616,250.00.
The TOTAL BASE AND OPTIONAL ITEMS Amount, Page 2b, should read as $7,148,150.00.

2. Items Accepted for award are Base Items 0001 through 0003AB and Option Items 0004 through 0009.

3. ACCOUNTING AND APPROPRIATION DATA:
96 NA X 3122.0000 G3 X 08 2433 0WDD0A 96453 3200 002QDP
Obligate $7,148,150.00

(End of page)

This page intentionally blank

CONTRACT NUMBER: DACW67-00-C-0013

IF THE CONTRACTOR IS A CORPORATION OR PARTNERSHIP, THE **APPLICABLE PORTION** OF THE FORM LISTED BELOW MUST BE COMPLETED. IN THE ALTERNATIVE, OTHER EVIDENCE MUST BE SUBMITTED TO SUBSTANTIATE THE AUTHORITY OF THE PERSON SIGNING THE CONTRACT. IF A CORPORATION, **THE SAME OFFICER SHALL NOT EXECUTE BOTH THE CONTRACT AND THE CERTIFICATE.**

CORPORATE CERTIFICATE

I, RENE SWANK, certify that I am the CORPORATE Secretary of the Corporation named as Contractor herein; that DEREK SWANK, who signed this contract on behalf of the Contractor was then VICE-PRESIDENT of said corporation; that said contract was duly signed for and on behalf of said corporation by authority of its governing body and is within the scope of its corporate powers.

Rene Swank (Secretary) (CORPORATE SEAL)

AUTHORITY TO BIND PARTNERSHIP

This is to certify that the names, signatures and Social Security Numbers of all partners are listed below and that the person signing the contract has authority actually to bind the partnership pursuant to its partnership agreements. Each of the partners individually has full authority to enter into and execute contractual instruments on behalf of said partnership with the United States of America, except as follows: (state "none" or describe limitations, if any) _____

This authority shall remain in full force and effect until such time as the revocation of authority by any cause whatsoever has been furnished in writing to, and acknowledged by, the Contracting Officer.

(Names, Signatures and Social Security Numbers of all Partners)

NAME	SIGNATURE	SOCIAL SECURITY NO.

This page intentionally blank

SCHEDULE

Item No.	Description of Item	Est. Quantity	Unit	Unit Price	Amount
	BASE ITEMS				
0001	All Work for Missoula Technology and Development Center, Except for Items 0002 through 0009	1	JOB	L.S.	$5,020,000.—
0002	All Roadwork for Missoula Technology and Development Center 1/	1	JOB	L.S.	$1,575,000.—
0003	All Work to Furnish One 276 Gpm Capacity Groundwater Supply Well and One Reinjection Well				
0003AA	First 200 Lineal Feet	200	LF	$80.—	$16,000.—
0003AB	All Over 200 Lineal Feet	100	LF	$52.50	$10,500.—
				TOTAL BASE ITEMS	$6,621,500.—
	OPTIONAL ITEMS				
0004	Lab Equipment, Building 3203 (Item 0004 = Additive Alternate #1 on the drawings)	1	JOB	L.S.	$96000.—
0005	East End Extension of Shop Building (Item 0005 = Additive Alternate #2 on the drawings)	1	JOB	L.S.	$144000.—
0006	Interior Work, Textile Lab (Item 0006 = Additive Alternate #3 on the drawings)	1	JOB	L.S.	$104400.—
0007	Landscaping (Item 0007 = Additive Alternate #4 on the drawings)	1	JOB	L.S.	$112400.—
0008	Security System (Item 0008 = Additive Alternate #5 on the drawings)	1	JOB	L.S.	$34300.—
0009	Water Main Loop (Item 0009 = Additive Alternate #6 on the drawings)	1	JOB	L.S.	$40800.—
				TOTAL OPTIONAL ITEMS	$531900.—
				TOTAL BASE AND OPTIONAL ITEMS	$7,153,400.—

NOTE:

1. See Section 01025 Payment

This page intentionally blank

SWANK ENTERPRISE'S SMALL BUSINESS SUBCONTRACTING PLAN FOR SMALL BUSINESS, HUBZONE SMALL BUSINESS, SMALL DISADVANTAGED BUSINESS, & WOMEN-OWNED BUSINESS

May 2, 2000

Contractor: Swank Enterprises
PO Box 568
Valier, MT 59486
Phone No: (406) 279-3241

Project Title: Missoula Technology & Development Center

Solicitation No: DACA67-00-B-0014

1. In accordance with the contract clauses at 52.219-8 and 52.219-9, Swank Enterprises submits the following Subcontracting Plan for Small, HUBZone Small, Small Disadvantaged, and Women-owned Business Concerns.

2. The following are corresponding dollar values for percentages cited in paragraph 3:

a. Total contract amount is $6,616,250.

b. Total dollars planned to be subcontracted is $4,749,000.

c. Total dollars planned to be subcontracted to small business concerns is $3,656,700.

d. Total dollars planned to be subcontracted to HUBZone small business: $47,490.

e. Total dollars planned to be subcontracted to small disadvantaged business concerns $450,000.

f. Total dollars planned to be subcontracted to small woman-owned business concerns $285,000.

3. The following percentage goals are applicable to the contract awarded under the solicitation cited above.

a. The total estimated percentage of all planned subcontracting to all types of business concerns under this contract is 71.8%.

b. **Small Business Concerns: 77%** of total planned subcontracting dollars under this contract will go to subcontractors who are small business concerns including 3c., 3d., and 3e.

c. **Small HUBZone Business Concerns: 1%** of total planned subcontracting dollars under this contract will go to HUBZone small business contractors at this time. At the time of the solicitation, we had only one HUBZone contractor respond, and their base bid was 186% higher than the low bid, and their alternate bid was 292% higher than the low alternate bid. We have a few items open, which we hope to fill with a HUBZone business, but at this time Montana only has twenty HUBZone businesses, and it has proved most difficult to locate one in the trades needed at this time.

d. **Small Disadvantaged Business Concerns: 9.5%** of total planned subcontracting dollars under this contract will go to subcontractors who are small disadvantaged individuals. Note: This percentage **does not** include Women-owned businesses unless they qualify as disadvantaged.

e. **Small Woman-Owned Business Concerns: 6%** of total planned subcontracting dollars under this contract will go to subcontractors who are small woman-owned businesses.

4. The principal items or areas we will subcontract under this contract are: Division 02, complete; Division 03, sections 03300, 03300-4; Division 04, complete; Division 05, complete; Division 06, sections 06155, 06171, 06185, 06200, 06402; Division 07, sections 07132, 07210,07210-2,07311, 07412,07531, 07620; Division 08, complete; Division 09, complete; Division 10, sections 10155, 10520, 10651,10801; Division 11, section 11610; Division 12, section 12348; Division 14, section 14240; Division 15, complete; Division 16, complete.

a. Of the items or areas stated in 4; the following are planned to be subcontracted to Small Businesses: Division 02, section 02810, 02900, 02905, 02831; Division 03, some of sections 03300, 03300-4; Division 04, complete; Division 05, Sections 05120, 05500, 05521; Division 06, sections 06155, 06171, 06185, 06200, 06402; Division 07, sections 07132, 07210,07210-2,07311, 07531, 07620; Division 08, sections 08120, 08310, 08410, 08520, 08800, 08950; Division 09, sections 09512, 09900, 09960; Division 10, sections 10155, 10520, 10651,10801; Division 15, complete; Division 16, complete.

b. Of the items or areas stated in 4; the following are planned to be subcontracted to HUBZone Small Businesses: At this point, we have no HUBZone contractors located for specific contracts, please see our note at the end on this plan.

c. Of the items or areas stated in 4.a; the following are planned to be subcontracted to Small Disadvantaged Businesses: Division 06, section 06155, 06171.

d. Of the items or areas stated in 4.a; the following are planned to be subcontracted to Small Women-Owned Businesses: Division 05, 05120, 05500, 05521; Division 06, section 06155, Division 09, section 09512.

5. The following describes the methods used to develop the subcontracting goals in paragraph 2:

a. Our subcontracting goals are always aimed at the "reasonable goals" listed in the solicitation.

b. Mailed bid invitations to small, HUBZone small, small disadvantaged, and women-owned businesses, contacted Economic Development Agency's to contact their small businesses or to give me a mailing list to contact, and e-mailed invitations to HUBZone small businesses through Pro-Net

c. Advertised in Builders Exchange bulletins in Billings, Great Falls, Northwest Montana, and Missoula.

d. Accessed SBA's ProNet system, to get list of certified disadvantaged, and HUBZone firms.

e. Obtained Montana DOT's list of disadvantaged and woman-owned small businesses.

f. We use internal lists to solicit subcontractors and suppliers.

6. Indirect costs were not used in establishing subcontracting goals.

7. The following individual will administer Swank Enterprises' Subcontracting Program:

Name: Nina Rapkoch Job Title: Small Business Program Coordinator
Address: PO Box 568, Valier, Montana 59486
Phone No: (406) 279-3241 Fax No: (406) 279-3321

Nina Rapkoch's specific duties with regard to the conduct of Swank Enterprises' Subcontracting Plan will include, but will not be limited to, the following:

a. Developing and maintaining bidders lists of small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns using sources such as the SBA's ProNet (http://pro-net.sba.gov/), Economic Development Centers, US Department of Commerce, National Center for American Indian Enterprise Development, Economic Development Centers, and Local Minority Business Development Centers.

b. Assuring the inclusion of small, HUBZone small, small disadvantaged, and women-owned small business concerns in all solicitations for products or services which they are capable of providing; and ensuring that all solicitations are structured to permit the maximum possible participation by small, HUBZone small, small disadvantaged, and women-owned small business concerns.

c. Establishing and maintaining records of all solicitations and subcontract awards to ensure that the members of the firm who review bidders proposals documents their reasons for selecting or not selecting a bid submitted by a small, HUBZone small, small disadvantaged, or women-owned small

business concern, and monitoring the firm's progress towards achievement of its percentaged goals.

d. Preparing and submitting the Subcontracting Report for Individual Contracts (SF 294) and the Summary Subcontract Report (SF 295) in accordance with instructions provided, and coordinating and preparing for all compliance reviews by Federal agencies.

e. Attendance or representation at DOD sponsored training programs in order to develop guidance and training to firm personnel on the policy of the federal government to aid, assist, and counsel small business under this and other government contracts. A company representative attended a training program held in Seattle, in March 2000.

f. Conducting or arranging for all other activities necessary to further the intent and attainment of the goals in the Plan to include motivational training of the firm's purchasing personnel, attendance at workshops, seminars and trade fairs conducted by or on behalf of small business and/or HUBZone small and/or small disadvantaged and/or women-owned small business concerns; and general cooperation with members of the small, HUBZone small, small disadvantaged and women-owned small business concerns or their representatives. Specifically, we have participated in a small business workshop, and distributed brochures as outreach to small businesses. We have contacted some of our current minority businesses, mailed certification packets to them, and encouraged them to become certified through SBA; and also have encouraged small businesses to become certified HUBZone small businesses due to their location.

8. The following steps will be taken to ensure that small, HUBZone small, small disadvantaged, and women-owned small business concerns receive notice of and have an equitable opportunity to compete for intended awards of subcontracts and/or purchase orders for the products and/or services describe in paragraph 4 above:

a. Sources will be requested through SBA's ProNet system, business development organizations, minority and small trade associations, and at small, HUBZone small, minority and women-owned small business procurement conferences; sources will be contacted; and bidding materials will be provided to all responding parties expressing an interest.

b. Internally, motivational training will be conducted to guide and encourage purchasing personnel; source lists and guides to small, HUBZone small, small disadvantaged, and women-owned small business concerns will be maintained and utilized by purchasing personnel while soliciting subcontracts and purchase orders; activities will be monitored to ensure sufficient time is allowed for interested bidders to prepare their proposals and to evaluate continuing compliance with the Subcontracting Plan.

9. Swank Enterprises agrees that the clause entitled "Utilization of Small Business Concerns" (Jan 1999) will be included in all subcontracts that offer further subcontracting opportunities. All subcontractors, except small business concerns, who receive subcontracts in excess of $1,000,000

will be required to adopt a plan similar to this one. Such plans will be reviewed to assure that all minimum requirements of an acceptable subcontracting plan have been satisfied.

The acceptability of percentaged goals shall be determined on a case-by-case basis depending on the supplies/services involved, the availability of potential small, HUBZone small, small disadvantaged, and women-owned subcontractors, and prior experience. Once approved and implemented, plans will be monitored through the submission of periodic reports, or as time and availability of funds permit, periodic visits to subcontractors facilities to review applicable records and subcontracting program progress.

10. Swank Enterprises agrees to submit periodic reports and cooperate in any studies or surveys as may be required by the Contracting Agency or Small Business Administration in order to determine the extent of compliance by the offeror with the subcontracting plan and with the clause entitled "Utilization of Small Business Concerns" contained in the contract.

11. Swank Enterprises agrees to maintain at least the following types of records to document compliance with the Subcontracting Plan:

a. The names of all organizations, agencies, and associations contacted for small, HUBZone small, small disadvantaged, and women-owned small business sources, along with records of attendance at conference, seminars, and trade fairs where additional sources were developed.

b. Source lists, guides, and other data identifying small, HUBZone small, small disadvantaged, and women-owned small business subcontractors and vendors.

c. Records on all subcontract solicitations resulting in an award of more than $100,000 on a contract-by-contract basis, indicating (1) whether small business concerns were solicited, and if not, why not; (2) whether HUBZone small business were solicited, and if not, why not; (3) whether small disadvantaged business concerns were solicited, and if not, why not; (4) whether small women-owned business concerns were solicited, and if not, why not; and (5) reasons for the failure of solicited small, HUBZone small, small disadvantaged or women-owned small business concerns to receive a subcontract award.

d. Records of all subcontract award data to include subcontractor's name and address, to be kept on a contract-by-contract basis.

e. Minutes of internal motivational meetings held for guidance and encouragement of purchasing personnel, and records of all monitoring activities performed for compliance evaluation.

f. Copies of SF 294 and SF 295 showing date and place of filing and copies of all other reports or results of reviews conducted by the contracting agency or other interested agencies of the Federal government to monitor our compliance with this Subcontracting Plan.

12. Swank Enterprises will submit a SF 295, Summary Subcontract Report, on Corps of Engineers projects only. The SF 295 shall be completed and distributed in accordance with the Corps of Engineers Supplemental Instructions. Swank Enterprises will not report Corps of Engineers projects through any other Agency unless authorized by the Contracting Officer.

13. In closing, Swank Enterprises states that it will be the policy of Swank Enterprises to afford every practicable opportunity for small, HUBZone small, small disadvantaged, and women-owned small business concerns to participate in contracts awarded to Swank Enterprises by the Federal Government, to ensure that equitable opportunity is provided to small, HUBZone small, small disadvantaged, and women-owned small business concerns to compete for award of subcontractors and purchase orders, and to diligently pursue the achievement of our goals of participation by small, HUBZone small, small disadvantaged, and women-owned small businesses in the dollars available for subcontract/purchase order awards under this contract.

BY: Jim Lake DATE: 5-2-00

Jim Lake, Vice President
Swank Enterprises

Date: April 27, 2000

	Dollars	Percentage
1. Option # 0004 total:	$ 96,000.00	100%
2. Total to be subcontracted to all types of businesses:	$ 90,241.00	94.0%
a. Subcontracted to Small Business (Including b, c, & d. below):	$ 5,687.00	6.3%
b. Subcontracted to HUBZone Small Businesses:	$ 0	0
c. Subcontracted to Small Disadvantaged Businesses:	$ 0	0
d. Subcontracted to Women-Owned Small Businesses:	$ 0	0

PLEASE NOTE THAT THIS OPTION IS A SPECIALIZED ITEM, WHICH IS BEING SUPPLIED BY A LARGE BUSINESS. THE NEXT SMALL BUSINESS BID WAS 125%+ HIGHER THAN THE LARGE BUSINESS BID. THERE ARE NO ITEMS LEFT TO PROCURE FOR THIS OPTION.

Date: April 27, 2000

	Dollars	Percentage
1. Option # 0005 total:	$ 144,000.00	100%
2. Total to be subcontracted to all types of businesses:	$ 82,970.00	57.6%
a. Subcontracted to Small Business (Including b, c, & d. below):	$ 70,938.00	85.5%
b. Subcontracted to HUBZone Small Businesses:	$ 800.00	1.0%
c. Subcontracted to Small Disadvantaged Businesses:	$ 20,500.00	24.7%
d. Subcontracted to Women-Owned Small Businesses:	$ 19,000.00	22.9%

Date: April 27. 2000

	Dollars	Percentage
1. Option # 0006 total:	$ 104,400.00	100%
2. Total to be subcontracted to all types of businesses:	$ 90,458.00	86%
a. Subcontracted to Small Business (Including b, c, & d. below):	$ 83,453.00	92.3%
b. Subcontracted to HUBZone Small Businesses:	$ 0	0%
c. Subcontracted to Small Disadvantaged Businesses:	$ 0.	0%
d. Subcontracted to Women-Owned Small Businesses:	$ 1,144.00	1.3%

AT THE TIME OF THIS PLAN, THERE ARE NO OPEN ITEMS THAT NEED TO BE PROCURED, SO THE "0" DOLLARS & PERCENTAGES LISTED ARE ONLY RELATIVE TO THIS OPTION.

Date: April 27. 2000

	Dollars	Percentage
1. Option # 0007 total:	$ 112,400.00	100%
2. Total to be subcontracted to all types of businesses:	$ 105,095.00	93.5%
a. Subcontracted to Small Business (Including b, c, & d. below):	$ 105,095.00	100%
b. Subcontracted to HUBZone Small Businesses:	$ 0	0
c. Subcontracted to Small Disadvantaged Businesses:	$ 0	0
d. Subcontracted to Women-Owned Small Businesses:	$ 0	0

AT THE TIME OF THIS PLAN, THERE ARE NO OPEN ITEMS THAT NEED TO BE PROCURED, SO THE "0" DOLLARS & PERCENTAGES LISTED ARE ONLY RELATIVE TO THIS OPTION.

Date: April 27, 2000

	Dollars	Percentage
1. Option # 0008 total:	$ 34,300.	100%
2. Total to be subcontracted to all types of businesses:	$ 32,040.00	93.4%
a. Subcontracted to Small Business (Including b, c, & d. below):	$ 32,040.00	100%
b. Subcontracted to HUBZone Small Businesses:	$ 0	0
c. Subcontracted to Small Disadvantaged Businesses	$ 0	0
d. Subcontracted to Women-Owned Small Businesses	$ 0	0

AT THE TIME OF THIS PLAN, THERE ARE NO OPEN ITEMS THAT NEED TO BE PROCURED, SO THE "0" DOLLARS & PERCENTAGES LISTED ARE ONLY RELATIVE TO THIS OPTION.

Date: April 27, 2000

	Dollars	Percentage
1. Option # 0009 total:	$ 40,800.00	100%
2. Total to be subcontracted to all types of businesses:	$ 38,000.00	93%
a. Subcontracted to Small Business (Including b, c, & d. below):	$ 38,000.00	100%
b. Subcontracted to HUBZone Small Businesses:	$ 0	0
c. Subcontracted to Small Disadvantaged Businesses:	$ 0	0
d. Subcontracted to Women-Owned Small Businesses:	$ 0	0

AT THE TIME OF THIS PLAN, THERE ARE NO OPEN ITEMS THAT NEED TO BE PROCURED, SO THE "0" DOLLARS & PERCENTAGES LISTED ARE ONLY RELATIVE TO THIS OPTION.

TO WHOM IT MAY CONCERN:

At the time of the bid we received only one HUBZone small business bid, and it's base quote was 134% higher then the low small business bid, and it's option quote was 210% higher. We are using the low small business bid.

At the time of this plan we do not have any HUBZone small businesses ready to contract with. We will continue in good faith try to locate some HUBZone small businesses to contract with. There are twenty HUBZone businesses listed in Montana on Pro-Net, and of those several are not even a part of this industry, which at present is making it difficult to procure HUBZone small businesses.

Swank Enterprises will continue in good faith to attain all goals set forth in this plan.

SWANK ENTERPRISES

Nina Rapkoch

Nina Rapkoch, Small Business Plan Coordinator

This page intentionally blank

FROM: US ARMY CORPS OF ENGINEERS
PO BOX 3755
SEATTLE, WA 98124-2255
(206)764-3653, CENWS-CT-CB-CU, ROSE N.S. PORCINCULA

1. Refer to Invitation For Bid DACW67-00-B-0014, Missoula Technology & Development Center, Missoula, Montana. This is Amendment Number Eight (0008), dated 31 March 2000 which provides for the following:

Drawing Sheet C17.0: Add new Note 10, to read, "Underground piping from the ground water supply well and from the reinjection well to the building shall be C900 PVC installed in accordance with Specification Section 15060."

Drawing Sheet A5.1: In Details 4, 5 and 9, revise the callout "1/2" sheathing w/finish face" to read "1/2" exterior rated AC plywood with A side painted."

Drawing Sheet A5.3: Revise the note under "Perforated Metal Panels" to read, "11 gage panels, no hem, hole pattern to be industry standard staggered holes. Tack weld the panels to the frame prior to finishing at 1'0" on center."

Drawing Sheet S1.9: Add note to read, "A W10x5 header is required between the columns of Grids U and V along Grid Line 30 and along Grid Line 32 to support the painted metal grating (not in contract) as shown on Sheet A1.5."

Drawing, Sheet S4.1: Revise Note 1, under Shearwall Schedule, to read, "Block all edges with metal studs of the same gage as the wall studs."

Drawing, Sheet M3.5: Delete the callout for CH-1 in Equipment Storage Room T108.

Specifications Section 08711: In Paragraph 3.6, Door Hardware Schedule, revise HW-15 to change the OH Stop/Holders from GJ90-M-6 US26D to GJ90-H-6 US26D. Revise HW-34 to change the lockset from L460 606 to L460 626. Revise HW-11, HW-12, HW-26, HW-30 and HW-35 as follows:

- To each set, add 1 mortise cylinder.
- For each exit device, add "storeroom/night latch function".
- Change "closer" to "closer with drop plate".

2. The BID OPENING TIME AND DATE Remains unchanged at 2:00 p.m., Local Time, 7 April 2000.

3. NOTICE TO BIDDERS: BIDDERS MUST ACKNOWLEDGE RECEIPT OF THIS AMENDMENT BY NUMBER AND DATE IN BLOCK 18 ON THE SF1442, OR BY TELEGRAM. PLEASE MARK THE OUTSIDE OF YOUR ENVELOPE CONTAINING THE BID TO SHOW AMENDMENTS RECEIVED.

This page intentionally blank

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
0007	29-Mar-2000	W68MD9-9337-3179	

6. ISSUED BY CODE DACW67
USA ENGINEER DISTRICT, SEATTLE
ATTN: CENWS-CT
P.O. BOX 3755

SEATTLE, WA 98124-3755

7. ADMINISTERED BY (If other than item 6) CODE
See Item 6

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)

CODE FACILITY CODE

X	9A. AMENDMENT OF SOLICITATION NO. DACW67-00-B-0014
X	9B. DATED (SEE ITEM 11) 08-Feb-2000
	10A. MOD. OF CONTRACT/ORDER NO.
	10B. DATED (SEE ITEM 13)

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer [ ] is extended, [X] is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the document; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN THE REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

[ ] A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

[ ] B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

[ ] C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

[ ] D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

PROJECT: Missoula Technology & Development Center, Missoula, Montana. Solicitation Number DACW67-00-0014.

This Amendment No. 0007 provides for the following:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) ROSE N PORCINCULA / CONTRACT SPECIALIST	
15B. CONTRACTOR/OFFEROR _____ (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY _____ (Signature of Contracting Officer)	16C. DATE SIGNED 28-Mar-2000

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

A. Revisions to Specification Sections 00800, 02810, 08950, 10105, 15205 and 15930 are hereby attached. Changes are annotated by strikeouts, underlines and sidebars.

B. The Bid Opening Time and Date remain unchanged at 2:00 p.m., Local Time, 7 April 2000.

C. All other terms and conditions of the solicitation remain unchanged.

D. NOTICE TO BIDDERS: BIDDERS MUST ACKNOWLEDGE RECEIPT OF THIS AMENDMENT BY NUMBER AND DATE ON THE BID OR BY TELEGRAM. PLEASE ALSO MARK THE OUTSIDE OF YOUR ENVELOPE CONTAINING YOUR BID TO SHOW AMENDMENTS RECEIVED.

FROM: US ARMY CORPS OF ENGINEERS
PO BOX 3755
SEATTLE, WA 98124-2255
(206)764-3653, CENWS-CT-CB-CU, ROSE N.S. PORCINCULA

1. Refer to Invitation For Bid DACW67-00-B-0014, Missoula Technology & Development Center, Missoula, Montana. This is Amendment Number Six (0006), dated 24 March 2000 which provides for the following:

2. The BID OPENING TIME AND DATE IS HEREBY EXTENDED FROM 2:00 p.m., Local Time, 29 March 2000, to 2:00 p.m., Local Time, 7 April 2000.

3. Amendment No. 0007 with technical changes/clarifications to follow.

4. Please Note: Amendment No. 0007 with Technical Changes/Clarifications should be available on our website at http://www.usace.army.mil, on/about 29 March 2000, followed by the hard copy in the mail thereafter.

5. NOTICE TO BIDDERS: BIDDERS MUST ACKNOWLEDGE RECEIPT OF THIS AMENDMENT BY NUMBER AND DATE IN BLOCK 18 ON THE SF1442, OR BY TELEGRAM. PLEASE MARK THE OUTSIDE OF YOUR ENVELOPE CONTAINING THE BID TO SHOW AMENDMENTS RECEIVED.

This page intentionally blank

FROM: US ARMY CORPS OF ENGINEERS
PO BOX 3755
SEATTLE, WA 98124-2255
(206)764-3653, CENWS-CT-CB-CU, ROSE N.S. PORCINCULA

1. Refer to Invitation For Bid DACW67-00-B-0014, Missoula Technology & Development Center, Missoula, Montana. This Amendment Number Five (0005), dated 21 March 2000 which provides for the following:

2. The BID OPENING TIME AND DATE IS HEREBY EXTENDED FROM 2:00 p.m., Local Time, 22 March 2000, to 2:00 p.m., Local Time, 29 March 2000.

3. Amendment No. 0006 with technical changes/clarifications to follow.

4. NOTICE TO BIDDERS: BIDDERS MUST ACKNOWLEDGE RECEIPT OF THIS AMENDMENT BY NUMBER AND DATE IN BLOCK 18 ON THE SF1442, OR BY TELEGRAM. PLEASE MARK THE OUTSIDE OF YOUR ENVELOPE CONTAINING THE BID TO SHOW AMENDMENTS RECEIVED.

This page intentionally blank

FROM: US ARMY CORPS OF ENGINEERS
PO BOX 3755
SEATTLE, WA 98124-2255
(206)764-3653, CENWS-CT-CB-CU, ROSE N.S. PORCINCULA

1. Refer to Invitation For Bid DACW67-00-B-0014, Missoula Technology & Development Center, Missoula, Montana. This Amendment Number Four (0004), dated 16 March 2000 which provides for the following:

Special Clauses, Section 00800, Clause SC-1.1.a: Change “Optional Bid Items 0003 through 0008” to “Optional Bid Items 0004 through 0009”.

2. The bid opening time and date remains unchanged at 2:00 p.m., Local Time, 22 March 2000.

3. NOTICE TO BIDDERS: BIDDERS MUST ACKNOWLEDGE RECEIPT OF THIS AMENDMENT BY NUMBER AND DATE IN BLOCK 18 ON THE SF1442, OR BY TELEGRAM. PLEASE MARK THE OUTSIDE OF YOUR ENVELOPE CONTAINING THE BID TO SHOW AMENDMENTS RECEIVED.

This page intentionally blank

FROM: US ARMY CORPS OF ENGINEERS
PO BOX 3755
SEATTLE, WA 98124-2255
(206)764-3653, CENWS-CT-CB-CU, ROSE N.S. PORCINCULA

1. Refer to Invitation For Bid DACW67-00-B-0014, Missoula Technology & Development Center, Missoula, Montana. IFB No. This is Amendment Number Three (0003), dated 15 March 2000 which provides for the following:

Special Clauses: In the Index of Drawings, change the Revision Number to 2 for Sheet A11.1, and the date of that drawing sheet to 02FEB00.

Drawing Sheet A7.1: Delete the Note on the bottom of the Door Schedule regarding finished or unfinished frames. In the Remarks Schedule of the Door Schedule, delete the reference to "See Note Below" for Doors Number T100-1, T104-1, T106-1, and T110-1

Drawing Sheet P3.2: Add to Keyed Note 8 to read, "Provide isolation valves on incoming and outgoing lines from water distiller."

Drawing Sheet E2.1: In General Note 9, change “240 volt” to “208 volt.”

Drawing, Sheet E2.3: Replace Keynote 2, which was deleted by Amendment 0001, as it was originally and add to it the following text: “In lieu of cable tray as shown through Lobby 105, the Contractor shall provide three (3) 4" empty conduits with pull strings through the Lobby. Termination of the conduit shall be at the cable trays at Corridor 144 and at Mechanical Room 106. Provide fire proofing for conduit passing through the fire rated wall of the mechanical room.”

Drawing, Sheet E3.3: Delete Key Note 3.

Drawing Sheet E6.0: Change the breaker for circuits 39 and 41 from a 2P-20A breaker to a 2P-30 breaker on Panel LC.

Drawing Sheet E7.0: Revise the first paragraph of Note 2 to read "Any generator that meets the requirements of this note is acceptable.” Revise the ninth paragraph of Note 2 to delete the first three sentences and replace them with: “The generator must be mounted on a single axle trailer with a 3500 lb rating.”

Specifications Section 09680: In Paragraph 2.1.A.1, add the words “Rolled carpet of quality comparable to” before “Interface”.

Specifications Section 15930: In Paragraph 2.4.A.1, change the second part of this paragraph to read as follows: "It is the intent of these specifications for the Contractor to provide and install a direct digital control (DDC) system with electric or electronic controllers. All 'system' type control functions, such as those used for fan systems, boilers, chillers, central plant and pumps, building pressurization, etc. shall be accomplished by using software algorithms in the respective DDC. Disregard any references within this or other specifications to pneumatically controlled devices. All controls for the VAV boxes are to be supplied by the Controls Contractor, with coordination with the VAV manufacturer."

Specifications Section 15930: Revise Paragraph 3.1.C to read: "The fan discharge temperature is controlled at 55 deg. F (adjustable). The discharge temperature is controlled by modulating the mixing dampers, a 3-way heating valve, or the ground water cooling valve. When the outside air can no longer control the discharge temperature, the ground water cooling system shall be activated, and the 3 way control valve shall modulate. All heating shall be provided at the VAV terminals or with fin tube."

Specifications Section 16740A: Revise third sentence to read, “Conduit shall be stubbed 90 degrees into accessible ceiling space between first and second floors for all locations.”

2. The bid opening time and date remains unchanged at 2:00 p.m., Local Time, 22 March 2000.

3. NOTICE TO BIDDERS: BIDDERS MUST ACKNOWLEDGE RECEIPT OF THIS AMENDMENT BY NUMBER AND DATE IN BLOCK 18 ON THE SF1442, OR BY TELEGRAM. PLEASE MARK THE OUTSIDE OF YOUR ENVELOPE CONTAINING THE BID TO SHOW AMENDMENTS RECEIVED.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 2

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
0002	08-Mar-2000	W68MD9-9337-3179	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
USA ENGINEER DISTRICT, SEATTLE ATTN: CENWS-CT P.O. BOX 3755 SEATTLE, WA 98124-3755	DACW67	**See Item 6**	

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
	X	9A. AMENDMENT OF SOLICITATION NO. DACW67-00-B-0014
	X	9B. DATED (SEE ITEM 11) 08-Feb-2000
		10A. MOD. OF CONTRACT/ORDER NO.
		10B. DATED (SEE ITEM 13)
CODE / FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer [ ] is extended, [X] is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the document; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN THE REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

[ ] A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

[ ] B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

[ ] C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

[ ] D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

PROJECT: Missoula Technology & Development Center, Missoula, Montana. Solicitation Number DACW67-00-B-0014.

This Amendment No. 0002 provides for the following:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) ROSE N PORCINCULA / ADDED BY SUMI	
15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (Signature of Contracting Officer)	16C. DATE SIGNED

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

A. Revisions to Specification Sections 00800, 01005, 01040, 07412, 08711 and the Table of Contents are hereby attached. Changes are annotated by strikeouts, underlines and sidebars.

B. The Bid Opening Time and Date remain unchanged at 2:00 p.m., Local Time, 22 March 2000.

C. All other terms and conditions of the solicitation remain unchanged.

D. NOTICE TO BIDDERS: BIDDERS MUST ACKNOWLEDGE RECEIPT OF THIS AMENDMENT BY NUMBER AND DATE ON THE BID OR BY TELEGRAM. PLEASE ALSO MARK THE OUTSIDE OF YOUR ENVELOPE CONTAINING YOUR BID TO SHOW AMENDMENTS RECEIVED.

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE	PAGE OF PAGES
	1 | 12

2. AMENDMENT/MODIFICATION NO.	3. EFFECTIVE DATE	4. REQUISITION/PURCHASE REQ. NO.	5. PROJECT NO.(If applicable)
0001	02-Mar-2000	W68MD9-9337-3179	

6. ISSUED BY	CODE	7. ADMINISTERED BY (If other than item 6)	CODE
USA ENGINEER DISTRICT, SEATTLE ATTN: CENWS-CT P.O. BOX 3755 SEATTLE, WA 98124-3755	DACW67	**See Item 6**	

8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)		
	X	9A. AMENDMENT OF SOLICITATION NO. DACW67-00-B-0014
	X	9B. DATED (SEE ITEM 11) 08-Feb-2000
		10A. MOD. OF CONTRACT/ORDER NO.
		10B. DATED (SEE ITEM 13)
CODE / FACILITY CODE		

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

[X] The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer [X] is extended, [ ] is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the document; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN THE REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS.
IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

[ ] A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.

[ ] B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).

[ ] C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:

[ ] D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor [ ] is not, [ ] is required to sign this document and return _____ copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)

PROJECT: Missoula Technology & Development Center, Missoula, Montana. Solicitation Number DACW67-00-B-0014.

This Amendment No. 0001 provides for the following:

Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print)		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) ROSE N PORCINCULA / ADDED BY SUMI	
15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign)	15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (Signature of Contracting Officer)	16C. DATE SIGNED

SECTION SF 30 BLOCK 14 CONTINUATION PAGE

A. The Department of Labor, Davis Bacon Wage Determination, MT000033 with 0 modifications, dated 02/11/2000, hereby supersedes and replaces in its entirety the Department of Labor, Davis Bacon Wage Determination, MT990033, with 1 modification, dated 10/22/1999.

B. Revisions to the Bid Schedule, Plans and Specifications are hereby attached.

C. The Bid Opening Time and Date are hereby extended from 1:00 p.m., Local Time, 15 March 2000, to 2:00 p.m., Local Time, 22 March 2000.

D. The following clauses listed below are hereby added/changed/replaced in their entirety:

SECTION 00100:	ADD:	**52.217-0005 M001 – Evaluation of Options**
	REVISED:	**52.225-12 -- Notice of Buy American Act/Balance of Payments Program Requirement-Construction Materials Under Trade Agreements.**
SECTION 00600:	ADD:	**52.225-6 - Trade Agreements Certificate.**
SECTION 00700:	DELETE:	**52.225-6 – Balance of Payments Program Certificate (APR 1985)**
	REVISED:	**52.225-5 - Trade Agreements.** **52.225-11 - Buy American Act-Balance of Payments Program Construction Materials under Trade Agreements.** **52.226-1 -- Utilization of Indian Organizations and Indian-Owned Economic Enterprises.** **52.248-3 -- Value Engineering – Construction.**

E. All other terms and conditions of the solicitation remains unchanged.

F. NOTICE TO BIDDERS: BIDDERS MUST ACKNOWLEDGE RECEIPT OF THIS AMENDMENT BY NUMBER AND DATE ON THE BID, OR BY TELEGRAM. PLEASE ALSO MARK THE OUTSIDE OF YOUR ENVELOPE CONTAINING YOUR BID TO SHOW AMENDMENTS RECEIVED.

SECTION 00100:

52.217-0005 M001 EVALUATION OF OPTIONS (JUL 1990)

SECTION 00700 Contract Clauses

CLAUSES INCORPORATED BY FULL TEXT

52.252-2 CLAUSES INCORPORATED BY REFERENCE (FEB 1998)

This contract incorporates one or more clauses by reference, with the same force and effect as if they were given in full text. Upon request, the Contracting Officer will make their full text available. Also, the full text of a clause may be accessed electronically at this/these address(es):

[Insert one or more Internet addresses]

SUCCESSOR CONTRACTING OFFICERS (52.0201-4001)

The Contracting Officer who signed this contract is the primary Contracting Officer for the contract. Nevertheless, any Contracting Officer assigned to the Seattle District and acting within his/her authority may take formal action on this contract when a contract action needs to be taken and the primary Contracting Officer is unavailable.

252.201-7000 CONTRACTING OFFICER'S REPRESENTATIVE (DEC 1991)

(a) "Definition. Contracting officer's representative" means an individual designated in accordance with subsection 201.602-2 of the Defense Federal Acquisition Regulation Supplement and authorized in writing by the contracting officer to perform specific technical or administrative functions.

(b) If the Contracting Officer designates a contracting officer's representative (COR), the Contractor will receive a copy of the written designation. It will specify the extent of the COR's authority to act on behalf of the contracting officer. The COR is not authorized to make any commitments or changes that will affect price, quality, quantity, delivery, or any other term or condition of the contract.

(End of clause)

52.202-1 DEFINITIONS (OCT 1995) --ALTERNATE I (APR 1984)

(a) "Head of the agency" (also called "agency head") or "Secretary" means the Secretary (or Attorney General, Administrator, Governor, Chairperson, or other chief official, as appropriate) of the agency, including any deputy or assistant chief official of the agency; and the term "authorized representative" means any person, persons, or board (other than the Contracting Officer) authorized to act for the head of the agency or Secretary.

(b) "Commercial component" means any component that is a commercial item.

(c) "Component" means any item supplied to the Federal Government as part of an end item or of another component.

(d) "Nondevelopmental item" means--

(1) Any previously developed item of supply used exclusively for governmental purposes by a Federal agency, a State or local government, or a foreign government with which the United States has a mutual defense cooperation agreement;

(2) Any item described in paragraph (e)(1) of this definition that requires only minor modification or modifications of a type customarily available in the commercial marketplace in order to meet the requirements of the procuring department or agency; or

(3) Any item of supply being produced that does not meet the requirements of paragraph (e)(1) or (e)(2) solely because the item is not yet in use.

(e) "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(f) Except as otherwise provided in this contract, the term "subcontracts" includes, but is not limited to, purchase orders and changes and modifications to purchase orders under this contract.

52.203-3 GRATUITIES (APR 1984)

(a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative--

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and

(2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If this contract is terminated under paragraph (a) of this clause, the Government is entitled--

(1) To pursue the same remedies as in a breach of the contract; and

(2) In addition to any other damages provided by law, to exemplary damages of not less than 3 nor more than 10 times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee. (This subparagraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to

any other rights and remedies provided by law or under this contract.

(End of clause)

52.203-5 COVENANT AGAINST CONTINGENT FEES (APR 1984)

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.

(b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.

(End of clause)

52.203-7 ANTI-KICKBACK PROCEDURES. (JUL 1995)

(a) Definitions.

"Kickback," as used in this clause, means any money, fee, commission, credit, gift, gratuity, thing of value, or compensation of any kind which is provided, directly or indirectly, to any prime Contractor, prime Contractor employee, subcontractor, or subcontractor employee for the purpose of improperly obtaining or rewarding favorable treatment in connection with a prime contract or in connection with a subcontract relating to a prime contract.

"Person," as used in this clause, means a corporation, partnership, business association of any kind, trust, joint-stock company, or individual.

"Prime contract," as used in this clause, means a contract or contractual action entered into by the United States for the purpose of obtaining supplies, materials, equipment, or services of any kind.

"Prime Contractor," as used in this clause, means a person who has entered into a prime contract with the United States.

"Prime Contractor employee," as used in this clause, means any officer, partner, employee, or agent of a prime Contractor.

"Subcontract," as used in this clause, means a contract or contractual action entered into by a prime Contractor or subcontractor for the purpose of obtaining supplies, materials, equipment, or services of any kind under a prime contract.

"Subcontractor," as used in this clause, (1) means any person, other than the prime Contractor, who offers to furnish or furnishes any supplies, materials, equipment, or services of any kind under a prime contract or a subcontract entered into in connection with such prime contract, and (2) includes any person who offers to furnish or furnishes general supplies to the prime Contractor or a higher tier subcontractor.

"Subcontractor employee," as used in this clause, means any officer, partner, employee, or agent of a subcontractor.

(b) The Anti-Kickback Act of 1986 (41 U.S.C. 51-58) (the Act), prohibits any person from -

(1) Providing or attempting to provide or offering to provide any kickback;

(2) Soliciting, accepting, or attempting to accept any kickback; or

(3) Including, directly or indirectly, the amount of any kickback in the contract price charged by a prime Contractor to the United States or in the contract price charged by a subcontractor to a prime Contractor or higher tier subcontractor.

(c)(1) The Contractor shall have in place and follow reasonable procedures designed to prevent and detect possible violations described in paragraph (b) of this clause in its own operations and direct business relationships.

(2) When the Contractor has reasonable grounds to believe that a violation described in paragraph (b) of this clause may have occurred, the Contractor shall promptly report in writing the possible violation. Such reports shall be made to the inspector general of the contracting agency, the head of the contracting agency if the agency does not have an inspector general, or the Department of Justice.

(3) The Contractor shall cooperate fully with any Federal agency investigating a possible violation described in paragraph (b) of this clause.

(4) The Contracting Officer may (i) offset the amount of the kickback against any monies owed by the United States under the prime contract and/or (ii) direct that the Prime Contractor withhold, from sums owed a subcontractor under the prime contract, the amount of any kickback. The Contracting Officer may order the monies withheld under subdivision (c)(4)(ii) of this clause be paid over to the Government unless the Government has already offset those monies under subdivision (c)(4)(i) of this clause. In either case, the Prime Contractor shall notify the Contracting Officer when the monies are withheld.

(5) The Contractor agrees to incorporate the substance of this clause, including this subparagraph (c)(5) but excepting subparagraph (c)(1), in all subcontracts under this contract which exceed $100,000.

52.203-8 CANCELLATION, RESCISSION, AND RECOVERY OF FUNDS FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)

(a) If the Government receives information that a contractor or a person has engaged in conduct constituting a violation of subsection (a), (b), (c), or (d) of Section 27 of the Office of Federal Procurement Policy Act (41 U.S.C. 423) (the Act), as amended by section 4304 of the 1996 National Defense Authorization Act for Fiscal Year 1996 (Pub. L. 104-106), the Government may--

(1) Cancel the solicitation, if the contract has not yet been awarded or issued; or

(2) Rescind the contract with respect to which--

(i) The Contractor or someone acting for the Contractor has been convicted for an offense where the conduct constitutes a violation of subsection 27 (a) or (b) of the Act for the purpose of either--

(A) Exchanging the information covered by such subsections for anything of value; or

(B) Obtaining or giving anyone a competitive advantage in the award of a Federal agency procurement contract; or

(ii) The head of the contracting activity has determined, based upon a preponderance of the evidence, that the Contractor or someone acting for the Contractor has engaged in conduct constituting an offense punishable under subsections 27(e)(1) of the Act.

(b) If the Government rescinds the contract under paragraph (a) of this clause, the Government is entitled to recover, in addition to any penalty prescribed by law, the amount expended under the contract.

(c) The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law, regulation, or under this contract.

52.203-10 PRICE OR FEE ADJUSTMENT FOR ILLEGAL OR IMPROPER ACTIVITY (JAN 1997)

(a) The Government, at its election, may reduce the price of a fixed-price type contract and the total cost and fee under a cost-type contract by the amount of profit or fee determined as set forth in paragraph (b) of this clause if the head of the contracting activity or designee determines that there was a violation of subsection 27 (a), (b), or (c) of the Office of Federal Procurement Policy Act, as amended (41 U.S.C. 423), as implemented in section 3.104 of the Federal Acquisition Regulation.

(b) The price or fee reduction referred to in paragraph (a) of this clause shall be--

(1) For cost-plus-fixed-fee contracts, the amount of the fee specified in the contract at the time of award;

(2) For cost-plus-incentive-fee contracts, the target fee specified in the contract at the time of award, notwithstanding any minimum fee or "fee floor" specified in the contract;

(3) For cost-plus-award-fee contracts--

(i) The base fee established in the contract at the time of contract award;

(ii) If no base fee is specified in the contract, 30 percent of the amount of each award fee otherwise payable to the Contractor for each award fee evaluation period or at each award fee determination point.

(4) For fixed-price-incentive contracts, the Government may--

(i) Reduce the contract target price and contract target profit both by an amount equal to the initial target profit specified in the contract at the time of contract award; or

(ii) If an immediate adjustment to the contract target price and contract target profit would have a significant adverse impact on the incentive price revision relationship under the contract, or adversely affect the contract financing provisions, the Contracting Officer may defer such adjustment until establishment of the total final price of the contract. The total final price established in accordance with the incentive price revision provisions of the contract shall be reduced by an amount equal to the initial target profit specified in the contract at the time of contract award and such reduced price shall be the total final contract price.

(5) For firm-fixed-price contracts, by 10 percent of the initial contract price or a profit amount determined by the Contracting Officer from records or documents in existence prior to the date of the contract award.

(c) The Government may, at its election, reduce a prime contractor's price or fee in accordance with the procedures of paragraph (b) of this clause for violations of the Act by its subcontractors by an amount not to exceed the amount of profit or fee reflected in the subcontract at the time the subcontract was first definitively priced.

(d) In addition to the remedies in paragraphs (a) and (c) of this clause, the Government may terminate this contract for default. The rights and remedies of the Government specified herein are not exclusive, and are in addition to any other rights and remedies provided by law or under this contract.

(End of clause)

52.203-12 LIMITATION ON PAYMENTS TO INFLUENCE CERTAIN FEDERAL TRANSACTIONS (JUN 1997)

(a) Definitions.

"Agency," as used in this clause, means executive agency as defined in 2.101.

"Covered Federal action," as used in this clause, means any of the following Federal actions:

(1) The awarding of any Federal contract.

(2) The making of any Federal grant.

(3) The making of any Federal loan.

(4) The entering into of any cooperative agreement.

(5) The extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

"Indian tribe" and "tribal organization," as used in this clause, have the meaning provided in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450B) and include Alaskan Natives.

"Influencing or attempting to influence," as used in this clause, means making, with the intent to influence, any communication to or appearance before an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any covered Federal action.

"Local government," as used in this clause, means a unit of government in a State and, if chartered, established, or otherwise recognized by a State for the performance of a governmental duty, including a local public authority, a special district, an intrastate district, a council of governments, a sponsor group representative organization, and any other instrumentality of a local government.

"Officer or employee of an agency," as used in this clause, includes the following individuals who are employed by an agency:

(1) An individual who is appointed to a position in the Government under title 5, United States Code, including a position under a temporary appointment.

(2) A member of the uniformed services, as defined in subsection 101(3), title 37, United States Code.

(3) A special Government employee, as defined in section 202, title 18, United States Code.

(4) An individual who is a member of a Federal advisory committee, as defined by the Federal Advisory Committee Act, title 5, United States Code, appendix 2.

"Person," as used in this clause, means an individual, corporation, company, association, authority, firm, partnership, society, State, and local government, regardless of whether such entity is operated for profit, or not for profit. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Reasonable compensation," as used in this clause, means, with respect to a regularly employed officer or employee of any person, compensation that is consistent with the normal compensation for such officer or employee for work that is not furnished to, not funded by, or not furnished in cooperation with the Federal Government.

"Reasonable payment," as used in this clause, means, with respect to professional and other technical services, a payment in an amount that is consistent with the amount normally paid for such services in the private sector.

"Recipient," as used in this clause, includes the Contractor and all subcontractors. This term excludes an Indian tribe, tribal organization, or any other Indian organization with respect to expenditures specifically permitted by other Federal law.

"Regularly employed," as used in this clause, means, with respect to an officer or employee of a person requesting or receiving a Federal contract, an officer or employee who is employed by such person for at least 130 working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person for receipt of such contract. An officer or employee who is employed by such person for less than 130

working days within 1 year immediately preceding the date of the submission that initiates agency consideration of such person shall be considered to be regularly employed as soon as he or she is employed by such person for 130 working days.

"State," as used in this clause, means a State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, a territory or possession of the United States, an agency or instrumentality of a State, and multi-State, regional, or interstate entity having governmental duties and powers.

(b) Prohibitions.

(1) Section 1352 of title 31, United States Code, among other things, prohibits a recipient of a Federal contract, grant, loan, or cooperative agreement from using appropriated funds to pay any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with any of the following covered Federal actions: the awarding of any Federal contract; the making of any Federal grant; the making of any Federal loan; the entering into of any cooperative agreement; or the modification of any Federal contract, grant, loan, or cooperative agreement.

(2) The Act also requires Contractors to furnish a disclosure if any funds other than Federal appropriated funds (including profit or fee received under a covered Federal transaction) have been paid, or will be paid, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with a Federal contract, grant, loan, or cooperative agreement.

(3) The prohibitions of the Act do not apply under the following conditions:

(i) Agency and legislative liaison by own employees.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of a payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action if the payment is for agency and legislative liaison activities not directly related to a covered Federal action.

(B) For purposes of subdivision (b)(3)(i)(A) of this clause, providing any information specifically requested by an agency or Congress is permitted at any time.

(C) The following agency and legislative liaison activities are permitted at any time where they are not related to a specific solicitation for any covered Federal action:

(1) Discussing with an agency the qualities and characteristics (including individual demonstrations) of the person's products or services, conditions or terms of sale, and service capabilities.

(2) Technical discussions and other activities regarding the application or adaptation of theperson's products or services for an agency's use.

(D) The following agency and legislative liaison activities are permitted where they are prior to formal solicitation of any covered Federal action--

(1) Providing any information not specifically requested but necessary for an agency to make an informed decision about initiation of a covered Federal action;

(2) Technical discussions regarding the preparation of an unsolicited proposal prior to its official submission; and

(3) Capability presentations by persons seeking awards from an agency pursuant to the provisions of the Small Business Act, as amended by Pub. L. 95-507, and subsequent amendments.

(E) Only those services expressly authorized by subdivision (b)(3)(i)(A) of this clause are permitted under this clause.

(ii) Professional and technical services.

(A) The prohibition on the use of appropriated funds, in subparagraph (b)(1) of this clause, does not apply in the case of--

(1) A payment of reasonable compensation made to an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action, if payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action.

(2) Any reasonable payment to a person, other than an officer or employee of a person requesting or receiving a covered Federal action or an extension, continuation, renewal, amendment, or modification of a covered Federal action if the payment is for professional or technical services rendered directly in the preparation, submission, or negotiation of any bid, proposal, or application for that Federal action or for meeting requirements imposed by or pursuant to law as a condition for receiving that Federal action. Persons other than officers or employees of a person requesting or receiving a covered Federal action include consultants and trade associations.

(B) For purposes of subdivision (b)(3)(ii)(A) of this clause, "professional and technical services" shall be limited to advice and analysis directly applying any professional or technical discipline. For example, drafting of a legal document accompanying a bid or proposal by a lawyer is allowable. Similarly, technical advice provided by an engineer on the performance or operational capability of a piece of equipment rendered directly in the negotiation of a contract is allowable. However, communications with the intent to influence made by a professional (such as a licensed lawyer) or a technical person (such as a licensed accountant) are not allowable under this section unless they provide advice and analysis directly applying their professional or technical expertise and unless the advice or analysis is rendered directly and solely in the preparation, submission or negotiation of a covered Federal action. Thus, for example, communications with the intent to influence made by a lawyer that do not provide legal advice or analysis directly and solely related to the legal aspects of his or her client's proposal, but generally advocate one proposal over another are not allowable under this section because the lawyer is not providing professional legal services. Similarly, communications with the intent to influence made by an engineer providing an engineering analysis prior to the preparation or submission of a bid or proposal are not allowable under this section since the engineer is providing technical services but not directly in the preparation, submission or negotiation of a covered Federal action.

(C) Requirements imposed by or pursuant to law as a condition for receiving a covered Federal award include those required by law or regulation and any other requirements in the actual award documents.

(D) Only those services expressly authorized by subdivisions (b)(3)(ii)(A)(1) and (2) of this clause are permitted under this clause.

(E) The reporting requirements of FAR 3.803(a) shall not apply with respect to payments of reasonable compensation made to regularly employed officers or employees of a person.

(c) Disclosure.

(1) The Contractor who requests or receives from an agency a Federal contract shall file with that agency a disclosure form, OMB standard form LLL, Disclosure of Lobbying Activities, if such person has made or has agreed to make any payment using nonappropriated funds (to include profits from any covered Federal action), which would be prohibited under subparagraph (b)(1) of this clause, if paid for with appropriated funds.

(2) The Contractor shall file a disclosure form at the end of each calendar quarter in which there occurs any event that materially affects the accuracy of the information contained in any disclosure form previously filed by such person under subparagraph (c)(1) of this clause. An event that materially affects the accuracy of the information reported includes--

(i) A cumulative increase of $25,000 or more in the amount paid or expected to be paid for influencing or attempting to influence a covered Federal action; or

(ii) A change in the person(s) or individual(s) influencing or attempting to influence a covered Federal action; or

(iii) A change in the officer(s), employee(s), or Member(s) contacted to influence or attempt to influence a covered Federal action.

(3) The Contractor shall require the submittal of a certification, and if required, a disclosure form by any person who requests or receives any subcontract exceeding $100,000 under the Federal contract.

(4) All subcontractor disclosure forms (but not certifications) shall be forwarded from tier to tier until received by the prime Contractor. The prime Contractor shall submit all disclosures to the Contracting Officer at the end of the calendar quarter in which the disclosure form is submitted by the subcontractor. Each subcontractor certification shall be retained in the subcontract file of the awarding Contractor.

(d) Agreement. The Contractor agrees not to make any payment prohibited by this clause.

(e) Penalties.

(1) Any person who makes an expenditure prohibited under paragraph (a) of this clause or who fails to file or amend the disclosure form to be filed or amended by paragraph (b) of this clause shall be subject to civil penalties as provided for by 31 U.S.C. 1352. An imposition of a civil penalty does not prevent the Government from seeking any other remedy that may be applicable.

(2) Contractors may rely without liability on the representation made by their subcontractors in the certification and disclosure form.

(f) Cost allowability. Nothing in this clause makes allowable or reasonable any costs which would otherwise be unallowable or unreasonable. Conversely, costs made specifically unallowable by the requirements in this clause will not be made allowable under any other provision.

(End of clause)

252.203-7001 PROHIBITION ON PERSONS CONVICTED OF FRAUD OR OTHER DEFENSE-CONTRACT-RELATED FELONIES (MAR 1999)

(a) *Definitions.* As used in this clause—

(1) "Arising out of a contract with the DoD" means any act in connection with—

(i) Attempting to obtain;

(ii) Obtaining, or

(iii) Performing a contract or first-tier subcontract of any agency, department, or component of the Department of Defense (DoD).

(2) "Conviction of fraud or any other felony" means any conviction for fraud or a felony in violation of state or Federal criminal statutes, whether entered on a verdict or plea, including a plea of *nolo contendere*, for which sentence has been imposed.

(3) "Date of conviction" means the date judgment was entered against the individual.

(b) Any individual who is convicted after September 29, 1988, of fraud or any other felony arising out of a contract with the DoD is prohibited from serving--

(1) In a management or supervisory capacity on any DoD contract or first-tier subcontract;

(2) On the board of directors of any DoD contractor or first-tier subcontractor;

(3) As a consultant, agent, or representative for any DoD contractor or first-tier subcontractor; or

(4) In any other capacity with the authority to influence, advise, or control the decisions of any DoD contractor or subcontractor with regard to any DoD contract or first-tier subcontract.

(c) Unless waived, the prohibition in paragraph (b) of this clause applies for not less than 5 years from the date of conviction.

(d) 10 U.S.C. 2408 provides that a defense contractor or first-tier subcontractor shall be subject to a criminal penalty of not more than $500,000 if convicted of knowingly—

(1) Employing a person under a prohibition specified in paragraph (b) of this clause; or

(2) Allowing such a person to serve on the board of directors of the contractor or first-tier subcontractor.

(e) In addition to the criminal penalties contained in 10 U.S.C. 2408, the Government may consider other available remedies, such as—

(1) Suspension or debarment;

(2) Cancellation of the contract at no cost to the Government; or

(3) Termination of the contract for default.

(f) The Contractor may submit written requests for waiver of the prohibition in paragraph (b) of this clause to the Contracting Officer. Requests shall clearly identify—

(1) The person involved;

(2) The nature of the conviction and resultant sentence or punishment imposed;

(3) The reasons for the requested waiver; and

(4) An explanation of why a waiver is in the interest of national security.

(g) The Contractor agrees to include the substance of this clause, appropriately modified to reflect the identity and relationship of the parties, in all first-tier subcontracts exceeding the simplified acquisition threshold in Part 2 of the Federal Acquisition Regulation, except those for commercial items or components.

(h) Pursuant to 10 U.S.C. 2408(c), defense contractors and subcontractors may obtain information as to whether a particular person has been convicted of fraud or any other felony arising out of a contract with the DoD by contacting The Office of Justice Programs, The Denial of Federal Benefits Office, U.S. Department of Justice, telephone (202) 616-3507.

(End of clause)

252.203-7002 DISPLAY OF DOD HOTLINE POSTER (DEC 1991)

(a) The Contractor shall display prominently in common work areas within business segments performing work under Department of Defense (DoD) contracts, DoD Hotline Posters prepared by the DoD Office of the Inspector General.

(b) DoD Hotline Posters may be obtained from the DoD Inspector General, ATTN: Defense Hotline, 400 Army Navy Drive, Washington, DC 22202-2884.

(c) The Contractor need not comply with paragraph (a) of this clause if it has established a mechanism, such as a hotline, by which employees may report suspected instances of improper conduct, and instructions that encourage employees to make such reports.

(End of clause)

52.204-4 PRINTING/COPYING DOUBLE-SIDED ON RECYCLED PAPER (JUN 1996)

(a) In accordance with Executive Order 12873, dated October 20, 1993, as amended by Executive Order 12995, dated March 25, 1996, the Offeror/Contractor is encouraged to submit paper documents, such as offers, letters, or reports, that are printed/copied double-sided on recycled paper that has at least 20 percent postconsumer material.

(b) The 20 percent standard applies to high-speed copier paper, offset paper, forms bond, computer printout paper, carbonless paper, file folders, white woven envelopes, and other uncoated printed and writing paper, such as writing and office paper, book paper, cotton fiber paper, and cover stock. An alternative to meeting the 20 percent postconsumer material standard is 50 percent recovered material content of certain industrial by-products.

252.204-7003 CONTROL OF GOVERNMENT PERSONNEL WORK PRODUCT (APR 1992)

The Contractor's procedures for protecting against unauthorized disclosure of information shall not require Department of Defense employees or members of the Armed Forces to relinquish control of their work products, whether classified or not, to the contractor.

(End of clause)

52.209-6 PROTECTING THE GOVERNMENT'S INTEREST WHEN SUBCONTRACTING WITH CONTRACTORS DEBARRED, SUSPENDED, OR PROPOSED FOR DEBARMENT. (JUL 1995)

(a) The Government suspends or debars Contractors to protect the Government's interests. The Contractor shall not enter into any subcontract in excess of the $25,000 with a Contractor that is debarred, suspended, or proposed for debarment unless there is a compelling reason to do so.

(b) The Contractor shall require each proposed first-tier subcontractor, whose subcontract will exceed $25,000, to disclose to the Contractor, in writing, whether as of the time of award of the subcontract, the subcontractor, or its principles, is or is not debarred, suspended, or proposed for debarment by the Federal Government.

(c) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is debarred, suspended, or proposed for debarment (see FAR 9.404 for information on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs). The notice must include the following:

(1) The name of the subcontractor.

(2) The Contractor's knowledge of the reasons for the subcontractor being on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

(3) The compelling reason(s) for doing business with the subcontractor notwithstanding its inclusion on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs.

(4) The systems and procedures the Contractor has established to ensure that it is fully protecting the Government's interests when dealing with such subcontractor in view of the specific basis for the party's debarment, suspension, or proposed debarment.

252.209-7004 SUBCONTRACTING WITH FIRMS THAT ARE OWNED OR CONTROLLED BY THE GOVERNMENT OF A TERRORIST COUNTRY (MAR 1998)

(a) Unless the Government determines that there is a compelling reason to do so, the Contractor shall not enter into any subcontract in excess of $25,000 with a firm, or subsidiary of a firm, that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country.

(b) A corporate officer or a designee of the Contractor shall notify the Contracting Officer, in writing, before entering into a subcontract with a party that is identified, on the List of Parties Excluded from Federal Procurement and Nonprocurement Programs, as being ineligible for the award of Defense contracts or subcontracts because it is owned or controlled by the government of a terrorist country. The notice must include the name of the proposed subcontractor notwithstanding its inclusion on the List of Parties Excluded From Federal Procurement and Nonprocurement Programs.

52.214-26 AUDIT AND RECORDS--SEALED BIDDING. (OCT 1997)

(a) As used in this clause, records includes books, documents, accounting procedures and practices, and other data, regardless of type and regardless of whether such items are in written form, in the form of computer data, or in any other form.

(b) Cost or pricing data. If the Contractor has been required to submit cost or pricing data in connection with the pricing of any modification to this contract, the Contracting Officer, or an authorized representative of the Contracting Officer, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data, shall have the right to examine and audit all of the Contractor's records, including computations and projections, related to--

(1) The proposal for the modification;

(2) The discussions conducted on the proposal(s), including those related to negotiating;

(3) Pricing of the modification; or

(4) Performance of the modification.

(c) Comptroller General. In the case of pricing any modification, the Comptroller General of the United States, or an authorized representative, shall have the same rights as specified in paragraph (b) of this clause.

(d) Availability. The Contractor shall make available at its office at all reasonable times the materials described in reproduction, until 3 years after final payment under this contract, or for any other period specified in Subpart 4.7 of the Federal Acquisition Regulation (FAR). FAR Subpart 4.7, Contractor Records Retention, in effect on the data of this contract, is incorporated by reference in its entirety and made a part of this contract.

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement.

(2) Records pertaining to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to the performance of this contract shall be made available until disposition of such appeals, litigation, or claims.

(e) The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (e), in all subcontracts expected to exceed the threshold in FAR 15.403-4(a)(1) for submission of cost or pricing data.

52.214-27 PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING. (OCT 1997)

(a) This clause shall become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for the submission of cost or pricing data at FAR 15.403-4(a)(1), except that this clause does not apply to a modification if an exception under FAR 15.403-1(b) applies.

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(b) If any price, including profit, negotiated in connection with any modification under this clause, was increased by any significant amount because

(1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data;

(2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data; or

(3) any of these parties furnished data of any description that were not accurate, the price shall be reduced accordingly and the contract shall be modified to reflect the reduction. This right to a price reduction is limited to that resulting from defects in data relating to modifications for which this clause becomes operative under paragraph (a) above.

(c) Any reduction in the contract price under paragraph (b) above due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which:

(1) the actual subcontract; or

(2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; provided, that the actual subcontract price was not itself affected by defective cost or pricing data.

(d) If the Contracting Officer determines under paragraph (b) of this clause that a price or cost reduction should be made:

(1) the Contractor agrees not to raise the following matters as a defense:

(i) The Contractor or subcontractor was a sole source supplier or otherwise was in a superior bargaining position and thus the price of the contract would not have been modified even if accurate, complete, and current cost or pricing data had been submitted;

(ii) The Contracting Officer should have known that the cost or pricing data in issue were defective even though the Contractor or subcontractor took no affirmative action to bring the character of the data to the attention of the Contracting Officer;

(iii) The contract was based on an agreement about the total cost of the contract and there was no agreement about the cost of each item procured under the contract; or

(iv) The Contractor or subcontractor did not submit a Certificate of Current Cost or Pricing Data.

(2) Except as prohibited by subdivision (d)(2)(ii) of this clause:

(i) an offset in an amount determined appropriate by the Contracting Officer based upon the facts shall be allowed against the amount of a contract price reduction if:

(A) The Contractor certifies to the Contracting Officer that, to the best of the Contractor's knowledge and belief, the Contractor is entitled to the offset in the amount requested; and

(B) The Contractor proves that the cost or pricing data were available before the date of agreement on the price of the contract (or price of the modification) and that the data were not submitted before such date.

(ii) An offset shall not be allowed if:

(A) The understated data was known by the Contractor to be understated when the Certificate of Current Cost or Pricing Data was signed; or (B) The Government proves that the facts demonstrate that the contract price would not have increased in the amount to be offset even if the available data had been submitted before the date of agreement on price.

(e) If any reduction in the contract price under this clause reduces the price of items for which payment was made prior to the date of the modification reflecting the price reduction, the Contractor shall be liable to and shall pay the United States at the time such overpayment is repaid:

(1) Simple interest on the amount of such overpayment to be computed from the date(s) of overpayment to the Contractor to the date the Government is repaid by the Contractor at the applicable underpayment rate effective for each quarter prescribed by the Secretary of the Treasury under 26 U.S.C. 6621(a)(2); and

(2) A penalty equal to the amount of the overpayment, if the Contractor or subcontractor knowingly submitted cost or pricing data which were incomplete, inaccurate, or noncurrent.

52.214-28 SUBCONTRACTOR COST OR PRICING DATA - MODIFICATIONS - SEALED BIDDING. (OCT 1997)

(a) The requirements of paragraphs (b) and (c) of this clause shall:

(1) become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for submission of cost or pricing data at (FAR) 48 CFR 15.403-4(a)(1); and

(2) be limited to such modifications.

(b) Before awarding any subcontract expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), on the date of agreement on price or the date of award, whichever is later; or before pricing any subcontract modifications involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1), the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless an exception under FAR 15.403-1(b) applies.

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(c) The Contractor shall require the subcontractor to certify in substantially the form prescribed in subsection 15.406-2 of the Federal Acquisition Regulation that, to the best of its knowledge and belief, the data submitted under paragraph (b) above were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(d) The Contractor shall insert the substance of this clause, including this paragraph (d), in each subcontract that, when entered into, exceeds the threshold for submission of cost or pricing data at FAR 15.403-4(a)(1).

52.214-29 ORDER OF PRECEDENCE--SEALED BIDDING (JAN 1986)

Any inconsistency in this solicitation or contract shall be resolved by giving precedence in the following order: (a) the Schedule (excluding the specifications); (b) representations and other instructions; (c) contract clauses; (d) other documents, exhibits, and attachments; and (e) the specifications.

(End of clause)

52.219-8 UTILIZATION OF SMALL BUSINESS CONCERNS (OCT 1999)

(a) It is the policy of the United States that small business concerns, HUBZone small business concerns, small business concerns owned and controlled by socially and economically disadvantaged individuals, and small business concerns owned and controlled by women shall have the maximum practicable opportunity to participate in performing contracts let by any Federal agency, including contracts and subcontracts for subsystems, assemblies, components, and related services for major systems. It is further the policy of the United States that its prime contractors establish procedures to ensure the timely payment of amounts due pursuant to the terms of their subcontracts with small business concerns, HUBZone small business concerns, small business concerns owned and controlled by socially and economically disadvantaged individuals, and small business concerns owned and controlled by women.

(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with efficient contract performance. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

(c) Definitions. As used in this contract (1) Small business concern means a small business as defined pursuant to section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto.

(2) HUBZone small business concern means a small business concern that appears on the List of Qualified HUBZone Small Business Concerns maintained by the Small Business Administration.

(3) Small business concern owned and controlled by socially and economically disadvantaged individuals and small disadvantaged business concern mean a small business concern that represents, as part of its offer that--

(i) It has received certification as a small disadvantaged business concern consistent with 13 CFR 124, Subpart B;

(ii) No material change in disadvantaged ownership and control has occurred since its certification;

(iii) Where the concern is owned by one or more individuals, the net worth of each individual upon whom the certification is based does not exceed $750,000 after taking into account the applicable exclusions set forth at 13 CFR 124.104(c)(2); and

(iv) It is identified, on the date of its representation, as a certified small disadvantaged business in the database maintained by the Small Business Administration (PRO-Net).

(4) Small business concern owned and controlled by women means a small business concern--

(i) Which is at least 51 percent owned by one or more women, or, in the case of any publicly owned business, at least 51 percent of the stock of which is owned by one or more women; and

(ii) Whose management and daily business operations are controlled by one or more women.

(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as a small business concern, a HUBZone small business concern, a small business concern owned and controlled by socially and economically disadvantaged individuals, or a small business concern owned and controlled by women.

(End of clause)

52.219-9 SMALL, SMALL DISADVANTAGED AND WOMEN-OWNED SMALL BUSINESS SUBCONTRACTING PLAN (OCT 1999)--ALTERNATE I (JAN 1999).

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The apparent low bidder, upon request by the Contracting Officer, shall submit a subcontracting plan, where applicable, that separately addresses subcontracting with small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns. If the bidder is submitting an individual contract plan, the plan must separately address subcontracting with small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns, with a separate part for the basic contract and separate parts for each option (if any). The plan shall be included in and made a part of the resultant contract. The subcontracting plan shall be submitted within the time specified by the Contracting Officer. Failure to submit the subcontracting plan shall make the bidder ineligible for the award of a contract.

(d) The offeror's subcontracting plan shall include the following:

(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns;

(iii) Total dollars planned to be subcontracted to HUBZone small business concerns;

(iv) Total dollars planned to be subcontracted to small disadvantaged business concerns; and

(v) Total dollars planned to be subcontracted to women-owned small business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to--

(i) Small business concerns;

(ii) HUBZone small business concerns;

(iii) Small disadvantaged business concerns; and

(iv) Women-owned small business concerns.

(4) A description of the method used to develop the subcontracting goals in paragraph (d)(1) of this clause.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Marketing and Access Network (PRO-Net) of the Small Business Administration (SBA), the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small, HUBZone, small disadvantaged, and women-owned small business trade associations). A firm may rely on the information contained in PRO-Net as an accurate representation of a concern's size and ownership characteristics for the purposes of maintaining a small, HUBZone, small disadvantaged and women-owned small business source list. Use of PRO-Net as its source list does not relieve a firm of its responsibilities (e.g., outreach, assistance, counseling, or publicizing subcontracting opportunities) in this clause.

(6) A statement as to whether or not the offeror in included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with—

(i) Small business concerns;

(ii) HUBZone small business concerns;

(iii) Small disadvantaged business concerns; and

(iv) Women-owned small business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small business, HUBZone small business, small disadvantaged and women-owned small business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause of this contract entitled "Utilization of Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of $500,000 ($1,000,000 for construction of any public facility) to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with the instructions on the forms or as provided in agency regulations and in paragraph (j) of this clause; and (iv) ensure that its subcontractors agree to submit Standard Forms 294 and 295.

(11) A description of the types of records that will be maintained concerning procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of the offeror's efforts to locate small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated)

(i) Source lists (e.g., PRO-Net), guides, and other data that identify small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small business, HUBZone small business, small disadvantaged business, or women-owned small business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than $100,000, indicating--

(A) Whether small business concerns were solicited and, if not, why not;

(B) Whether HUBZone small business concerns were solicited and, if not, why not;

(C) Whether small disadvantaged business concerns were solicited and, if not, why not;

(D) Whether women-owned small business concerns were solicited and, if not, why not; and

(E) If applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact--

(A) Trade associations;

(B) Business development organizations; and

(C) Conferences and trade fairs to locate small, HUBZone small, small disadvantaged, and women-owned small business sources.

(v) Records of internal guidance and encouragement provided to buyers through--

(A) Workshops, seminars, training, etc.; and

(B) Monitoring performance to evaluate compliance with the program's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having commercial plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the Contractor's lists of potential small business, HUBZone small business, small disadvantaged business, and women-owned small business subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small business, HUBZone small business, small disadvantaged business, and women-owned small business concerns in all ''make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small business, HUBZone small business, small disadvantaged business, and women-owned small business firms.

(4) Provide notice to subcontractors concerning penalties and remedies for misrepresentations of business status as small, HUBZone small, small disadvantaged, or women-owned small business for the purpose of obtaining a subcontract that is to be included as part or all of a goal contained in the Contractor's subcontracting plan.

(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by paragraph (d) of this clause, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided, (1) the master plan has been approved, (2) the offeror ensures that the master plan is updated as necessary and provides copies of the approved master plan, including evidence of its approval, to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g)(1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and noncommercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be con-sidered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization Of Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.

(j) The Contractor shall submit the following reports:

(1) Standard Form 294, Subcontracting Report for Individual Contracts. This report shall be submitted to the Contracting Officer semiannually and at contract completion. The report covers subcontract award data related to this contract. This report is not required for commercial plans.

(2) Standard Form 295, Summary Subcontract Report. This report encompasses all the contracts with the awarding agency. It must be submitted semi-annually for contracts with the Department of Defense and annually for contracts with civilian agencies. If the reporting activity is covered by a commercial plan, the reporting activity must report annually all subcontract awards under that plan. All reports submitted at the close of each fiscal year (both individual and commercial plans) shall include a breakout, in the Contractor's format, of subcontract awards, in whole dollars, to small disadvantaged business concerns by Standard Industrial Classification (SIC) Major Group. For a commercial plan, the Contractor may obtain from each of its subcontractors a predominant SIC Major Group and report all awards to that subcontractor under its predominant SIC Major Group.

(End of clause)

52.219-16 LIQUIDATED DAMAGES-SUBCONTRACTING PLAN (JAN 1999)

(a) Failure to make a good faith effort to comply with the subcontracting plan, as used in this clause, means a willful or intentional failure to perform in accordance with the requirements of the subcontracting plan approved under the clause in this contract entitled "Small Business Subcontracting Plan," or willful or intentional action to frustrate the plan.

(b) Performance shall be measured by applying the percentage goals to the total actual subcontracting dollars or, if a commercial plan is involved, to the pro rata share of actual subcontracting dollars attributable to Government contracts covered by the commercial plan. If, at contract completion or, in the case of a commercial plan, at the close of the fiscal year for which the plan is applicable, the Contractor has failed to meet its subcontracting goals and the Contracting Officer decides in accordance with paragraph (c) of this clause that the Contractor failed to make a good faith effort to comply with its subcontracting plan, established in accordance with the clause in this contract entitled ''Small Business Subcontracting Plan,'' the Contractor shall pay the Government liquidated damages in an amount stated. The amount of probable damages attributable to the Contractor's failure to comply shall be an amount equal to the actual dollar amount by which the Contractor failed to achieve each subcontract goal.

(c) Before the Contracting Officer makes a final decision that the Contractor has failed to make such good faith effort, the Contracting Officer shall give the Contractor written notice specifying the failure and permitting the Contractor to demonstrate what good faith efforts have been made and to discuss the matter. Failure to respond to the notice may be taken as an admission that no valid explanation exists. If, after consideration of all the pertinent data, the Contracting Officer finds that the Contractor failed to make a good faith effort to comply with the subcontracting plan, the Contracting Officer shall issue a final decision to that effect and require that the Contractor pay the Government liquidated damages as provided in paragraph (b) of this clause.

(d) With respect to commercial plans, the Contracting Officer who approved the plan will perform the functions of the Contracting Officer under this clause on behalf of all agencies with contracts covered by the commercial plan.

(e) The Contractor shall have the right of appeal, under the clause in this contract entitled Disputes, from any final decision of the Contracting Officer.

(f) Liquidated damages shall be in addition to any other remedies that the Government may have.

(End of clause)

52.222-4 CONTRACT WORK HOURS AND SAFETY STANDARDS ACT - OVERTIME COMPENSATION. (JUL 1995)

(a) Overtime requirements. No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics (see Federal Acquisition Regulation (FAR) 22.300) shall require or permit any such laborers or mechanics in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than 1 1/2 times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(b) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the provisions set forth in paragraph (a) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanics employed in violation of the provisions set forth in paragraph (a) of this clause in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by provisions set forth in paragraph (a) of this clause.

(c) Withholding for unpaid wages and liquidated damages. The Contracting Officer shall upon his or her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same Prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in paragraph (b) of this clause.

(d) Payrolls and basic records. (1) The Contractor or subcontractor shall maintain payrolls and basic payroll records during the course of contract work and shall preserve them for a period of 3 years from the completion of the contract for all laborers and mechanics working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Nothing in this paragraph shall require the duplication of records required to be maintained for construction work by Department of Labor regulations at 29 CFR 5.5(a)(3) implementing the Davis-Bacon Act.

(2) The records to be maintained under paragraph (d)(1) of this clause shall be made available by the Contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit such representatives to interview employees during working hours on the job.

(e) Subcontracts. The Contractor or subcontractor shall insert in any subcontracts exceeding $100,000 the provisions set forth in paragraphs (a) through (e) of this clause and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the provisions set forth in paragraphs (a) through (e) of this clause.

52.222-6 DAVIS-BACON ACT (FEB 1995)

(a) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not

less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (d) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such period. Such laborers and mechanics shall be paid not less than the appropriate wage rate and fringe benefits in the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled Apprentices and Trainees. Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classifications and wage rates conformed under paragraph (b) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(b)(1) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefor only when all the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination.

(ii) The classification is utilized in the area by the construction industry.

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator or an authorized representative will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(3) In the event the Contractor, the laborers or mechanics to be employed in the classification, or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator of the Wage and Hour Division for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (b)(2) and (b)(3) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(c) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(d) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

52.222-7 WITHHOLDING OF FUNDS (FEB 1988)

The Contracting Officer shall, upon his or her own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

52.222-8 PAYROLLS AND BASIC RECORDS (FEB 1988)

(a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of 3 years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid. Whenever the Secretary of Labor has found, under paragraph (d) of the clause entitled Davis-Bacon Act, that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(b)(1) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. This information may be submitted in any form desired. Optional Form WH-347 (Federal Stock Number 029-005-00014-1) is available for this purpose and may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The Prime Contractor is responsible for the submission of copies of payrolls by all subcontractors.

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify--

(i) That the payroll for the payroll period contains the information required to be maintained under paragraph (a) of this clause and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in the Regulations, 29 CFR Part 3; and

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (b)(2) of this clause.

(4) The falsification of any of the certifications in this clause may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(c) The Contractor or subcontractor shall make the records required under paragraph (a) of this clause available for inspection, copying, or transcription by the Contracting Officer or authorized representatives of the Contracting Officer or the Department of Labor. The Contractor or subcontractor shall permit the Contracting Officer or representatives of the Contracting Officer or the Department of Labor to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit required records or to make them available, the Contracting Officer may, after written notice to the Contractor, take such action as may be necessary to cause the suspension of any further payment. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

52.222-9 APPRENTICES AND TRAINEES (FEB 1988)

(a) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a

State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated in this paragraph, shall be paid not less than the applicable wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(b) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed in the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate in the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate in the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate in the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under this clause shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

52.222-10 COMPLIANCE WITH COPELAND ACT REQUIREMENTS (FEB 1988)

The Contractor shall comply with the requirements of 29 CFR Part 3, which are hereby incorporated by reference in this contract.

52.222-11 SUBCONTRACTS (LABOR STANDARDS (FEB 1988)

(a) The Contractor or subcontractor shall insert in any subcontracts the clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act-Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Withholding of Funds, Subcontracts (Labor Standards), Contract Termination-Debarment, Disputes Concerning Labor Standards, Compliance with Davis-Bacon and Related Act Regulations, and Certification of Eligibility, and such other clauses as the Contracting Officer may, by appropriate instructions, require, and also a clause requiring subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited in this paragraph.

(b)(1) Within 14 days after award of the contract, the Contractor shall deliver to the Contracting Officer a completed Statement and Acknowledgment Form (SF 1413) for each subcontract, including the subcontractor's signed and dated acknowledgment that the clauses set forth in paragraph (a) of this clause have been included in the subcontract.

(2) Within 14 days after the award of any subsequently awarded subcontract the Contractor shall deliver to the Contracting Officer an updated completed SF 1413 for such additional subcontract.

52.222-12 CONTRACT TERMINATION--DEBARMENT (FEB 1988)

A breach of the contract clauses entitled Davis-Bacon Act, Contract Work Hours and Safety Standards Act--Overtime Compensation, Apprentices and Trainees, Payrolls and Basic Records, Compliance with Copeland Act Requirements, Subcontracts (Labor Standards), Compliance with Davis-Bacon and Related Act Regulations, or Certification of Eligibility may be grounds for termination of the contract, and for debarment as a Contractor and subcontractor as provided in 29 CFR 5.12.

52.222-13 COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REGULATIONS (FEB 1988)

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are hereby incorporated by reference in this contract.

52.222-14 DISPUTES CONCERNING LABOR STANDARDS (FEB 1988)

The United States Department of Labor has set forth in 29 CFR Parts 5, 6, and 7 procedures for resolving disputes concerning labor standards requirements. Such disputes shall be resolved in accordance with those procedures and not the Disputes clause of this contract. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

52.222-15 CERTIFICATION OF ELIGIBILITY (FEB 1988)

(a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

52.222-23 NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY FOR CONSTRUCTION (FEB 1999)

(a) The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

(b) The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for minority participation for each trade	Goals for female participation for each trade
2.7%	6.9%

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs office.

(c) The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

(d) The Contractor shall provide written notification to the Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, within 10 working days following award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the --

(1) Name, address, and telephone number of the subcontractor;

(2) Employer's identification number of the subcontractor;

(3) Estimated dollar amount of the subcontract;

(4) Estimated starting and completion dates of the subcontract; and

(5) Geographical area in which the subcontract is to be performed.

(e) As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is State of Montana, County of Missoula, City of Missoula.

52.222-26 EQUAL OPPORTUNITY (FEB 1999)

(a) If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of $10,000, the Contractor shall comply with subparagraphs (b)(1) through (11) of this clause. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.

(b) During performing this contract, the Contractor agrees as follows:

(1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. However, it shall not be a violation of this clause for the Contractor to extend a publicly announced preference in employment to Indians living on or near an Indian reservation, in connection with employment opportunities on or near an Indian reservation, as permitted by 41 CFR 60-1.5.

(2) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination, (vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.

(3) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(4) The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(5) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(6) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(7) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor. The Contractor shall also file Standard Form 100 (EEO-1), or any successor form, as prescribed in 41 CFR part 60-1. Unless the Contractor has filed within the 12 months preceding the date of contract award, the Contractor shall, within 30 days after contract award, apply to either the regional Office of Federal Contract Compliance Programs (OFCCP) or the local office of the Equal Employment Opportunity Commission for the necessary forms.

(8) The Contractor shall permit access to its premises, during normal business hours, by the contracting agency or the OFCCP for the purpose of conducting on-site compliance evaluations and complaint investigations. The Contractor shall permit the Government to inspect and copy any books, accounts, records (including computerized records), and other material that may be relevant to the matter under investigation and pertinent to compliance with Executive Order 11246, as amended, and rules and regulations that implement the Executive Order.

(9) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended; in the rules, regulations, and orders of the Secretary of Labor; or as otherwise provided by law.

(10) The Contractor shall include the terms and conditions of subparagraphs (b)(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting officer may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

(c) Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.

52.222-27 AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (FEB 1999)

(a) Definitions. "Covered area," as used in this clause, means the geographical area described in the solicitation for this contract.

"Deputy Assistant Secretary," as used in this clause, means Deputy Assistant Secretary for Federal Contract Compliance, U.S. Department of Labor, or a designee.

"Employer's identification number," as used in this clause, means the Federal Social Security number used on the employer's quarterly federal tax return, U.S. Treasury Department Form 941.

"Minority," as used in this clause, means--

(1) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(2) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands);

(3) Black (all persons having origins in any of the black African racial groups not of Hispanic origin); and

(4) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race).

(b) If the Contractor, or a subcontractor at any tier, subcontracts a portion of the work involving any construction trade, each such subcontract in excess of $10,000 shall include this clause and the Notice containing the goals for minority and female participation stated in the solicitation for this contract.

(c) If the Contractor is participating in a Hometown Plan (41 CFR 60-4) approved by the U.S. Department of Labor in a covered area, either individually or through an association, its affirmative action obligations on all work in the plan area (including goals) shall comply with the plan for those trades that have unions participating in the plan. Contractors must be able to demonstrate participation in, and compliance with, the provisions of the plan. Each Contractor or subcontractor participating in an approved plan is also required to comply with its obligations under the Equal Opportunity clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good-faith performance by other Contractors or subcontractors toward a goal in an approved plan does not excuse any Contractor's or subcontractor's failure to make good-faith efforts to achieve the plan's goals.

(d) The Contractor shall implement the affirmative action procedures in subparagraphs (g)(1) through (16) of this clause. The goals stated in the solicitation for this contract are expressed as percentages of the total hours of employment and training of minority and female utilization that the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where that work is actually performed. The Contractor is expected to make substantially uniform progress toward its goals in each craft.

(e) Neither the terms and conditions of any collective bargaining agreement, nor the failure by a union with which the Contractor has a collective bargaining agreement, to refer minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, as amended, or the regulations thereunder.

(f) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(g) The Contractor shall take affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:

(1) Ensure a working environment free of harassment, intimidation, and coercion at all sites and in all facilities where the Contractor's employees are assigned to work. The Contractor, if possible, will assign two or more women to each construction project. The Contractor shall ensure that foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at these sites or facilities.

(2) Establish and maintain a current list of sources for minority and female recruitment. Provide written notification to minority and female recruitment sources and community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

(3) Establish and maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant, referrals of minorities or females from unions, recruitment sources, or community organizations, and the action taken with respect to each individual. If an individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred back, not employed by the Contractor, this shall be documented in the file, along with whatever additional actions the Contractor may have taken.

(4) Immediately notify the Deputy Assistant Secretary when the union or unions with which the Contractor has a collective bargaining agreement has not referred back to the Contractor a minority or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area that expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under subparagraph (g)(2) of this clause.

(6) Disseminate the Contractor's equal employment policy by--

(i) Providing notice of the policy to unions and to training, recruitment, and outreach programs, and requesting their cooperation in assisting the Contractor in meeting its contract obligations;

(ii) Including the policy in any policy manual and in collective bargaining agreements;

(iii) Publicizing the policy in the company newspaper, annual report, etc.;

(iv) Reviewing the policy with all management personnel and with all minority and female employees at least once a year; and

(v) Posting the policy on bulletin boards accessible to employees at each location where construction work is performed.

(7) Review, at least annually, the Contractor's equal employment policy and affirmative action obligations with all employees having responsibility for hiring, assignment, layoff, termination, or other employment decisions. Conduct review of this policy with all on-site supervisory personnel before initiating construction work at a job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's equal employment policy externally by including it in any advertising in the news media, specifically including minority and female news media. Provide written notification to, and discuss this policy with, other Contractors and subcontractors with which the Contractor does or anticipates doing business.

(9) Direct recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than 1 month before the date for acceptance of applications for apprenticeship or training by any recruitment source, send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit minority persons and women. Where reasonable, provide after-school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's workforce.

(11) Validate all tests and other selection requirements where required under 41 CFR 60-3.

(12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities. Encourage these employees to seek or to prepare for, through appropriate training, etc., opportunities for promotion.

(13) Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the Contractor's obligations under this contract are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user rest rooms and necessary dressing or sleeping areas shall be provided to assure privacy between the sexes.

(15) Maintain a record of solicitations for subcontracts for minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's equal employment policy and affirmative action obligations.

(h) The Contractor is encouraged to participate in voluntary associations that may assist in fulfilling one or more of the affirmative action obligations contained in subparagraphs (g)(1) through (16) of this clause. The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant may be asserted as fulfilling one or more of its obligations under subparagraphs (g)(1) through (16) of this clause, provided the Contractor--

(1) Actively participates in the group;

(2) Makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry;

(3) Ensures that concrete benefits of the program are reflected in the Contractor's minority and female workforce participation;

(4) Makes a good-faith effort to meet its individual goals and timetables; and

(5) Can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply is the Contractor's, and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

(i) A single goal for minorities and a separate single goal for women shall be established. The Contractor is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of Executive Order 11246, as amended, if a particular group is employed in a substantially disparate manner.

(j) The Contractor shall not use goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(k) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts under Executive Order 11246, as amended.

(l) The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal Opportunity clause, including suspension, termination, and cancellation of existing subcontracts, as may be imposed or ordered under Executive Order 11246, as amended, and its implementing regulations, by the OFCCP. Any failure to carry out these sanctions and penalties as ordered shall be a violation of this clause and Executive Order 11246, as amended.

(m) The Contractor in fulfilling its obligations under this clause shall implement affirmative action procedures at least as extensive as those prescribed in paragraph (g) of this clause, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or this clause, the Deputy Assistant Secretary shall take action as prescribed in 41 CFR 60-4.8.

(n) The Contractor shall designate a responsible official to--

(1) Monitor all employment-related activity to ensure that the Contractor's equal employment policy is being carried out;

(2) Submit reports as may be required by the Government; and

(3) Keep records that shall at least include for each employee the name, address, telephone number, construction trade, union affiliation (if any), employee identification number, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, separate records are not required to be maintained.

Nothing contained herein shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

52.222-35 AFFIRMATIVE ACTION FOR DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (APR 1998)

(a)) Definitions. As used in this clause--

All employment openings includes all positions except executive and top management, those positions that will be filled from within the contractor's organization, and positions lasting 3 days or less. This term includes full-time employment, temporary employment of more than 3 days' duration, and part-time employment.

Appropriate office of the State employment service system means the local office of the Federal-State national system of public employment offices with assigned responsibility to serve the area where the employment opening is to be filled, including the District of Columbia, Guam, the Commonwealth of Puerto Rico, and the Virgin Islands.

Positions that will be filled from within the Contractor's organization means employment openings for which no consideration will be given to persons outside the Contractor's organization (including any affiliates, subsidiaries, and parent companies) and includes any openings that the Contractor proposes to fill from regularly established ''recall" lists. The exception does not apply to a particular opening once an employer decides to consider applicants outside of its organization.

Veteran of the Vietnam era means a person who--

(1) Served on active duty for a period of more than 180 days, any part of which occurred between August 5, 1964, and May 7, 1975, and was discharged or released therefrom with other than a dishonorable discharge; or

(2) Was discharged or released from active duty for a service-connected disability if any part of such active duty was performed between August 5, 1964, and May 7, 1975.

(b) General. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against the individual because the individual is a disabled veteran or a veteran of the Vietnam era. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified disabled veterans and veterans of the Vietnam era without discrimination based upon their disability or veterans' status in all employment practices such as--

(i) Employment;

(ii) Upgrading;

(iii) Demotion or transfer;

(iv) Recruitment;

(v) Advertising;

(vi) Layoff or termination;

(vii) Rates of pay or other forms of compensation; and

(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Vietnam Era Veterans' Readjustment Assistance Act of 1972 (the Act), as amended.

(c) Listing openings. (1) The Contractor agrees to list all employment openings existing at contract award or occurring during contract performance, at an appropriate office of the State employment service system in the locality where the opening occurs. These openings include those occurring at any Contractor facility, including one not connected with performing this contract. An independent corporate affiliate is exempt from this requirement.

(2) State and local government agencies holding Federal contracts of $10,000 or more shall also list all their employment openings with the appropriate office of the State employment service.

(3) The listing of employment openings with the State employment service system is required at least concurrently with using any other recruitment source or effort and involves the obligations of placing a bona fide job order, including accepting referrals of veterans and nonveterans. This listing does not require hiring any particular job applicant or hiring from any particular group of job applicants and is not intended to relieve the Contractor from any requirements of Executive orders or regulations concerning nondiscrimination in employment.

(4) Whenever the Contractor becomes contractually bound to the listing terms of this clause, it shall advise the State employment service system, in each State where it has establishments, of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these terms and has so advised the State system, it need not advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by this contract clause.

(d) Applicability. This clause does not apply to the listing of employment openings that occur and are filled outside the 50 States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, and the Virgin Islands.

(e) Postings. (1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified disabled veterans and veterans of the Vietnam era, and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance Programs, Department of Labor (Deputy Assistant Secretary), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Act, and is committed to take affirmative action to employ, and advance in employment, qualified disabled veterans and veterans of the Vietnam Era.

(f) Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(g) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

(End of clause)

52.222-36 AFFIRMATIVE ACTION FOR WORKERS WITH DISABILITIES (JUN 1998)

(a) General. (1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental disability. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified individuals with disabilities without discrimination based upon their physical or mental disability in all employment practices such as--

(i) Recruitment, advertising, and job application procedures;

(ii) Hiring, upgrading, promotion, award of tenure, demotion, transfer, layoff, termination, right of return from layoff, and rehiring;

(iii) Rates of pay or any other form of compensation and changes in compensation;

(iv) Job assignments, job classifications, organizational structures, position descriptions, lines of progression, and seniority lists;

(v) Leaves of absence, sick leave, or any other leave;

(vi) Fringe benefits available by virtue of employment, whether or not administered by the Contractor;

(vii) Selection and financial support for training, including apprenticeships, professional meetings, conferences, and other related activities, and selection for leaves of absence to pursue training;

(viii) Activities sponsored by the Contractor, including social or recreational programs; and

(ix) Any other term, condition, or privilege of employment.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.

(b) Postings. (1) The Contractor agrees to post employment notices stating--

(i) The Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified individuals with disabilities; and

(ii) The rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. The Contractor shall ensure that applicants and employees with disabilities are informed of the contents of the notice (e.g., the Contractor may have the notice read to a visually disabled individual, or may lower the posted notice so that it might be read by a person in a wheelchair). The notices shall be in a form prescribed by the Deputy Assistant Secretary for Federal Contract Compliance of the U.S. Department of Labor (Deputy Assistant Secretary) and shall be provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Act and is committed to take affirmative action to employ, and advance in employment, qualified individuals with physical or mental disabilities.

(c) Noncompliance. If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(d) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of $10,000 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Deputy Assistant Secretary to enforce the terms, including action for noncompliance.

(End of clause)

52.222-37 EMPLOYMENT REPORTS ON DISABLED VETERANS AND VETERANS OF THE VIETNAM ERA (JAN 1999)

(a) Unless the Contractor is a State or local government agency, the Contractor shall report at least annually, as required by the Secretary of Labor, on--

(1) The number of disabled veterans and the number of veterans of the Vietnam era in the workforce of the contractor by job category and hiring location; and

(2) The total number of new employees hired during the period covered by the report, and of that total, the number of disabled veterans, and the number of veterans of the Vietnam era.

(b) The above items shall be reported by completing the form entitled "Federal Contractor Veterans' Employment Report VETS-100."

(c) Reports shall be submitted no later than September 30 of each year beginning September 30, 1988.

(d) The employment activity report required by paragraph (a)(2) of this clause shall reflect total hires during the most recent 12-month period as of the ending date selected for the employment profile report required by paragraph (a)(1) of this clause. Contractors may select an ending date: (1) As of the end of any pay period during the period January through March 1st of the year the report is due, or (2) as of December 31, if the contractor has previous written approval from the Equal Employment Opportunity Commission to do so for purposes of submitting the Employer Information Report EEO-1 (Standard Form 100).

(e) The count of veterans reported according to paragraph (a) of this clause shall be based on voluntary disclosure. Each Contractor subject to the reporting requirements at 38 U.S.C. 4212 shall invite all disabled veterans and veterans of the Vietnam era who wish to benefit under the affirmative action program at 38 U.S.C. 4212 to identify themselves to the Contractor. The invitation shall state that the information is voluntarily provided; that the information will be kept confidential; that disclosure or refusal to provide the information will not subject the applicant or employee to any adverse treatment; and that the information will be used only in accordance with the regulations promulgated under 38 U.S.C. 4212.

(f) Subcontracts. The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary.

(End of clause)

52.223-2 CLEAN AIR AND WATER (APR 1984)

(a) "Air Act," as used in this clause, means the Clean Air Act (42 U.S.C. 7401, et seq.).

"Clean air standards," as used in this clause, means--

(1) Any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, work practices, or other requirements contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738;

(2) An applicable implementation plan as described in section 110(d) of the Air Act (42 U.S.C. 7410(d));

(3) An approved implementation procedure or plan under section 111(c) or section 111(d) of the Air Act (42 U.S.C. 7411(c) or (d)); or

(4) An approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 7412(d)).

"Clean water standards," as used in this clause, means any enforceable limitation, control, condition, prohibition, standard, or other requirement promulgated under the Water Act or contained in a permit issued to a discharger by the EPA or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

"Compliance," as used in this clause, means compliance with--

(1) Clean air or water standards; or

(2) A schedule or plan ordered or approved by a court of competent jurisdiction, the EPA, or an air or water pollution control agency under the requirements of the Air Act or Water Act and related regulations.

"Facility," as used in this clause, means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a Contractor or subcontractor, used in the performance of a contract or subcontract. When a location or site of operations includes more than one building, plant, installation, or structure, the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the EPA determines that independent facilities are collocated in one geographical area.

"Water Act," as used in this clause, means Clean Water Act (33 U.S.C. 1251, et seq.).

(b) The Contractor agrees--

(1) To comply with the requirements of section 114 of the Clean Air Act (42 U.S.C. 7414) and section 308 of the Clean Water Act (33 U.S.C. 1318) relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, and all regulations and guidelines issued to implement those acts before the award of this contract;

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the EPA List of Violating Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of the facility from the listing;

(3) To use best efforts to comply with clean air standards and clean water standards at the facility in which the contract is being performed; and

(4) To insert the substance of this clause into any nonexempt subcontract, including this subparagraph (b)(4).

(End of clause)

52.223-3 HAZARDOUS MATERIAL IDENTIFICATION AND MATERIAL SAFETY DATA (JAN 1997)

(a) "Hazardous material", as used in this clause, includes any material defined as hazardous under the latest version of Federal Standard No. 313 (including revisions adopted during the term of the contract).

(b) The offeror must list any hazardous material, as defined in paragraph (a) of this clause, to be delivered under this contract. The hazardous material shall be properly identified and include any applicable identification number, such as National Stock Number or Special Item Number. This information shall also be included on the Material Safety Data Sheet submitted under this contract.

Material (If none, insert "None")	Identification No.
_____	_____
_____	_____
_____	_____

(c) This list must be updated during performance of the contract whenever the Contractor determines that any other material to be delivered under this contract is hazardous.

(d) The apparently successful offeror agrees to submit, for each item as required prior to award, a Material Safety Data Sheet, meeting the requirements of 29 CFR 1910.1200(g) and the latest version of Federal Standard No. 313, for all hazardous material identified in paragraph (b) of this clause. Data shall be submitted in accordance with Federal Standard No. 313, whether or not the apparently successful offeror is the actual manufacturer of these items. Failure to submit the Material Safety Data Sheet prior to award may result in the apparently successful offeror being considered nonresponsible and ineligible for award.

(e) If, after award, there is a change in the composition of the item(s) or a revision to Federal Standard No. 313, which renders incomplete or inaccurate the data submitted under paragraph (d) of this clause, the Contractor shall promptly notify the Contracting Officer and resubmit the data.

(f) Neither the requirements of this clause nor any act or failure to act by the Government shall relieve the Contractor of any responsibility or liability for the safety of Government, Contractor, or subcontractor personnel or property.

(g) Nothing contained in this clause shall relieve the Contractor from complying with applicable Federal, State, and local laws, codes, ordinances, and regulations (including the obtaining of licenses and permits) in connection with hazardous material.

(h) The Government's rights in data furnished under this contract with respect to hazardous material are as follows:

(1) To use, duplicate and disclose any data to which this clause is applicable. The purposes of this right are to--

(i) Apprise personnel of the hazards to which they may be exposed in using, handling, packaging, transporting, or disposing of hazardous materials;

(ii) Obtain medical treatment for those affected by the material; and

(iii) Have others use, duplicate, and disclose the data for the Government for these purposes.

(2) To use, duplicate, and disclose data furnished under this clause, in accordance with subparagraph (h)(1) of this clause, in precedence over any other clause of this contract providing for rights in data.

(3) The Government is not precluded from using similar or identical data acquired from other sources.

(End of clause)

52.223-6 DRUG-FREE WORKPLACE (JAN 1997)

(a) Definitions. As used in this clause --

"Controlled substance" means a controlled substance in schedules I through V of section 202 of the Controlled Substances Act (21 U.S.C. 812) and as further defined in regulation at 21 CFR 1308.11 - 1308.15.

"Conviction" means a finding of guilt (including a plea of nolo contendere) or imposition of sentence, or both, by any judicial body charged with the responsibility to deter- mine violations of the Federal or State criminal drug statutes.

"Criminal drug statute" means a Federal or non-Federal criminal statute involving the manufacture, distribution, dispensing, possession, or use of any controlled substance.

"Drug-free workplace" means the site(s) for the performance of work done by the Contractor in connection with a specific contract at which employees of the Contractor are prohibited from engaging in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance.

"Employee" means an employee of a Contractor directly engaged in the performance of work under a Government contract. "Directly engaged" is defined to include all direct cost employees and any other Contractor employee who has other than a minimal impact or involvement in contract performance.

"Individual" means an offeror/contractor that has no more than one employee including the offeror/contractor.

(b) The Contractor, if other than an individual, shall-- within 30 days after award (unless a longer period is agreed to

in writing for contracts of 30 days or more performance duration), or as soon as possible for contracts of less than 30 days performance duration--

(1) Publish a statement notifying its employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the Contractor's workplace and specifying the actions that will be taken against employees for violations of such prohibition;

(2) Establish an ongoing drug-free awareness program to inform such employees about--

(i) The dangers of drug abuse in the workplace;

(ii) The Contractor's policy of maintaining a drug-free workplace;

(iii) Any available drug counseling, rehabilitation, and employee assistance programs; and

(iv) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(3) Provide all employees engaged in performance of the contract with a copy of the statement required by subparagraph (b)(1) of this clause;

(4) Notify such employees in writing in the statement required by subparagraph (b)(1) of this clause that, as a condition of continued employment on this contract, the employee will--

(i) Abide by the terms of the statement; and

(ii) Notify the employer in writing of the employee's conviction under a criminal drug statute for a violation occurring in the workplace no later than 5 days after such conviction.

(5) Notify the Contracting Officer in writing within 10 days after receiving notice under subdivision (b)(4)(ii) of this clause, from an employee or otherwise receiving actual notice of such conviction. The notice shall include the position title of the employee;

(6) Within 30 days after receiving notice under subdivision (b)(4)(ii) of this clause of a conviction, take one of the following actions with respect to any employee who is convicted of a drug abuse violation occurring in the workplace:

(i) Taking appropriate personnel action against such employee, up to and including termination; or

(ii) Require such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State, or local health, law enforcement, or other appropriate agency; and

(7) Make a good faith effort to maintain a drug-free workplace through implementation of subparagraphs (b)(1) though (b)(6) of this clause.

(c) The Contractor, if an individual, agrees by award of the contract or acceptance of a purchase order, not to engage in the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance while performing this contract.

(d) In addition to other remedies available to the Government, the Contractor's failure to comply with the requirements of paragraph (b) or (c) of this clause may, pursuant to FAR 23.506, render the Contractor subject to suspension of contract payments, termination of the contract for default, and suspension or debarment.

(End of clause)

52.223-14 TOXIC CHEMICAL RELEASE REPORTING (OCT 1996)

(a) Unless otherwise exempt, the Contractor, as owner or operator of a facility used in the performance of this contract, shall file by July 1 for the prior calendar year an annual Toxic Chemical Release Inventory Form (Form R) as described in sections 313(a) and (g) of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA) (42 U.S.C. 11023(a) and (g)), and section 6607 of the Pollution Prevention Act of 1990 (PPA) (42 U.S.C. 13106). The Contractor shall file, for each facility subject to the Form R filing and reporting requirements, the annual Form R throughout the life of the contract.

(b) A Contractor owned or operated facility used in the performance of this contract is exempt from the requirement to file an annual Form R if--

(1) The facility does not manufacture, process, or otherwise use any toxic chemicals listed under section 313(c) of EPCRA, 42 U.S.C. 11023(c);

(2) The facility does not have 10 or more full-time employees as specified in section 313(b)(1)(A) of EPCRA, 42 U.S.C. 11023(b)(1)(A);

(3) The facility does not meet the reporting thresholds of toxic chemicals established under of EPCRA, 42 U.S.C. 11023(f) (including the alternate thresholds at 40 CFR 372.27, provided an appropriate certification form has been filed with EPA);

(4) The facility does not fall within Standard Industrial Classification Code (SIC) designations 20 through 39 as set forth in section 19.102 of the Federal Acquisition Regulation (FAR); or

(5) The facility is not located within any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, American Samoa, the United States Virgin Islands, the Northern Mariana Islands, or any other territory or possession over which the United States has jurisdiction.

(c) If the Contractor has certified to an exemption in accordance with one or more of the criteria in paragraph (b) of this clause, and after award of the contract circumstances change so that any of its owned or operated facilities used in the performance of this contract is no longer exempt--

(1) The Contractor shall notify the Contracting Officer; and

(2) The Contractor, as owner or operator of a facility used in the performance of this contract that is no longer exempt, shall (i) submit a Toxic Chemical Release Inventory Form (Form R) on or before July 1 for the prior calendar year during which the facility becomes eligible; and (ii) continue to file the annual Form R for the life of the contract for such facility.

(d) The Contracting Officer may terminate this contract or take other action as appropriate, if the Contractor fails to comply accurately and fully with the EPCRA and PPA toxic chemical release filing and reporting requirements.

(e) Except for acquisitions of commercial items, as defined in FAR Part 2, the Contractor shall--

(1) For competitive subcontracts expected to exceed $100,000 (including all options), include a solicitation provision substantially the same as the provision at FAR 52.223-13, Certification of Toxic Chemical Release Reporting; and

(2) Include in any resultant subcontract exceeding $100,000 (including all options), the substance of this clause, except this paragraph (e).

252.223-7001 HAZARD WARNING LABELS (DEC 1991)

(a) "Hazardous material," as used in this clause, is defined in the Hazardous Material Identification and Material Safety Data clause of this contract.

(b) The Contractor shall label the item package (unit container) of any hazardous material to be delivered under this contract in accordance with the Hazard Communication Standard (29 CFR 1910.1200 et seq). The Standard requires that the hazard warning label conform to the requirements of the standard unless the material is otherwise subject to the labeling requirements of one of the following statutes:

(1) Federal Insecticide, Fungicide and Rodenticide Act;

(2) Federal Food, Drug and Cosmetics Act;

(3) Consumer Product Safety Act;

(4) Federal Hazardous Substances Act; or

(5) Federal Alcohol Administration Act.

(c) The Offeror shall list which hazardous material listed in the Hazardous Material Identification and Material Safety Data clause of this contract will be labeled in accordance with one of the Acts in paragraphs (b)(1) through (5) of this clause instead of the Hazard Communication Standard. Any hazardous material not listed will be interpreted to mean that a label is required in accordance with the Hazard Communication Standard.

MATERIAL (If None, Insert "None.")	ACT
_____	_____
_____	_____

(d) The apparently successful Offeror agrees to submit, before award, a copy of the hazard warning label for all hazardous materials not listed in paragraph (c) of this clause. The Offeror shall submit the label with the Material Safety Data Sheet being furnished under the Hazardous Material Identification and Material Safety Data clause of this contract.

(e) The Contractor shall also comply with MIL-STD-129, Marking for Shipment and Storage (including revisions adopted during the term of this contract).

(End of clause)

252.223-7004 DRUG-FREE WORK FORCE (SEP 1988)

(a) Definitions.

(1) "Employee in a sensitive position," as used in this clause, means an employee who has been granted access to classified information; or employees in other positions that the Contractor determines involve national security; health or safety, or functions other than the foregoing requiring a high degree of trust and confidence.

(2) "Illegal drugs," as used in this clause, means controlled substances included in Schedules I and II, as defined by section 802(6) of title 21 of the United States Code, the possession of which is unlawful under chapter 13 of that Title. The term "illegal drugs" does not mean the use of a controlled substance pursuant to a valid prescription or other uses authorized by law.

(b) The Contractor agrees to institute and maintain a program for achieving the objective of a drug-free work force. While this clause defines criteria for such a program, contractors are encouraged to implement alternative approaches comparable to the criteria in paragraph (c) that are designed to achieve the objectives of this clause.

(c) Contractor programs shall include the following, or appropriate alternatives:

(1) Employee assistance programs emphasizing high level direction, education, counseling, rehabilitation, and coordination with available community resources;

(2) Supervisory training to assist in identifying and addressing illegal drug use by Contractor employees;

(3) Provision for self-referrals as well as supervisory referrals to treatment with maximum respect for individual confidentiality consistent with safety and security issues;

(4) Provision for identifying illegal drug users, including testing on a controlled and carefully monitored basis. Employee drug testing programs shall be established taking account of the following:

(i) The Contractor shall establish a program that provides for testing for the use of illegal drugs by employees in sensitive positions. The extent of and criteria for such testing shall be determined by the Contractor based on considerations that include the nature of the work being performed under the contract, the employee's duties, and efficient use of Contractor resources, and the risks to health, safety, or national security that could result from the failure of an employee adequately to discharge his or her position.

(ii) In addition, the Contractor may establish a program for employee drug testing--

(A) When there is a reasonable suspicion that an employee uses illegal drugs; or

(B) When an employees has been involved in an accident or unsafe practice;

(C) As part of or as a follow-up to counseling or rehabilitation for illegal drug use;

(D) As part of a voluntary employee drug testing program.

(iii) The Contractor may establish a program to test applicants for employment for illegal drug use.

(iv) For the purpose of administering this clause, testing for illegal drugs may be limited to those substances for which testing is prescribed by section 2..1 of subpart B of the "Mandatory Guidelines for Federal Workplace Drug Testing Programs" (53 FR 11980 (April 11, 1988), issued by the Department of Health and Human Services.

(d) Contractors shall adopt appropriate personnel procedures to deal with employees who are found to be using drugs illegally. Contractors shall not allow any employee to remain on duty or perform in a sensitive position who is found to use illegal drugs until such times as the Contractor, in accordance with procedures established by the Contractor, determines that the employee may perform in such a position.

(e) The provisions of this clause pertaining to drug testing program shall not apply to the extent that are inconsistent with state or local law, or with an existing collective bargaining agreement; provided that with respect to the latter, the Contractor agrees those issues that are in conflict will be a subject of negotiation at the next collective bargaining session.

(End of clause)

52.225-5 BUY AMERICAN ACT--CONSTRUCTION MATERIALS (JUNE 1997)

(a) Definitions. As used in this clause--

"Components," means those articles, materials, and supplies incorporated directly into construction materials.

"Construction material," means an article, material, or supply brought to the construction site for incorporation into the building or work. Construction material also includes an item brought to the site pre-assembled from articles, materials, and supplies. However, emergency life safety systems, such as emergency lighting, fire alarm, and audio evacuation systems, which are discrete systems incorporated into a public building or work and which are produced as a complete system, shall be evaluated as a single and distinct construction material regardless of when or how the individual parts or components of such systems are delivered to the construction site.

"Domestic construction material" means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(2) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

(b) (1) The Buy American Act (41 U.S.C. 10a-10d) requires that only domestic construction material be used in performing this contract, except as provided in paragraphs (b)(2) and (b)(3) of this clause.

(2) This requirement does not apply to the excepted construction material or components listed by the Government as follows:

(List applicable excepted materials or indicate "none")

(3) Other foreign construction material may be added to the list in paragraph (b)(2) of this clause if the Government determines that--

(i) The cost would be unreasonable (the cost of a particular domestic construction material shall be determined to be unreasonable when the cost of such material exceeds the cost of foreign material by more than 6 percent, unless the agency head determines a higher percentage to be appropriate);

(ii) The application of the restriction of the Buy American Act to a particular construction material would be impracticable or inconsistent with the public interest; or

(iii) The construction material is not mined, produced, or manufactured in the United States in sufficient and reasonably available commercial quantities or a satisfactory quality.

(4) The Contractor agrees that only domestic construction material will be used by the Contractor, subcontractors, material men, and suppliers in the performance of this contract, except for foreign construction materials, if any, listed in paragraph (b)(2) of this clause.

(c) Request for determination. (1) Contractors requesting to use foreign construction material under paragraph (b)(3) of this clause shall provide adequate information for Government evaluation of the request for a determination regarding the inapplicability of the Buy American Act. Each submission shall include a description of the foreign and domestic construction materials, including unit of measure, quantity, price, time of delivery or availability, location of the construction project, name and address of the proposed contractor, and a detailed justification of the reason for use of foreign materials cited in accordance with paragraph (b)(3) of this clause. A submission based on unreasonable cost shall include a reasonable survey of the market and a completed price comparison table in the format in paragraph (d) of this clause. The price of construction material shall include all delivery costs to the construction site and any applicable duty (whether or not a duty-free certificate may be issued.)

(2) If the Government determines after contract award that an exception to the Buy American Act applies, the contract shall be modified to allow use of the foreign construction material, and adequate consideration shall be negotiated. However, when the basis for the exception is the unreasonable price of a domestic construction material, adequate consideration shall not be less than the differential established in paragraph (b)(3)(i) of this clause.

(3) If the Government does not determine that an exception to the Buy American Act applies, the use of that particular foreign construction material will be a failure to comply with the Act.

(d) For evaluation of requests under paragraph (c) of this clause based on unreasonable cost, the following information and any applicable supporting data based on the survey of suppliers shall be included in the request:

Foreign and Domestic Construction Materials Price Comparison

Unit of Price

Construction material description measure Quantity (dollars)\1\

Item 1:

Foreign construction material . . . . . .

Domestic construction material . . . . . .

Item 2;

Foreign construction material . . . . . .

Domestic construction material . .. .

List name, address, telephone number, and contact for suppliers surveyed. Attach copy of response; if oral, attach summary.

Include other applicable supporting information.

\1\ Include all delivery costs to the construction site and any applicable duty (whether or not a duty-free entry certificate is issued).

52.225-6 BALANCE OF PAYMENTS PROGRAM CERTIFICATE (APR 1985)

(a) The offeror hereby certifies that each end product or service, except the end products or services listed below, is a domestic end product or service (as defined in the clause entitled "Balance of Payments Program") and that components of unknown origin have been considered to have been mined, produced, or manufactured outside the United States.

Excluded End Products or Services

Line Item No. Country of Origin

_____ _____

_____ _____

_____ _____

(List as necessary)

(b) For evaluation purposes only, each offer of an end product other than a domestic end product shall be increased by 50 percent. Any domestic end product offer that exceeds such evaluated other end product shall be considered unreasonable in cost or inconsistent with the public interest.

52.225-11 RESTRICTIONS ON CERTAIN FOREIGN PURCHASES (AUG 1998)

(a) Unless advance written approval of the Contracting Officer is obtained, the Contractor shall not acquire, for use in the performance of this contract, any supplies or services originating from sources within, or that were located in or transported from or through, countries whose products are banned from importation into the United States by Executive order or regulations of the Office of Foreign Assets Control, Department of the Treasury. Those countries include Cuba, Iran, Iraq, Libya, North Korea, and Sudan.

(b) The Contractor shall not acquire for use in the performance of this contract any supplies or services from entities controlled by the Government of Iraq.

(c) The Contractor agrees to insert the provisions of this clause, including this paragraph (c), in all subcontracts hereunder.

(End of clause)

52.226-1 UTILIZATION OF INDIAN ORGANIZATIONS AND INDIAN-OWNED ECONOMIC ENTERPRISES (SEP 1996)

(a) For Department of Defense contracts, this clause applies only if the contract includes a subcontracting plan incorporated under the terms of the clause at 52.219-9, Small Business Subcontracting Plan. It does not apply to contracts awarded based on a subcontracting plan submitted and approved under paragraph (g) of the clause at 52.219-9.

(b) Definitions. As used in this clause:

"Indian" means any person who is a member of any Indian tribe, band, group, pueblo or community which is recognized by the Federal Government as eligible for services from the Bureau of Indian Affairs (BIA) in accordance with 25 U.S.C. 1452(c) and any ‘‘Native’’ as defined in the Alaska Native Claims Settlement Act (43 U.S.C. 1601).

"Indian organization" means the governing body of any Indian tribe or entity established or recognized by the governing body of an Indian tribe for the purposes of 25 U.S.C., chapter 17.

"Indian-owned economic enterprise" means any Indian-owned (as determined by the Secretary of the Interior) commercial, industrial, or business activity established or organized for the purpose of profit, provided that Indian ownership shall constitute not less than 51 percent of the enterprise.

"Indian tribe" means any Indian tribe, band, group, pueblo or community, including native villages and native groups (including corporations organized by Kenai, Juneau, Sitka, and Kodiak) as defined in the Alaska Native Claims Settlement Act, which is recognized by the Federal Government as eligible for services from BIA in accordance with 25 U.S.C. 1542(c).

"Interested party" means a prime contractor or an actual or prospective offeror whose direct economic interest would be affected by the award of a subcontract or by the failure to award a subcontract.

(c)The Contractor agrees to use its best efforts to give Indian organizations and Indian-owned economic enterprises (25 U.S.C. 1544) the maximum practicable opportunity to participate in the subcontracts it awards to the fullest extent consistent with efficient performance of its contract.

(1) The Contracting Officer and the Contractor, acting in good faith, may rely on the representation of an Indian organization or Indian-owned economic enterprise as to its eligibility, unless an interested party challenges its status or the Contracting Officer has independent reason to question that status. In the event of a challenge to the representation of a subcontractor, the Contracting Officer shall refer the matter to the U.S. Department of the Interior, Bureau of Indian Affairs (BIA), Attn: Chief, Division of Contracting and Grants Administration, 1849 C Street, NW, MS-334A-SIB, Washington, DC 20245. The BIA will determine the eligibility and notify the Contracting Officer. The 5 percent incentive payment will not be made within 50 working days of subcontract award or while a challenge is pending. If a subcontractor is determined to be an ineligible participant, no incentive payment will be made under the Indian Incentive Program.

(2) The Contractor may request an adjustment under the Indian Incentive Program to the following:

(i) The estimated cost of a cost-type contract.

(ii) The target cost of a cost-plus-incentive-fee prime contract.

(iii) The target cost and ceiling price of a fixed-price incentive prime contract.

(iv) The price of a firm-fixed-price prime contract.

(3) The amount of the equitable adjustment to the prime contract shall be 5 percent of the estimated cost, target cost or firm-fixed-price included in the subcontract initially awarded to the Indian organization or Indian-owned economic enterprise.

(4) The Contractor has the burden of proving the amount claimed and must assert its request for an adjustment prior to completion of contract performance.

(d) The Contracting Officer, subject to the terms and conditions of the contract and the availability of funds, shall authorize an incentive payment of 5 percent of the amount paid to the subcontractor. Contracting Officers shall seek funding in accordance with agency procedures. The Contracting Officer's decision is final and not subject to the Disputes clause of this contract.

52.227-1 AUTHORIZATION AND CONSENT (JUL 1995)

(a) The Government authorizes and consents to all use and manufacture, in performing this contract or any subcontract at any tier, of any invention described in and covered by a United States patent (1) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract or (2) used in machinery, tools, or methods whose use necessarily results from compliance by the Contractor or a subcontractor with (i) specifications or written provisions forming a part of this contract or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clause, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.

(b) The Contractor agrees to include, and require inclusion of, this clause, suitably modified to identify the parties, in all subcontracts at any tier for supplies or services (including construction, architect-engineer services, and materials, supplies, models, samples, and design or testing services expected to exceed the simplified acquisition threshold (however, omission of this clause from any subcontract, including those at or below the simplified acquisition threshold, does not affect this authorization and consent.)

52.227-4 PATENT INDEMNITY--CONSTRUCTION CONTRACTS (APR 1984)

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and

employees against liability, including costs and expenses, for infringement upon any United States patent (except a patent issued upon an application that is now or may hereafter be withheld from issue pursuant to a Secrecy Order under 35 U.S.C. 181) arising out of performing this contract or out of the use or disposal by or for the account of the Government of supplies furnished or work performed under this contract.

252.227-7022 GOVERNMENT RIGHTS (UNLIMITED) (MAR 1979)

The Government shall have unlimited rights, in all drawings, designs, specifications, notes and other works developed in the performance of this contract, including the right to use same on any other Government design or construction without additional compensation to the Contractor. The Contractor hereby grants to the Government a paid-up license throughout the world to all such works to which he may assert or establish any claim under design patent or copyright laws. The Contractor for a period of three (3) years after completion of the project agrees to furnish the original or copies of all such works on the request of the Contracting Officer.

252.227-7023 DRAWINGS AND OTHER DATA TO BECOME PROPERTY OF GOVERNMENT. (MAR 1979)

All designs, drawings, specifications, notes and other works developed in the performance of this contract shall become the sole property of the Government and may be used on any other design or construction without additional compensation to the Contractor. The Government shall be considered the "person for whom the work was prepared" for the purpose of authorship in any copyrightable work under 17 U.S.C. 201(b). With respect thereto, the Contractor agrees not to assert or authorize others to assert any rights nor establish any claim under the design patent or copyright laws. The Contractor for a period of three (3) years after completion of the project agrees to furnish all retained works on the request of the Contracting Officer. Unless otherwise provided in this contract, the Contractor shall have the right to retain copies of all works beyond such period.

252.227-7033 RIGHTS IN SHOP DRAWINGS (APR 1966)

(a) Shop drawings for construction means drawings, submitted to the Government by the Construction Contractor, subcontractor or any lower-tier subcontractor pursuant to a construction contract, showing in detail (i) the proposed fabrication and assembly of structural elements and (ii) the installation (i.e., form, fit, and attachment details) of materials or equipment. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(b) This clause, including this paragraph (b), shall be included in all subcontracts hereunder at any tier.

52.228-2 ADDITIONAL BOND SECURITY (OCT 1997)

The Contractor shall promptly furnish additional security required to protect the Government and persons supplying labor or materials under this contract if--

(a) Any surety upon any bond, or issuing financial institution for other security, furnished with this contract becomes unacceptable to the Government.

(b) Any surety fails to furnish reports on its financial condition as required by the Government;

(c) The contract price is increased so that the penal sum of any bond becomes inadequate in the opinion of the Contracting Officer; or

(d) An irrevocable letter of credit (ILC) used as security will expire before the end of the period of required security. If the Contractor does not furnish an acceptable extension or replacement ILC, or other acceptable substitute, at least 30 days before an ILC's scheduled expiration, the Contracting officer has the right to immediately draw on the ILC.

52.228-12 PROSPECTIVE SUBCONTRACTOR REQUESTS FOR BONDS. (OCT 1995)

In accordance with Section 806(a)(3) of Pub. L. 102-190, as amended by Sections 2091 and 8105 of Pub. L. 103-355, upon the request of a prospective subcontractor or supplier offering to furnish labor or material for the performance of this contract for which a payment bond has been furnished to the Government pursuant to the Miller Act, the Contractor shall promptly provide a copy of such payment bond to the requester.

52.229-3 FEDERAL, STATE, AND LOCAL TAXES (JAN 1991)

(a) "Contract date," as used in this clause, means the date set for bid opening or, if this is a negotiated contract or a modification, the effective date of this contract or modification.

"All applicable Federal, State, and local taxes and duties," as used in this clause, means all taxes and duties, in effect on the contract date, that the taxing authority is imposing and collecting on the transactions or property covered by this contract.

"After-imposed Federal tax," as used in this clause, means any new or increased Federal excise tax or duty, or tax that was exempted or excluded on the contract date but whose exemption was later revoked or reduced during the contract period, on the transactions or property covered by this contract that the Contractor is required to pay or bear as the result of legislative, judicial, or administrative action taking effect after the contract date. It does not include social security tax or other employment taxes.

"After-relieved Federal tax," as used in this clause, means any amount of Federal excise tax or duty, except social security or other employment taxes, that would otherwise have been payable on the transactions or property covered by this contract, but which the Contractor is not required to pay or bear, or for which the Contractor obtains a refund or drawback, as the result of legislative, judicial, or administrative action taking effect after the contract date.

(b) The contract price includes all applicable Federal, State, and local taxes and duties.

(c) The contract price shall be increased by the amount of any after-imposed Federal tax, provided the Contractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price, as a contingency reserve or otherwise.

(d) The contract price shall be decreased by the amount of any after-relieved Federal tax.

(e) The contract price shall be decreased by the amount of any Federal excise tax or duty, except social security or other employment taxes, that the Contractor is required to pay or bear, or does not obtain a refund of, through the Contractor's fault, negligence, or failure to follow instructions of the Contracting Officer.

(f) No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceeds $250.

(g) The Contractor shall promptly notify the Contracting Officer of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the contract price and shall take appropriate action as the Contracting Officer directs.

(h) The Government shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.

(End of clause)

252.231-7000 SUPPLEMENTAL COST PRINCIPLES (DEC 1991)

When the allowability of costs under this contract is determined in accordance with part 31 of the Federal Acquisition Regulation (FAR), allowability shall also be determined in accordance with part 231 of the Defense FAR Supplement, in effect on the date of this contract.

52.232-5 PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (MAY 1997)

(a) Payment of price. The Government shall pay the Contractor the contract price as provided in this contract.

(b) Progress payments. The Government shall make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates of work accomplished which meets the standards of quality established under the contract, as approved by the Contracting Officer.

(1) The Contractor's request for progress payments shall include the following substantiation:

(i) An itemization of the amounts requested, related to the various elements of work required by the contract covered by the payment requested.

(ii) A listing of the amount included for work performed by each subcontractor under the contract.

(iii) A listing of the total amount of each subcontract under the contract.

(iv) A listing of the amounts previously paid to each such subcontractor under the contract.

(v) Additional supporting data in a form and detail required by the Contracting Officer.

(2) In the preparation of estimates, the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site also may be taken into consideration if--

(i) Consideration is specifically authorized by this contract; and

(ii) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will

be used to perform this contract.

(c) Contractor certification. Along with each request for progress payments, the Contractor shall furnish the following certification, or payment shall not be made: (However, if the Contractor elects to delete paragraph (c)(4) from the certification, the certification is still acceptable.)

I hereby certify, to the best of my knowledge and belief, that--

(1) The amounts requested are only for performance in accordance with the specifications, terms, and conditions of the contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of chapter 39 of Title 31, United States Code;

(3) This request for progress payments does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract; and

(4) This certification is not to be construed as final acceptance of a subcontractor's performance.

_____

(Name)

_____

(Title)

_____

(Date)

(d) Refund of unearned amounts. If the Contractor, after making a certified request for progress payments, discovers that a portion or all of such request constitutes a payment for performance by the Contractor that fails to conform to the specifications, terms, and conditions of this contract (hereinafter referred to as the "unearned amount"), the Contractor shall--

(1) Notify the Contracting Officer of such performance deficiency; and

(2) Be obligated to pay the Government an amount (computed by the Contracting Officer in the manner provided in paragraph (j) of this clause) equal to interest on the unearned amount from the 8th day after the date of receipt of the unearned amount until--

(i) The date the Contractor notifies the Contracting Officer that the performance deficiency has been corrected; or

(ii) The date the Contractor reduces the amount of any subsequent certified request for progress payments by an amount equal to the unearned amount.

(e) Retainage. If the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer shall authorize payment to be made in full. However, if satisfactory progress has not been made, the Contracting Officer may retain a maximum of 10 percent of the amount of the payment until satisfactory progress is achieved. When the work is substantially complete, the Contracting Officer may retain from previously withheld funds and future progress payments that amount the Contracting Officer considers adequate for protection of the Government and shall release to the Contractor all the remaining withheld funds. Also, on completion and acceptance of each separate building, public work, or other division of the contract, for which the price is stated separately in the contract, payment shall be made for the completed work without retention of a percentage.

(f) Title, liability, and reservation of rights. All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as--

(1) Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

(2) Waiving the right of the Government to require the fulfillment of all of the terms of the contract.

(g) Reimbursement for bond premiums. In making these progress payments, the Government shall, upon request, reimburse the Contractor for the amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after the Contractor has furnished evidence of full payment to the surety. The retainage provisions in paragraph (e) of this clause shall not apply to that portion of progress payments attributable to bond premiums.

(h) Final payment. The Government shall pay the amount due the Contractor under this contract after--

(1) Completion and acceptance of all work;

(2) Presentation of a properly executed voucher; and

(3) Presentation of release of all claims against
the Government arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned under the Assignment of Claims Act of 1940 (31 U.S.C. 3727 and 41 U.S.C. 15).

(i) Limitation because of undefinitized work. Notwithstanding any provision of this contract, progress payments shall not exceed 80 percent on work accomplished on undefinitized contract actions. A "contract action" is any action resulting in a contract, as defined in FAR Subpart 2.1, including contract modifications for additional supplies or services, but not including contract modifications that are within the scope and under the terms of the contract, such as contract modifications issued pursuant to the Changes clause, or funding and other administrative changes.

(j) Interest computation on unearned amounts. In accordance with 31 U.S.C. 3903(c)(1), the amount payable under subparagraph (d)(2) of this clause shall be--

(1) Computed at the rate of average bond equivalent rates of 91-day Treasury bills auctioned at the most recent auction of such bills prior to the date the Contractor receives the unearned amount; and

(2) Deducted from the next available payment to the Contractor.

52.232-17 INTEREST (JUNE 1996)

(a) Except as otherwise provided in this contract under a Price Reduction for Defective Cost or Pricing Data clause or a Cost Accounting Standards clause, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code (26 U.S.C. 1481)) shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of the Treasury as provided in Section 12 of the Contract Disputes Act of 1978 (Public Law 95-563), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this clause, and then at the rate applicable for each six-month period as fixed by the Secretary until the amount is paid. reproduce, prepare derivative works, distribute copies to the public, and (b) Amounts shall be due at the earliest of the following dates:

(1) The date fixed under this contract.

(2) The date of the first written demand for payment consistent with this contract, including any demand resulting from a default termination.

(3) The date the Government transmits to the Contractor a proposed supplemental agreement to confirm completed negotiations establishing the amount of debt.

(4) If this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or a negotiated pricing agreement not confirmed by contract modification.

(c) The interest charge made under this clause may be reduced under the procedures prescribed in 32.614-2 of the Federal Acquisition Regulation in effect on the date of this contract.

52.232-18 AVAILABILITY OF FUNDS (APR 1984)

Funds are not presently available for this contract. The Government's obligation under this contract is contingent upon the availability of appropriated funds from which payment for contract purposes can be made. No legal liability on the part of the Government for any payment may arise until funds are made available to the Contracting Officer for this contract and until the Contractor receives notice of such availability, to be confirmed in writing by the Contracting Officer.

52.232-23 ASSIGNMENT OF CLAIMS (JAN 1986)

(a) The Contractor, under the Assignment of Claims Act, as amended, 31 U.S.C. 3727, 41 U.S.C. 15 (hereafter referred to as "the Act"), may assign its rights to be paid amounts due or to become due as a result of the performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original

assignment to any type of financing institution described in the preceding sentence.

(b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under this contract, and shall not be made to more than one party, except that an assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in the financing of this contract.

(c) The Contractor shall not furnish or disclose to any assignee under this contract any classified document (including this contract) or information related to work under this contract until the Contracting Officer authorizes such action in writing.

52.232-27 PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS (JUN 1997)

Notwithstanding any other payment terms in this contract, the Government will make invoice payments and contract financing payments under the terms and conditions specified in this clause. Payment shall be considered as being made on the day a check is dated or the date of an electronic funds transfer. Definitions of pertinent terms are set forth in section 32.902 of the Federal Acquisition Regulation. All days referred to in this clause are calendar days, unless otherwise specified. (However, see subparagraph (a)(3) concerning payments due on Saturdays, Sundays, and legal holidays.)

(a) Invoice payments. (1) Types of invoice payments. For purposes of this clause, there are several types of invoice payments that may occur under this contract, as follows:

(i) Progress payments, if provided for elsewhere in this contract, based on Contracting Officer approval of the estimated amount and value of work or services performed, including payments for reaching milestones in any project:

(A) The due date for making such payments shall be 14 days after receipt of the payment request by the designated billing office. If the designated billing office fails to annotate the payment request with the actual date of receipt at the time of receipt, the payment due date shall be the 14th day after the date of the Contractor's payment request, provided a proper payment request is received and there is no disagreement over quantity, quality, or Contractor compliance with contract requirements.

(B) The due date for payment of any amounts retained by the Contracting Officer in accordance with the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts, shall be as specified in the contract or, if not specified, 30 days after approval for release to the Contractor by the Contracting Officer.

(ii) Final payments based on completion and acceptance of all work and presentation of release of all claims against the Government arising by virtue of the contract, and payments for partial deliveries that have been accepted by the Government (e.g., each separate building, public work, or other division of the contract for which the price is stated separately in the contract):

(A) The due date for making such payments shall be either the 30th day after receipt by the designated billing office of a proper invoice from the Contractor, or the 30th day after Government acceptance of the work or services completed by the Contractor, whichever is later. If the designated billing office fails to annotate the invoice with the date of actual receipt at the time of receipt, the invoice payment due date shall be the 30th day after the date of the Contractor's invoice, provided a proper invoice is received and there is no disagreement over quantity, quality, or

Contractor compliance with contract requirements.

(B) On a final invoice where the payment amount is subject to contract settlement actions (e.g., release of claims), acceptance shall be deemed to have occurred on the effective date of the contract settlement.

(2) Contractor's invoice. The Contractor shall prepare and submit invoices to the designated billing office specified in the contract. A proper invoice must include the items listed in subdivisions (a)(2)(i) through (a)(2)(ix) of this clause. If the invoice does not comply with these requirements, it shall be returned within 7 days after the date the designated billing office received the invoice, with a statement of the reasons why it is not a proper invoice. Untimely notification will be taken into account in computing any interest penalty owed the Contractor in the manner described in subparagraph (a)(4) of this clause.

(i) Name and address of the Contractor.

(ii) Invoice date. (The Contractor is encouraged to date invoices as close as possible to the date of mailing or transmission.)

(iii) Contract number or other authorization for work or services performed (including order number and contract line item number).

(iv) Description of work or services performed.

(v) Delivery and payment terms (e.g., prompt payment discount terms).

(vi) Name and address of Contractor official to whom payment is to be sent (must be the same as that in the contract or in a proper notice of assignment).

(vii) Name (where practicable), title, phone number, and mailing address of person to be notified in the event of a defective invoice.

(viii) For payments described in subdivision (a)(1)(i) of this clause, substantiation of the amounts requested and certification in accordance with the requirements of the clause at 52.232-5, Payments Under Fixed-Price Construction Contracts.

(ix) Any other information or documentation required by the contract.

(x) While not required, the Contractor is strongly encouraged to assign an identification number to each invoice.

(3) Interest penalty. An interest penalty shall be paid automatically by the designated payment office, without request from the Contractor, if payment is not made by the due date and the conditions listed in subdivisions (a)(3)(i) through (a)(3)(iii) of this clause are met, if applicable. However, when the due date falls on a Saturday, Sunday, or legal holiday when Federal Government offices are closed and Government business is not expected to be conducted, payment may be made on the following business day without incurring a late payment interest penalty.

(i) A proper invoice was received by the designated billing office.

(ii) A receiving report or other Government documentation authorizing payment was processed and there was no

disagreement over quantity, quality, Contractor compliance with any contract term or condition, or requested progress payment amount.

(iii) In the case of a final invoice for any balance of funds due the Contractor for work or services performed, the amount was not subject to further contract settlement actions between the Government and the Contractor.

(4) Computing penalty amount. The interest penalty shall be at the rate established by the Secretary of the Treasury under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) that is in effect on the day after the due date, except where the interest penalty is prescribed by other governmental authority (e.g., tariffs). This rate is referred to as the "Renegotiation Board Interest Rate," and it is published in the Federal Register semiannually on or about January 1 and July 1. The interest penalty shall accrue daily on the invoice principal payment amount approved by the Government until the payment date of such approved principal amount; and will be compounded in 30-day increments inclusive from the first day after the due date through the payment date. That is, interest accrued at the end of any 30-day period will be added to the approved invoice principal payment amount and will be subject to interest penalties if not paid in the succeeding 30-day period. If the designated billing office failed to notify the Contractor of a defective invoice within the periods prescribed in subparagraph (a)(2) of this clause, the due date on the corrected invoice will be adjusted by subtracting from such date the number of days taken beyond the prescribed notification of defects period. Any interest penalty owed the Contractor will be based on this adjusted due date. Adjustments will be made by the designated payment office for errors in calculating interest penalties.

(i) For the sole purpose of computing an interest penalty that might be due the Contractor for payments described in subdivision (a)(1)(ii) of this clause, Government acceptance or approval shall be deemed to have occurred constructively on the 7th day after the Contractor has completed the work or services in accordance with the terms and conditions of the contract. In the event that actual acceptance or approval occurs within the constructive acceptance or approval period, the determination of an interest penalty shall be based on the actual date of acceptance or approval. Constructive acceptance or constructive approval requirements do not apply if there is a disagreement over quantity, quality, or Contractor compliance with a contract provision. These requirements also do not compel Government officials to accept work or services, approve Contractor estimates, perform contract administration functions, or make payment prior to fulfilling their responsibilities.

(ii) The following periods of time will not be included in the determination of an interest penalty:

(A) The period taken to notify the Contractor of defects in invoices submitted to the Government, but this may not exceed 7 days.

(B) The period between the defects notice and resubmission of the corrected invoice by the Contractor.

(C) For incorrect electronic funds transfer (EFT) information, in accordance with the EFT clause of this contract.

(iii) Interest penalties will not continue to accrue after the filing of a claim for such penalties under the clause at 52.233-1, Disputes, or for more than 1 year. Interest penalties of less than $1 need not be paid.

(iv) Interest penalties are not required on payment delays due to disagreement between the Government and the Contractor over the payment amount or other issues involving contract compliance, or on amounts temporarily withheld or retained in accordance with the terms of the contract. Claims involving disputes, and any interest that may be payable, will be resolved in accordance with the clause at 52.233-1, Disputes.

(5) Prompt payment discounts. An interest penalty also shall be paid automatically by the designated payment

office, without request from the Contractor, if a discount for prompt payment is taken improperly. The interest penalty will be calculated on the amount of discount taken for the period beginning with the first day after the end of the discount period through the date when the Contractor is paid.

(6) Additional interest penalty. (i) If this contract was awarded on or after October 1, 1989, a penalty amount, calculated in accordance with subdivision (a)(6)(iii) of this clause, shall be paid in addition to the interest penalty amount if the Contractor--

(A) Is owed an interest penalty of $1 or more;

(B) Is not paid the interest penalty within 10 days after the date the invoice amount is paid; and

(C) Makes a written demand to the designated payment office for additional penalty payment, in accordance with subdivision (a)(6)(ii) of this clause, postmarked not later than 40 days after the date the invoice amount is paid.

(ii)(A) Contractors shall support written demands for additional penalty payments with the following data. No additional data shall be required. Contractors shall--

(1) Specifically assert that late payment interest is due under a specific invoice, and request payment of all overdue late payment interest penalty and such additional penalty as may be required;

(2) Attach a copy of the invoice on which the unpaid late payment interest was due; and

(3) State that payment of the principal has been received, including the date of receipt.

(B) Demands must be postmarked on or before the 40th day after payment was made, except that--

(1) If the postmark is illegible or nonexistent, the demand must have been received and annotated with the date of receipt by the designated payment office on or before the 40th day after payment was made; or

(2) If the postmark is illegible or nonexistent and the designated payment office fails to make the required annotation, the demand's validity will be determined by the date the Contractor has placed on the demand; provided such date is no later than the 40th day after payment was made.

(iii)(A) The additional penalty shall be equal to 100 percent of any original late payment interest penalty, except--

(1) The additional penalty shall not exceed $5,000;

(2) The additional penalty shall never be less than $25; and

(3) No additional penalty is owed if the amount of the underlying interest penalty is less than $1.

(B) If the interest penalty ceases to accrue in accordance with the limits stated in subdivision (a)(4)(iii) of this clause, the amount of the additional penalty shall be calculated on the amount of interest penalty that would have accrued in the absence of these limits, subject to the overall limits on the additional penalty specified in subdivision (a)(6)(iii)(A) of this clause.

(C) For determining the maximum and minimum additional penalties, the test shall be the interest penalty due on

each separate payment made for each separate contract. The maximum and minimum additional penalty shall not be based upon individual invoices unless the invoices are paid separately. Where payments are consolidated for disbursing purposes, the maximum and minimum additional penalty determination shall be made separately for each contract therein.

(D) The additional penalty does not apply to payments regulated by other Government regulations (e.g., payments under utility contracts subject to tariffs and regulation).

(b) Contract financing payments. (1) Due dates for recurring financing payments. If this contract provides for contract financing, requests for payment shall be submitted to the designated billing office as specified in this contract or as directed by the Contracting Officer. Contract financing payments shall be made on the [insert day as prescribed by Agency head; if not prescribed, insert 30th day] day after receipt of a proper contract financing request by the designated billing office. In the event that an audit or other review of a specific financing request is required to ensure compliance with the terms and conditions of the contract, the designated payment office is not compelled to make payment by the due date specified.

(2) Due dates for other contract financing. For advance payments, loans, or other arrangements that do not involve recurring submissions of contract financing requests, payment shall be made in accordance with the corresponding contract terms or as directed by the Contracting Officer.

(3) Interest penalty not applicable. Contract financing payments shall not be assessed an interest penalty for payment delays.

(c) Subcontract clause requirements. The Contractor shall include in each subcontract for property or services (including a material supplier) for the purpose of performing this contract the following:

(1) Prompt payment for subcontractors. A payment clause that obligates the Contractor to pay the subcontractor for satisfactory performance under its subcontract not later than 7 days from receipt of payment out of such amounts as are paid to the Contractor under this contract.

(2) Interest for subcontractors. An interest penalty clause that obligates the Contractor to pay to the subcontractor an interest penalty for each payment not made in accordance with the payment clause--

(i) For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and

(ii) Computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contract Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(3) Subcontractor clause flowdown. A clause requiring each subcontractor to include a payment clause and an interest penalty clause conforming to the standards set forth in subparagraphs (c)(1) and (c)(2) of this clause in each of its subcontracts, and to require each of its subcontractors to include such clauses in their subcontracts with each lower-tier subcontractor or supplier.

(d) Subcontract clause interpretation. The clauses required by paragraph (c) of this clause shall not be construed to impair the right of the Contractor or a subcontractor at any tier to negotiate, and to include in their subcontract, provisions that--

(1) Retainage permitted. Permit the Contractor or a subcontractor to retain (without cause) a specified percentage of each progress payment otherwise due to a subcontractor for satisfactory performance under the subcontract without incurring any obligation to pay a late payment interest penalty, in accordance with terms and conditions agreed to by the parties to the subcontract, giving such recognition as the parties deem appropriate to the ability of a subcontractor to furnish a performance bond and a payment bond;

(2) Withholding permitted. Permit the Contractor or subcontractor to make a determination that part or all of the subcontractor's request for payment may be withheld in accordance with the subcontract agreement; and

(3) Withholding requirements. Permit such withholding without incurring any obligation to pay a late payment penalty if--

(i) A notice conforming to the standards of paragraph (g) of this clause previously has been furnished to the subcontractor; and

(ii) A copy of any notice issued by a Contractor pursuant to subdivision (d)(3)(i) of this clause has been furnished to the Contracting Officer.

(e) Subcontractor withholding procedures. If a Contractor, after making a request for payment to the Government but before making a payment to a subcontractor for the subcontractor's performance covered by the payment request, discovers that all or a portion of the payment otherwise due such subcontractor is subject to withholding from the subcontractor in accordance with the subcontract agreement, then the Contractor shall--

(1) Subcontractor notice. Furnish to the subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon ascertaining the cause giving rise to a withholding, but prior to the due date for subcontractor payment;

(2) Contracting Officer notice. Furnish to the Contracting Officer, as soon as practicable, a copy of the notice furnished to the subcontractor pursuant to subparagraph (e)(1) of this clause;

(3) Subcontractor progress payment reduction. Reduce the subcontractor's progress payment by an amount not to exceed the amount specified in the notice of withholding furnished under subparagraph (e)(1) of this clause;

(4) Subsequent subcontractor payment. Pay the subcontractor as soon as practicable after the correction of the identified subcontract performance deficiency, and--

(i) Make such payment within--

(A) Seven days after correction of the identified subcontract performance deficiency (unless the funds therefor must be recovered from the Government because of a reduction under subdivision (e)(5)(i)) of this clause; or

(B) Seven days after the Contractor recovers such funds from the Government; or

(ii) Incur an obligation to pay a late payment interest penalty computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty;

(5) Notice to Contracting Officer. Notify the Contracting Officer upon--

(i) Reduction of the amount of any subsequent certified application for payment; or

(ii) Payment to the subcontractor of any withheld amounts of a progress payment, specifying--

(A) The amounts withheld under subparagraph (e)(1) of this clause; and

(B) The dates that such withholding began and ended; and

(6) Interest to Government. Be obligated to pay to the Government an amount equal to interest on the withheld payments (computed in the manner provided in 31 U.S.C. 3903(c)(1)), from the 8th day after receipt of the withheld amounts from the Government until--

(i) The day the identified subcontractor performance deficiency is corrected; or

(ii) The date that any subsequent payment is reduced under subdivision (e)(5)(i) of this clause.

(f) Third-party deficiency reports. (1) Withholding from subcontractor. If a Contractor, after making payment to a first-tier subcontractor, receives from a supplier or subcontractor of the first-tier subcontractor (hereafter referred to as a "second-tier subcontractor") a written notice in accordance with section 2 of the Act of August 24, 1935 (40 U.S.C. 270b, Miller Act), asserting a deficiency in such first-tier subcontractor's performance under the contract for which the Contractor may be ultimately liable, and the Contractor determines that all or a portion of future payments otherwise due such first-tier subcontractor is subject to withholding in accordance with the subcontract agreement, the Contractor may, without incurring an obligation to pay an interest penalty under subparagraph (e)(6) of this clause--

(i) Furnish to the first-tier subcontractor a notice conforming to the standards of paragraph (g) of this clause as soon as practicable upon making such determination; and

(ii) Withhold from the first-tier subcontractor's next available progress payment or payments an amount not to exceed the amount specified in the notice of withholding furnished under subdivision (f)(1)(i) of this clause.

(2) Subsequent payment or interest charge. As soon as practicable, but not later than 7 days after receipt of satisfactory written notification that the identified subcontract performance deficiency has been corrected, the Contractor shall--

(i) Pay the amount withheld under subdivision (f)(1)(ii) of this clause to such first-tier subcontractor; or

(ii) Incur an obligation to pay a late payment interest penalty to such first-tier subcontractor computed at the rate of interest established by the Secretary of the Treasury, and published in the Federal Register, for interest payments under section 12 of the Contracts Disputes Act of 1978 (41 U.S.C. 611) in effect at the time the Contractor accrues the obligation to pay an interest penalty.

(g) Written notice of subcontractor withholding. A written notice of any withholding shall be issued to a subcontractor (with a copy to the Contracting Officer of any such notice issued by the Contractor), specifying--

(1) The amount to be withheld;

(2) The specific causes for the withholding under the terms of the subcontract; and

(3) The remedial actions to be taken by the subcontractor in order to receive payment of the amounts withheld.

(h) Subcontractor payment entitlement. The Contractor may not request payment from the Government of any amount withheld or retained in accordance with paragraph (d) of this clause until such time as the Contractor has determined and certified to the Contracting Officer that the subcontractor is entitled to the payment of such amount.

(i) Prime-subcontractor disputes. A dispute between the Contractor and subcontractor relating to the amount or entitlement of a subcontractor to a payment or a late payment interest penalty under a clause included in the subcontract pursuant to paragraph (c) of this clause does not constitute a dispute to which the United States is a party. The United States may not be interpleaded in any judicial or administrative proceeding involving such a dispute.

(j) Preservation of prime-subcontractor rights. Except as provided in paragraph (i) of this clause, this clause shall not limit or impair any contractual, administrative, or judicial remedies otherwise available to the Contractor or a subcontractor in the event of a dispute involving late payment or nonpayment by the Contractor or deficient subcontract performance or nonperformance by a subcontractor.

(k) Non-recourse for prime contractor interest penalty. The Contractor’s obligation to pay an interest penalty to a subcontractor pursuant to the clauses included in a subcontract under paragraph (c) of this clause shall not be construed to be an obligation of the United States for such interest penalty. A cost-reimbursement claim may not include any amount for reimbursement of such interest penalty.

52.232-33 PAYMENT BY ELECTRONIC FUNDS TRANSFER—CENTRAL CONTRACTOR REGISTRATION (MAY 1999)

(a) Method of payment. (1) All payments by the Government under this contract shall be made by electronic funds transfer (EFT), except as provided in paragraph (a)(2) of this clause. As used in this clause, the term ``EFT'' refers to the funds transfer and may also include the payment information transfer.

(2) In the event the Government is unable to release one or more payments by EFT, the Contractor agrees to either--

(i) Accept payment by check or some other mutually agreeable method of payment; or

(ii) Request the Government to extend the payment due date until such time as the Government can make payment by EFT (but see paragraph (d) of this clause).

(b) Contractor's EFT information. The Government shall make payment to the Contractor using the EFT information contained in the Central Contractor Registration (CCR) database. In the event that the EFT information changes, the Contractor shall be responsible for providing the updated information to the CCR database.

(c) Mechanisms for EFT payment. The Government may make payment by EFT through either the Automated Clearing House (ACH) network, subject to the rules of the National Automated Clearing House Association, or the

Fedwire Transfer System. The rules governing Federal payments through the ACH are contained in 31 CFR part 210.

(d) Suspension of payment. If the Contractor's EFT information in the CCR database is incorrect, then the Government need not make payment to the Contractor under this contract until correct EFT information is entered into the CCR database; and any invoice or contract financing request shall be deemed not to be a proper invoice for the purpose of prompt payment under this contract. The prompt payment terms of the contract regarding notice of an improper invoice and delays in accrual of interest penalties apply.

(e) Contractor EFT arrangements. If the Contractor has identified multiple payment receiving points (i.e., more than one remittance address and/or EFT information set) in the CCR database, and the Contractor has not notified the Government of the payment receiving point applicable to this contract, the Government shall make payment to the first payment receiving point (EFT information set or remittance address as applicable) listed in the CCR database.

(f) Liability for uncompleted or erroneous transfers. (1) If an uncompleted or erroneous transfer occurs because the Government used the Contractor's EFT information incorrectly, the Government remains responsible for--

(i) Making a correct payment;

(ii) Paying any prompt payment penalty due; and

(iii) Recovering any erroneously directed funds.

(2) If an uncompleted or erroneous transfer occurs because the Contractor's EFT information was incorrect, or was revised within 30 days of Government release of the EFT payment transaction instruction to the Federal Reserve System, and--

(i) If the funds are no longer under the control of the payment office, the Government is deemed to have made payment and the Contractor is responsible for recovery of any erroneously directed funds; or

(ii) If the funds remain under the control of the payment office, the Government shall not make payment, and the provisions of paragraph (d) of this clause shall apply.

(g) EFT and prompt payment. A payment shall be deemed to have been made in a timely manner in accordance with the prompt payment terms of this contract if, in the EFT payment transaction instruction released to the Federal Reserve System, the date specified for settlement of the payment is on or before the prompt payment due date, provided the specified payment date is a valid date under the rules of the Federal Reserve System.

(h) EFT and assignment of claims. If the Contractor assigns the proceeds of this contract as provided for in the assignment of claims terms of this contract, the Contractor shall require as a condition of any such assignment, that the assignee shall register in the CCR database and shall be paid by EFT in accordance with the terms of this clause. In all respects, the requirements of this clause shall apply to the assignee as if it were the Contractor. EFT information that shows the ultimate recipient of the transfer to be other than the Contractor, in the absence of a proper assignment of claims acceptable to the Government, is incorrect EFT information within the meaning of paragraph (d) of this clause.

(i) Liability for change of EFT information by financial agent. The Government is not liable for errors resulting from changes to EFT information made by the Contractor's financial agent.

(j) Payment information. The payment or disbursing office shall forward to the Contractor available payment information that is suitable for transmission as of the date of release of the EFT instruction to the Federal Reserve System. The Government may request the Contractor to designate a desired format and method(s) for delivery of payment information from a list of formats and methods the payment office is capable of executing. However, the Government does not guarantee that any particular format or method of delivery is available at any particular payment office and retains the latitude to use the format and delivery method most convenient to the Government. If the Government makes payment by check in accordance with paragraph (a) of this clause, the Government shall mail the payment information to the remittance address contained in the CCR database.

(End of Clause)

52.233-1 DISPUTES. (OCT 1995) -- ALTERNATE I (DEC 1991)

(a) This contract is subject to the Contract Disputes Act of 1978, as amended (41 U.S.C. 601-613).

(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved under this clause.

(c) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this contract. A claim arising under a contract, unlike a claim relating to that contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. However, a written demand or written assertion by the Contractor seeking the payment of money exceeding $100,000 is not a claim under the Act until certified as required by subparagraph (d)(2) of this clause. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under the Act. The submission may be converted to a claim under the Act, by complying with the submission and certification requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(d)(1) A claim by the Contractor shall be made in writing and, unless otherwise stated in this contract, submitted within 6 years after accrual of the claim to the Contracting Officer for a written decision. A claim by the Government against the Contractor shall be subject to a written decision by the Contracting Officer.

(2) (i) Contractors shall provide the certification specified in subparagraph (d)(2)(iii) of this clause when submitting any claim -

(A) Exceeding $100,000; or

(B) Regardless of the amount claimed, when using -

(1) Arbitration conducted pursuant to 5 U.S.C. 575-580; or

(2) Any other alternative means of dispute resolution (ADR) technique that the agency elects to handle in accordance with the Administrative Dispute Resolution Act (ADRA).

(ii) The certification requirement does not apply to issues in controversy that have not been submitted as all or part of a claim.

(iii) The certification shall state as follows: "I certify that the claim is made in good faith; that the supporting data are accurate and complete to the best of my knowledge and belief; that the amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable; and that I am duly authorized to certify the claim on behalf of the Contractor.

(3) The certification may be executed by any person duly authorized to bind the Contractor with respect to the claim.

(e) For Contractor claims of $100,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over $100,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.

(f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.

(g) If the claim by the Contractor is submitted to the Contracting Officer or a claim by the Government is presented to the Contractor, the parties, by mutual consent, may agree to use ADR. If the Contractor refuses an offer for alternative disputes resolution, the Contractor shall inform the Contracting Officer, in writing, of the Contractor's specific reasons for rejecting the request. When using arbitration conducted pursuant to 5 U.S.C. 575-580, or when using any other ADR technique that the agency elects to handle in accordance with the ADRA, any claim, regardless of amount, shall be accompanied by the certification described in subparagraph (d)(2)(iii) of this clause, and executed in accordance with subparagraph (d)(3) of this clause.

(h) The Government shall pay interest on the amount found due and unpaid from (1) the date the Contracting Officer receives the claim (certified, if required); or (2) the date that payment otherwise would be due, if that date is later, until the date of payment. With regard to claims having defective certifications, as defined in (FAR) 48 CFR 33.201, interest shall be paid from the date that the Contracting Officer initially receives the claim. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Contracting Officer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

(i) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under or relating to the contract, and comply with any decision of the Contracting Officer.

52.233-3 PROTEST AFTER AWARD (AUG. 1996)

(a) Upon receipt of a notice of protest (as defined in FAR 33.101) or a determination that a protest is likely (see FAR 33.102(d)), the Contracting Officer may, by written order to the Contractor, direct the Contractor to stop performance of the work called for by this contract. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision in the protest, the Contracting Officer shall either--

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Default, or the Termination for Convenience of the Government, clause of this contract.

(b) If a stop-work order issued under this clause is canceled either before or after a final decision in the protest, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule or contract price, or both, and the contract shall be modified, in writing, accordingly, if--

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Contractor asserts its right to an adjustment within 30 days after the end of the period of work stoppage; provided, that if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon a proposal at any time before final payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(e) The Government's rights to terminate this contract at any time are not affected by action taken under this clause.

(f) If, as the result of the Contractor's intentional or negligent misstatement, misrepresentation, or miscertification, a protest related to this contract is sustained, and the Government pays costs, as provided in FAR 33.102(b)(2) or 33.104(h)(1), the Government may require the Contractor to reimburse the Government the amount of such costs. In addition to any other remedy available, and pursuant to the requirements of Subpart 32.6, the Government may collect this debt by offsetting the amount against any payment due the Contractor under any contract between the Contractor and the Government.

52.236-2 DIFFERING SITE CONDITIONS (APR 1984)

As prescribed in 36.502, insert the following clause in solicitations and contracts when a fixed-price construction contract or a fixed-price dismantling, demolition, or removal of improvements contract is contemplated and the contract amount is expected to exceed the small purchase limitation. The Contracting Officer may insert the clause in solicitations and contracts when a fixed-price construction or a fixed-price contract for dismantling, demolition, or removal of improvements is contemplated and the contract amount is expected to be within the small purchase limitation.

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of

(1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or

(2) unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inhering in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.

52.236-3 SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (APR 1984)

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to

(1) conditions bearing upon transportation, disposal, handling, and storage of materials;

(2) the availability of labor, water, electric power, and roads;

(3) uncertainties of weather, river stages, tides, or similar physical conditions at the site;

(4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Government.

(b) The Government assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Government. Nor does the Government assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.

52.236-5 MATERIAL AND WORKMANSHIP (APR 1984)

(a) All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The

Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of the manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(c) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.

52.236-6 SUPERINTENDENCE BY THE CONTRACTOR (APR 1984)

At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the worksite a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.

52.236-7 PERMITS AND RESPONSIBILITIES (NOV 1991)

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, State, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.

52.236-8 OTHER CONTRACTS (APR 1984)

The Government may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with Government employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any act that will interfere with the performance of work by any other contractor or by Government employees.

52.236-9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (APR 1984)

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(b) The Contractor shall protect from damage all existing improvements and utilities

(1) at or near the work site, and

(2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

52.236-10 OPERATIONS AND STORAGE AREAS (APR 1984)

(a) The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

(b) Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

52.236-11 USE AND POSSESSION PRIOR TO COMPLETION (APR 1984)

(a) The Government shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Government intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Government's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the Government has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the Government's possession or use, notwithstanding the terms of the clause in this contract entitled "Permits and Responsibilities." If prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.

52.236-12 CLEANING UP (APR 1984)

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any rubbish, tools, scaffolding, equipment, and materials that are not the property of the Government. Upon completing the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer.

52.236-13 ACCIDENT PREVENTION (NOV 1991)

(a) The Contractor shall provide and maintain work environments and procedures which will

(1) safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities;

(2) avoid interruptions of Government operations and delays in project completion dates; and

(3) control costs in the performance of this contract.

(b) For these purposes on contracts for construction or dismantling, demolition, or removal of improvements, the Contractor shall-

(1) Provide appropriate safety barricades, signs, and signal lights;

(2) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and

(3) Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for the purposes are taken.

(c) If this contract is for construction or dismantling, demolition or removal of improvements with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the latest version of U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, in effect on the date of the solicitation.

(d) Whenever the Contracting Officer becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public or Government personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. This notice, when delivered to the Contractor or the Contractor's representative at the work site, shall be deemed sufficient notice of the noncompliance and that corrective action is required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to

promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.

(e) The Contractor shall insert this clause, including this paragraph (e), with appropriate changes in the designation of the parties, in subcontracts.

52.236-15 SCHEDULES FOR CONSTRUCTION CONTRACTS (APR 1984)

(a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule.

(b) The Contractor shall enter the actual progress on the chart as directed by the Contracting Officer, and upon doing so shall immediately deliver three copies of the annotated schedule to the Contracting Officer. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

(c) Failure of the Contractor to comply with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of this contract.

52.236-21 SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FEB 1997)

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order",

"designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by," or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown," as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place," that is "furnished and installed".

(d) Shop drawings means drawings, submitted to the Government by the Contractor, subcontractor, or any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements, and (2) the installation (i.e., fit, and attachment details) of materials or equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the contractor to explain in detail specific portions of the work required by the contract. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the Contracting Officer and one set will be returned to the Contractor.

52.236-26 PRECONSTRUCTION CONFERENCE (FEB 1995)

If the Contracting Officer decides to conduct a preconstruction conference, the successful offeror will be notified and will be required to attend. The Contracting Officer's notification will include specific details regarding the date, time, and location of the conference, any need for attendance by subcontractors, and information regarding the items to be discussed.

252.236-7000 MODIFICATION PROPOSALS - PRICE BREAKDOWN. (DEC 1991)

(a) The Contractor shall furnish a price breakdown, itemized as required and within the time specified by the Contracting Officer, with any proposal for a contract modification.

(b) The price breakdown --

(1) Must include sufficient detail to permit an analysis of profit, and of all costs for --

(i) Material;

(ii) Labor;

(iii) Equipment;

(iv) Subcontracts; and

(v) Overhead; and

(2) Must cover all work involved in the modification, whether the work was deleted, added, or changed.

(c) The Contractor shall provide similar price breakdowns to support any amounts claimed for subcontracts.

(d) The Contractor's proposal shall include a justification for any time extension proposed.

52.242-13 BANKRUPTCY. (JUL 1995)

In the event the Contractor enters into proceedings relating to bankruptcy, whether voluntary or involuntary, the Contractor agrees to furnish, by certified mail or electronic commerce method authorized by the contract, written notification of the bankruptcy to the Contracting Officer responsible for administering the contract. This notification shall be furnished within five days of the initiation of the proceedings relating to bankruptcy filing. This notification shall include the date on which the bankruptcy petition was filed, the identity of the court in which the bankruptcy petition was filed, and a listing of Government contract numbers and contracting offices for all Government contracts against which final payment has not been made. This obligation remains in effect until final payment under this contract.

52.242-14 SUSPENSION OF WORK (APR 1984)

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and the contract modified in writing accordingly.

However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause, including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract. (c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.

52.243-4 CHANGES (AUG 1987)

(a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes--

(1) In the specifications (including drawings and designs);

(2) In the method or manner of performance of the work;

(3) In the Government-furnished facilities, equipment, materials, services, or site; or

(4) Directing acceleration in the performance of the work.

(b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating

(1) the date, circumstances, and source of the order and

(2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for an adjustment based on defective specifications, no adjustment for any change under paragraph (b) of this clause shall be made for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must assert its right to an adjustment under this clause within 30 days after

(1) receipt of a written change order under paragraph (a) of this clause or (2) the furnishing of a written notice under paragraph (b) of this clause, by submitting to the Contracting Officer a written statement describing the general nature and amount of the proposal, unless this period is extended by the Government. The statement of proposal for

adjustment may be included in the notice under paragraph (b) above.

(f) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

252.243-7000 ENGINEERING CHANGE PROPOSALS (SEP 1999)

(a) The Contracting Officer may ask the Contractor to prepare engineering change proposals for engineering changes within the scope of this contract. Upon receipt of a written request from the Contracting Officer, the Contractor shall prepare and submit an engineering change proposal in accordance with the instructions of MIL-STD-973, in effect on the date of contract award.

(b) The Contractor may initiate engineering change proposals. Contractor initiated engineering change proposals shall include a "not to exceed" price* or a "not less than" price* and delivery adjustment. If the Contracting Officer orders the engineering change, the increase shall not exceed nor the decrease be less than the "not to exceed" or "not less than" amounts**.

When the price* of the engineering change is $500,000 or more, the Contractor shall submit--

(1) A completed SF 1411, Contract Pricing Proposal Cover Sheet (Cost or Pricing Data Required); and

(2) At the time of agreement on price*, or on another date agreed upon between the parties, a signed Certificate of Current Cost or Pricing Data.

(c) When the price* of the engineering change is $500,000 or more, the Contractor shall submit—

(1) A contract pricing proposal using the format in Table 15-2, Section 15.408, of the Federal Acquisition Regulation and

(2) At the time of agreement on price*, or on another date agreed upon between the parties, a signed Certificate of Current Cost or Pricing Data.

(End of clause)

252.243-7001 PRICING OF CONTRACT MODIFICATIONS (DEC 1991)

When costs are a factor in any price adjustment under this contract, the contract cost principles and procedures in FAR part 31 and DFARS part 231, in effect on the date of this contract, apply.

52.246-12 INSPECTION OF CONSTRUCTION (AUG 1996)

(a) Definition. "Work" includes, but is not limited to, materials, workmanship, and manufacture and fabrication of components.

(b) The Contractor shall maintain an adequate inspection system and perform such inspections as will ensure that the work performed under the contract conforms to contract requirements. The Contractor shall maintain complete

inspection records and make them available to the Government. All work shall be conducted under the general direction of the Contracting Officer and is subject to Government inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) Government inspections and tests are for the sole benefit of the Government and do not--

(1) Relieve the Contractor of responsibility for providing adequate quality control measures;

(2) Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;

(3) Constitute or imply acceptance; or

(4) Affect the continuing rights of the Government after acceptance of the completed work under paragraph (i) of this section.

(d) The presence or absence of a Government inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Contracting Officer's written authorization.

(e) The Contractor shall promptly furnish, at no increase in contract price, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The Government may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The Government shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) The Contractor shall, without charge, replace or correct work found by the Government not to conform to contract requirements, unless in the public interest the Government consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(g) If the Contractor does not promptly replace or correct rejected work, the Government may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the Contractor's right to proceed.

(h) If, before acceptance of the entire work, the Government decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary facilities, labor, and material. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satisfactory reconstruction. However, if the work is found to meet contract requirements, the Contracting Officer shall make an equitable adjustment for the additional services involved in the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(i) Unless otherwise specified in the contract, the Government shall accept, as promptly as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the Government's rights under any warranty or guarantee.

52.248-3 VALUE ENGINEERING--CONSTRUCTION (MAR 1989)

(a) General. The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECP's) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECP's, in accordance with paragraph (f) below.

(b) Definitions. "Collateral costs," as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.

"Collateral savings," as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exclusive of acquisition savings, whether or not the acquisition cost changes.

"Contractor's development and implementation costs," as used in this clause, means those costs the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the contractual changes required by Government acceptance of a VECP.

"Government costs," as used in this clause, means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.

"Instant contract savings," as used in this clause, means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) below).

"Value engineering change proposal (VECP)" means a proposal that--

(1) Requires a change to this, the instant contract, to implement; and

(2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics; provided, that it does not involve a change--

(i) In deliverable end item quantities only; or

(ii) To the contract type only.

(c) VECP preparation. As a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through (7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.

(2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.

(3) A separate, detailed cost estimate for

(i) the affected portions of the existing contract requirement and

(ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) below.

(4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.

(5) A prediction of any effects the proposed change would have on collateral costs to the agency.

(6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

(d) Submission. The Contractor shall submit VECP's to the Resident Engineer at the worksite, with a copy to the Contracting Officer.

(e) Government action.

(1) The Contracting Officer shall notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required, the Contracting Officer shall notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The Government will process VECP's expeditiously; however, it shall not be liable for any delay in acting upon a VECP.

If the VECP is not accepted, the Contracting Officer shall notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The Contracting Officer's decision to accept or reject all or part of any VECP shall be final and not subject to the Disputes clause or otherwise subject to litigation under the Contract Disputes Act of 1978 (41 U.S.C. 601-613).

(f) Sharing.

(1) Rates. The Government's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by

(i) 45 percent for fixed-price contracts or

(ii) 75 percent for cost-reimbursement contracts.

(2) Payment. Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to--

(i) Accept the VECP;

(ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(iii) Provide the Contractor's share of savings by adding the amount calculated to the contract price or fee.

(g) Collateral savings. If a VECP is accepted, the instant contract amount shall be increased by 20 percent of any projected collateral savings determined to be realized in a typical year of use after subtracting any Government costs not previously offset. However, the Contractor's share of collateral savings shall not exceed (1) the contract's firm-fixed-price or estimated cost, at the time the VECP is accepted, or (2) $100,000, whichever is greater. The Contracting Officer shall be the sole determiner of the amount of collateral savings, and that amount shall not be subject to the Disputes clause or otherwise subject to litigation under 41 U.S.C. 601-613.

(h) Subcontracts. The Contractor shall include an appropriate value engineering clause in any subcontract of $50,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) above, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments; provided, that these payments shall not reduce the Government's share of the savings resulting from the VECP.

(i) Data. The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

"These data, furnished under the Value Engineering-- Construction clause of contract . . . . . , shall not be disclosed outside the Government or duplicated, used, or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations." If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in Part 27 of the Federal Acquisition Regulation.)

252.248-7000 PREPARATION OF VALUE ENGINEERING CHANGE PROPOSALS (MAY 1994)

Prepare value engineering change proposals, for submission pursuant to the value engineering clause of this contract, in the format prescribed by the version of MIL-STD-973 in effect on the date of contract award.

(End of clause)

52.249-2 TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SEP 1996) - ALTERNATE I (SEP 1996)

(a) The Government may terminate performance of work under this contract in whole or, from time to time, in part if the Contracting Officer determines that a termination is in the Government's interest. The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying the extent of termination and the effective date.

(b) After receipt of a Notice of Termination, and except as directed by the Contracting Officer, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

(1) Stop work as specified in the notice.

(2) Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete the continued portion of the contract.

(3) Terminate all subcontracts to the extent they relate to the work terminated.

(4) Assign to the Government, as directed by the Contracting Officer, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the Contracting Officer, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this clause.

(6) As directed by the Contracting Officer, transfer title and deliver to the Government (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (ii) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the Government.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (b)(6) of this clause; provided, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.

(c) The Contractor shall submit complete termination inventory schedules no later than 120 days from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 120-day period.

(d) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor may request the Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept title to those items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(e) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 1-year period. However, if the Contracting Officer determines that the facts justify it, a termination settlement proposal may be received and acted on after 1 year or any extension. If the Contractor fails to submit the proposal within the time allowed, the Contracting Officer may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.

(f) Subject to paragraph (e) of this clause, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount to be paid or remaining to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (g) or paragraph (g) of this clause, exclusive of costs shown in subparagraph (g)(3) of this clause, may not exceed the total contract price as reduced by (1) the amount of payments previously made and (2) the contract price of work not terminated. The contract shall be modified, and the Contractor paid the agreed amount. Paragraph (g) of this clause shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.

(g) If the Contractor and Contracting Officer fail to agree on the whole amount to be paid the Contractor because of the termination of work, the Contracting Officer shall pay the Contractor the amounts determined as follows, but without duplication of any amounts agreed upon under paragraph (f) of this clause:

(1) For contract work performed before the effective date of termination, the total (without duplication of any items) of--

(i) The cost of this work;

(ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (g)(1)(i) of this clause; and

(iii) A sum, as profit on subdivision (g)(1)(i) of this clause, determined by the Contracting Officer under 49.202 of the Federal Acquisition Regulation, in effect on the date of this contract, to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the Contracting Officer shall allow no profit under this subdivision (iii) and shall reduce the settlement to reflect the indicated rate of loss.

(2) The reasonable costs of settlement of the work terminated, including--

(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

(h) Except for normal spoilage, and except to the extent that the Government expressly assumed the risk of loss, the Contracting Officer shall exclude from the amounts payable to the Contractor under paragraph (g) of this clause, the fair value, as determined by the Contracting Officer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government or to a buyer.

(i) The cost principles and procedures of Part 31 of the Federal Acquisition Regulation, in effect on the date of this contract, shall govern all costs claimed, agreed to, or determined under this clause.

(j) The Contractor shall have the right of appeal, under the Disputes clause, from any determination made by the Contracting Officer under paragraph (e), (g), or (l) of this clause, except that if the Contractor failed to submit the termination settlement proposal or request for equitable adjustment within the time provided in paragraph (e) or (l), respectively, and failed to request a time extension, there is no right of appeal.

(k) In arriving at the amount due the Contractor under this clause, there shall be deducted--

(1) All unliquidated advance or other payments to the Contractor under the terminated portion of this contract;

(2) Any claim which the Government has against the Contractor under this contract; and

(3) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the Government.

(l) If the termination is partial, the Contractor may file a proposal with the Contracting Officer for an equitable adjustment of the price(s) of the continued portion of the contract. The Contracting Officer shall make any equitable adjustment agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within 90 days from the effective date of termination unless extended in writing by the Contracting Officer.

(m)(1) The Government may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Contracting Officer believes the total of these payments will not exceed the amount to which the Contractor will be entitled.

(2) If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215(b)(2). Interest shall be computed for the period from the date the excess payment is received by the Contractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Contractor's termination settlement proposal because of retention or other disposition of termination inventory until 10 days after the date of the retention or disposition, or a later date determined by the Contracting Officer because of the circumstances.

(n) Unless otherwise provided in this contract or by statute, the Contractor shall maintain all records and documents relating to the terminated portion of this contract for 3 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this contract. The Contractor shall make these records and documents available to the Government, at the Contractor's office, at all reasonable times, without any direct charge. If approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

52.249-10 DEFAULT (FIXED-PRICE CONSTRUCTION) (APR 1984)

(a) If the Contractor refuses or fails to prosecute the work or any separable part, with the diligence that will insure its completion within the time specified in this contract including any extension, or fails to complete the work within this time, the Government may, by written notice to the Contractor, terminate the right to proceed with the work (or the separable part of the work) that has been delayed. In this event, the Government may take over the work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the Government resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the Government in completing the work.

(b) The Contractor's right to proceed shall not be terminated nor the Contractor charged with damages under this clause, if--

(1) The delay in completing the work arises from unforeseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include

(i) acts of God or of the public enemy,

(ii) acts of the Government in either its sovereign or contractual capacity,

(iii) acts of another Contractor in the performance of a contract with the Government,

(iv) fires,

(v) floods,

(vi) epidemics,

(vii) quarantine restrictions,

(viii) strikes,

(ix) freight embargoes,

(x) unusually severe weather, or delays of subcontractors or suppliers at any tier arising from unforeseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any delay (unless extended by the Contracting Officer), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, the time for completing the work shall be extended. The findings of the Contracting Officer shall be final and conclusive on the parties, but subject to appeal under the Disputes clause.

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of the Government.

The rights and remedies of the Government in this clause are in addition to any other rights and remedies provided by law or under this contract.

52.249-5000 BASIS FOR SETTLEMENT OF PROPOSALS

Actual costs will be used to determine equipment costs for a settlement proposal submitted on the total cost basis under FAR 49.206-2(b). In evaluating a terminations settlement proposal using the total cost basis, the following principles will be applied to determine allowable equipment costs:

(1) Actual costs for each piece of equipment, or groups of similar serial or series equipment, need not be available in the contractor's accounting records to determine total actual equipment costs.

(2) If equipment costs have been allocated to a contract using predetermined rates , those charges will be adjusted to actual costs.

(3) Recorded job costs adjusted for unallowable expenses will be used to determine equipment operating expenses.

(4) Ownership costs (depreciation) will be determined using the contractor's depreciation schedule (subject to the provisions of FAR 31.205-11).

(5) License, taxes, storage and insurance costs are normally recovered as an indirect expense and unless the contractor charges these costs directly to contracts, they will be recovered through the indirect expense rate.

(End of Clause)

52.252-4 ALTERATIONS IN CONTRACT (APR 1984)

Portions of this contract are altered as follows:

52.253-1 COMPUTER GENERATED FORMS (JAN 1991)

(a) Any data required to be submitted on a Standard or Optional Form prescribed by the Federal Acquisition Regulation (FAR) may be submitted on a computer generated version of the form, provided there is no change to the name, content, or sequence of the data elements on the form, and provided the form carries the Standard or Optional Form number and edition date.

(b) Unless prohibited by agency regulations, any data required to be submitted on an agency unique form prescribed by an agency supplement to the FAR may be submitted on a computer generated version of the form provided there

is no change to the name, content, or sequence of the data elements on the form and provided the form carries the agency form number and edition date.

(c) If the Contractor submits a computer generated version of a form that is different than the required form, then the rights and obligations of the parties will be determined based on the content of the required form.

This page intentionally blank

TABLE OF CONTENTS

SPECIAL CLAUSES

PARAGRAPH NO.	PARAGRAPH TITLE
SC-1	COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK
SC-1.1	OPTION FOR INCREASED QUANTITY
SC-2	LIQUIDATED DAMAGES - CONSTRUCTION
SC-3	DELETED - TIME EXTENSIONS
SC-4	VARIATIONS IN ESTIMATED QUANTITIES - SUBDIVIDED ITEMS
SC-5	INSURANCE - WORK ON A GOVERNMENT INSTALLATION
SC-6	DELETED - CONTINUING CONTRACTS
SC-7	PERFORMANCE OF WORK BY THE CONTRACTOR
SC-8	PHYSICAL DATA
SC-9	DELETED - QUANTITY SURVEYS
SC-10	LAYOUT OF WORK
SC-11	DELETED - PAYMENT FOR MOBILIZATION AND DEMOBILIZATION
SC-12	DELETED - AIRFIELD SAFETY PRECAUTIONS
SC-13	IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY
SC-14	EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE
SC-15	PAYMENT FOR MATERIALS DELIVERED OFF-SITE
SC-16	DELETED - ORDER OF PRECEDENCE
SC-17	DELETED - LIMITATION OF PAYMENT FOR DESIGN
SC-18	CONTRACT DRAWINGS, MAPS AND SPECIFICATIONS
SC-19.	DELETED -TECHNICAL PROPOSAL - COPIES TO BE FURNISHED UPON AWARD
SC-20.	DELETED - COMPLIANCE CERTIFICATION
SC-21.	VALUE ENGINEERING

SC-22. DELETED - EPA ENERGY STAR

SC-23 RECOVERED MATERIALS

SPECIAL CLAUSES

SC-1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK (APR 1984) (FAR 52.211-10).

The Contractor shall be required to (a) commence work under this Contract within 10 calendar days after the date the Contractor receives the notice to proceed, (b) prosecute the work diligently, and (c) complete the entire work ready for use not later than 600 calendar days after date of receipt by Contractor of notice to proceed. The time stated for completion shall include final cleanup of the premises.

SC-1.1 OPTION FOR INCREASED QUANTITY

a. The Government may increase the quantity of work awarded by exercising one or more of the Optional Bid Items 0004 through 0009 at any time, or not at all, but no later than 120 calendar days after receipt by Contractor of notice to proceed for Base Bid Items. Notice to proceed on work items added by exercise of the options will be given upon execution of consent of surety.

b. The parties hereto further agree that any option herein shall be considered to have been exercised at the time the Government deposits written notification to the Contractor in the mails.

c. The time allowed for completion of any optional items awarded under this contract will be the same as that for the base items, and will be measured from the date of receipt of the notice to proceed for the base items.

SC-1.2 Exception to Completion Period(s): In case the Contracting Officer determines that completion of seeding, sodding, and planting, and establishment of same is not feasible within the completion period(s) stated above, the Contractor shall accomplish such work in the first planting period following the contract completion period and shall complete such work as specified, unless other planting periods are directed or approved by the Contracting Officer.

SC-2. LIQUIDATED DAMAGES - CONSTRUCTION (APR 1984) (FAR 52.211-12)

(a) If the Contractor fails to complete the work within the time specified in the Contract, or any extension, the Contractor shall pay to the Government as liquidated damages, the sum of $499.37 for each day of delay.

(b) If the Government terminates the Contractor's right to proceed, the resulting damage will consist of liquidated damages until such reasonable time as may be required for final completion of the work together with any increased costs occasioned the Government in completing the work.

(c) If the Government does not terminate the Contractor's right to proceed, the resulting damage will consist of liquidated damages until the work is completed or accepted.

(d) Exception to Liquidated Damage: In case the Contracting Officer determines that completion of work stated above in paragraph Exception to Completion Period(s) is not feasible during the completion period(s) stated in SC-1, such work will be exempted from liquidated damages.

SC-3 DELETED.

SC-4. VARIATIONS IN ESTIMATED QUANTITIES - SUBDIVIDED ITEMS (MAR 1995) (EFARS 52.212-5001): This variation in estimated quantities clause is applicable only to Item No. 0003.

(a) Variation from the estimated quantity in the actual work performed under any second or subsequent sub-item or elimination of all work under such a second or subsequent sub-item will not be the basis for an adjustment in contract unit price.

(b) Where the actual quantity of work performed for Items No. 0003 is less than 85% of the quantity of the first sub-item listed under such item, the Contractor will be paid at the contract unit price for that sub-item for the actual quantity of work performed and, in addition, an equitable adjustment shall be made in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

(c) If the actual quantity of work performed under Items No. 0003 exceeds 115 percent or is less than 85 percent of the total estimated quantity of the sub-item under that item and/or if the quantity of the work performed under the second sub-item or any subsequent sub-item under Items No. 0003 exceeds 115 % or is less than 85 % of the estimated quantity of any such sub-item, and if such variation causes an increase or a decrease in the time required for performance of this contract the contract completion time will be adjusted in accordance with the clause FAR 52.211-18, Variation in Estimated Quantities.

SC-5. INSURANCE - WORK ON A GOVERNMENT INSTALLATION (SEP 1989) (FAR 52.228-5)

(a) The Contractor shall, at its own expense, provide and maintain during the entire performance period of this Contract at least the kinds and minimum amounts of insurance required in the Insurance Liability Schedule or elsewhere in the Contract.

(b) Before commencing work under this Contract, the Contractor shall certify to the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective:

(1) for such period as the laws of the State in which this Contract is to be performed prescribe; or

(2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

(c) The Contractor shall insert the substance of this clause, including this paragraph (c), in subcontracts under this Contract that require work on a Government installation and shall require subcontractors to provide and maintain the insurance required in the Schedule or elsewhere in the Contract. The Contractor

shall maintain a copy of all subcontractors' proofs of required insurance, and shall make copies available to the Contracting Officer upon request.

(d) Insurance Liability Schedule (FAR 28.307-2)

(1) Workers' compensation and employer's liability. Contractors are required to comply with applicable Federal and State workers' compensation and occupational disease statutes. If occupational diseases are not compensable under those statutes, they shall be covered under the employer's liability section of the insurance policy, except when Contract operations are so commingled with a Contractor's commercial operation that it would not be practical to require this coverage. Employer's liability coverage of at least $100,000 shall be required, except in states with exclusive or monopolistic funds that do not permit workers' compensation to be written by private carriers.

(2) General Liability.

(a) The Contracting Officer shall require bodily injury liability insurance coverage written on the comprehensive form of policy of at least $500,000 per occurrence.

(b) Property damage liability insurance shall be required only in special circumstances as determined by the agency.

(3) Automobile liability. The Contracting Officer shall require automobile liability insurance written on the comprehensive form of policy. The policy shall provide for bodily injury and property damage liability covering the operation of all automobiles used in connection with performing the Contract. Policies covering automobiles operated in the United States shall provide coverage of at least $200,000 per person and $500,000 per occurrence for bodily injury and $20,000 per occurrence for property damage. The amount of liability coverage on other policies shall be commensurate with any legal requirements of the locality and sufficient to meet normal and customary claims.

(4) Aircraft public and passenger liability. When aircraft are used in connection with performing the Contract, the Contracting Officer shall require aircraft public and passenger liability insurance. Coverage shall be at least $200,000 per person and $500,000 per occurrence for bodily injury, other than passenger liability, and $200,000 per occurrence for property damage. Coverage for passenger liability bodily injury shall be at least $200,000 multiplied by the number of seats or passengers, whichever is greater.

(5) Vessel liability. When Contract performance involves use of vessels, the Contracting Officer shall require, as determined by the agency, vessel collision liability and protection and indemnity liability insurance.

(6) Environmental Liability If this contract includes the transport, treatment, storage, or disposal of hazardous material waste the following coverage is required.

(7) Additional insurance required. The Contractor will be responsible for obtaining additional insurance when working adjacent to, on or under Montana Rail Link property. See Section 01001, Paragraph 1.11.1

The Contractor shall ensure the transporter and disposal facility have liability insurance if effect for claims arising out of the death or bodily injury and property damage from hazardous material/waste transport, treatment, storage and disposal, including vehicle liability and legal defense costs in the amount of $1,000,000.00 as evidenced by a certificate of insurance for General, Automobile, and Environmental Liability Coverage. Proof of this insurance shall be provided to the Contracting Officer.

SC-6. – DELETED.

SC-7. PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984) (FAR 52.236-1): The Contractor shall perform on the site, and with its own organization, work equivalent to at least fifteen percent (15%) of the total amount of work to be performed under the Contract. The percentage may be reduced by a supplemental agreement to this Contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

SC-8. PHYSICAL DATA (APR 1984) (FAR 52.236-4): Data and information furnished or referred to below is for the Contractor's information. The Government will not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor.

(a) Physical Conditions: The indications of physical conditions on the drawings and in the specifications are the result of site investigations by test holes shown on the drawings.

(b) Weather Conditions: Each bidder shall be satisfied before submitting his bid as to the hazards likely to arise from weather conditions. Complete weather records and reports may be obtained from any National Weather Service Office.

(c) Transportation Facilities: Each bidder, before submitting his bid, shall make an investigation of the conditions of existing public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress at the jobsite. The unavailability of transportation facilities or limitations thereon shall not become a basis for claims for damages or extension of time for completion of the work.

SC-9. DELETED.

SC-10. LAYOUT OF WORK (APR 1984) (FAR 52.236-17): The Contractor shall lay out its work from Government-established base lines and bench marks indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at its own expense, all stakes, templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through its negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due, or to become due, to the Contractor.

SC-11. THROUGH SC-12. DELETED.

SC-13. IDENTIFICATION OF GOVERNMENT-FURNISHED PROPERTY (APR 1984) (FAR 52.245-3): The Government will furnish to the Contractor the property identified in the schedule to be incorporated or installed into the work or used in performing the contract. The listed property will be furnished to the Contractor at the place designated by the Contracting Officer. The Contractor is required to accept delivery, pay any demurrage or detention charges, and unload and transport the property to the jobsite at its own expense. When the property is delivered, the Contractor shall verify its quantity and condition and acknowledge receipt in writing to the Contracting Officer. The Contractor shall also report in writing to the Contracting Officer within 24 hours of delivery any damage to or shortage of the property as received. All such property shall be installed or incorporated into the work at the expense of the Contractor, unless otherwise indicated in this contract.

SCHEDULE

QUANTITY	**ITEM**
1 each	**P/A Head Unit and Microphone for Reception Desk**
1	**P/A Amplifier for Computer Room 239**

SC-14. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE (MAR 1995)-(EFARS 52.231-5000)

(a) This clause does not apply to terminations. See 52.249-5000, Basis for Settlement of Proposals and FAR Part 49.

(b) Allowable cost for construction and marine plant and equipment in sound workable condition owned or controlled and furnished by a contractor or subcontractor at any tier shall be based on actual cost data for each piece of equipment or groups of similar serial and series for which the Government can determine both ownership and operating costs from the contractor's accounting records. When both ownership and operating costs cannot be determined for any piece of equipment or groups of similar serial or series equipment from the contractor's accounting records, costs for that equipment shall be based upon the applicable provisions of EP 1110-1-8, Construction Equipment Ownership and Operating Expense Schedule, Region IV. Working conditions shall be considered to be average for determining equipment rates using the schedule unless specified otherwise by the contracting officer. For equipment not included in the schedule, rates for comparable pieces of equipment may be used or a rate may be developed using the formula provided in the schedule. For forward pricing, the schedule in effect at the time of negotiations shall apply. For retroactive pricing, the schedule in effect at the time the work was performed shall apply.

(c) Equipment rental costs are allowable, subject to the provisions of FAR 31.105(d)(ii) and FAR 31.205-36. Rates for equipment rented from an organization under common control, lease-purchase arrangements, and sale-leaseback arrangements, will be determined using the schedule, except that actual rates will be used for equipment leased from an organization under common control that has an established practice of leasing the same or similar equipment to unaffiliated lessees.

(d) When actual equipment costs are proposed and the total amount of the pricing action exceeds the small purchase threshold, the contracting officer shall request the contractor to submit either certified cost or pricing data, or partial/limited data, as appropriate. The data shall be submitted on Standard Form 1411, Contract Pricing Proposal Cover Sheet.

(e) Copies of EP1110-1-8 "Construction Equipment Ownership and Operating Expense Schedule" Volume 4 (Montana) and Volume 8 (Washington, Oregon and Idaho) are available from the Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954, phone (202) 512-1800 and fax (202) 512-2250, OR from the Government Bookstore in the Jackson Federal Building, Seattle, WA, phone (206) 553-4279. The cost is $33.00 for each volume. Use the following stock numbers when ordering schedules:

S/N 008-022-00317-7	Volume 4
S/N 008-022-00321-5	Volume 8

SC-15. PAYMENT FOR MATERIALS DELIVERED OFF-SITE (MAR 1995)-(EFARS 52.232-5000)

(a) Pursuant to FAR clause 52.232-5, Payments Under Fixed Priced Construction Contracts, materials delivered to the contractor at locations other than the site of the work may be taken into consideration in making payments if included in payment estimates and if all the conditions of the General Provisions are fulfilled. Payment for items delivered to locations other than the work site will be limited to: (1) materials required by the technical provisions; or (2) materials that have been fabricated to the point where they are identifiable to an item of work required under this contract.

(b) Such payment will be made only after receipt of paid or receipted invoices or invoices with canceled check showing title to the items in the prime contractor and including the value of material and labor incorporated into the item. In addition to petroleum products, payment for materials delivered off-site is limited to the following items: Any other construction material stored offsite may be considered in determining the amount of a progress payment.

SC-16 AND SC-17. DELETED.

SC-18. CONTRACT DRAWINGS, MAPS, AND SPECIFICATIONS (DEC 1991)(DOD FAR SUPP 252.236-7001)

(a) The Government--

(1) Will provide the Contractor, without charge, one set of contract drawings and one set of specifications in electronic format on a compact disk. The Government will not give the Contractor any hard copy paper drawings or specifications for any contract resulting from this solicitation.

(b) The Contractor shall--

(1) check all drawings furnished immediately upon receipt;

(2) Compare all drawings and verify the figures before laying out the work;

(3) Promptly notify the Contracting Officer of any discrepancies; and

(4) Be responsible for any errors which might have been avoided by complying with this paragraph (b).

(c) Large scale drawings shall, in general, govern small scale drawings. Figures marked on drawings shall, in general, be followed in preference to scale measurements.

(d) Omissions from the drawings or specifications or the misdescription of details of work which are manifestly necessary to carry out the intent of the drawings and specifications, or which are customarily performed, shall not relieve the Contractor from performing such omitted or misdescribed details of the work, but shall be performed as if fully and correctly set forth and described in the drawings and specifications.

(e) The work shall conform to the specifications and the contract drawings identified on the index of drawings at the end of the Special Clauses.

SC-19 AND SC-20. DELETED.

SC-21. VALUE ENGINEERING: The Corps of Engineers encourages all offeror's to utilize the Value Engineering methodology and functional analysis techniques. These techniques will most often result in a quality and cost effective product.

SC-22. DELETED

SC-23. RECOVERED MATERIALS: The Corps of Engineers encourages all bidders to utilize recovered materials to the maximum extent practicable. The attached APPENDIX R contains procurement guidelines for products containing recovered materials.

APPENDIX A

PART 247 - COMPREHENSIVE PROCUREMENT GUIDELINE FOR PRODUCTS CONTAINING RECOVERED MATERIALS

40 CFR Ch. 1 (9-1-99 Edition)

Subpart B-Item Designations

§ 247.10 Paper and paper products.

Paper and paper products, excluding building and construction paper grades.

§ 247.11 Vehicular products.

(a) Lubricating oils containing re-refined oil, including engine lubricating oils, hydraulic fluids, and gear oils, excluding marine and aviation oils.
(b) Tires, excluding airplane tire
(e) Reclaimed engine coolants, excluding coolants used in non-vehicular applications.

247.12 Construction products.

(a) Building insulation product including the following items:
(1) Loose-fill insulation, including but not limited to cellulose fiber, mineral fibers (fiberglass and rock vermiculite, and perlite;
(2) Blanket and batt insulation, including but not limited to mineral fibers (fiberglass and rock wool).
(3) Board (sheathing, roof decking wall panel) insulation, including but not limited to structural fiberboard and laminated paperboard products perlite composite board, polyurethane, polyisocyanurate, polystyrene, phenolics, and composites; and
(4) Spray-in-place insulation, including but not limited to foam-in-place polyurethane and polyisocyanurate and spray-on cellulose.
(b) Structural fiberboard and laminated paperboard products for applications other than building insulation, including building board, sheathing shingle backer, sound deadening board, roof insulating board, insulating wallboard, acoustical and non-acoustical ceiling tile, acoustical and non-acoustical lay-in panels, floor underlayments, and roof overlay (cover board).
(c) Cement and concrete, including concrete products such as pipe and block, containing coal fly as ground granulated blast furnace (GGBF) slag.
(d) Carpet made of polyester fiber use in low- and medium-wear applications.
(e) Floor tiles and patio block containing recovered rubber or plastic.
(f) Shower and restroom dividers/partitions containing recovered plastic or steel.
(g) (1) Consolidated latex paint used for covering grafitti; and
(2) Reprocessed latex paint used for interior and exterior architectural applications such as wallboard, ceilings, and trim; gutter boards; and concrete, stucco, masonry, wood and metal surfaces.

§247.13 Transportation products.

(a) Traffic barricades and traffic cones used in controlling or restricting vehicular traffic.
(b) Parking stops made from concrete or containing recovered plastic or rubber.
(c) Channelizers containing recovered plastic or rubber.
(d) Delineators containing recovered plastic, rubber, or steel.
(e) Flexible delineators containing recovered plastic.

§ 247.14 Park and recreation products

(a) Playground surfaces and running tracks containing recovered rubber or plastic.
(b) Plastic fencing containing recovered plastic for use in controlling snow or sand drifting and as a warning/safety barrier in construction or other applications.

247.15 Landscaping products.

(a) Hydraulic mulch products containing recovered paper or recovered wood used for hydroseeding and as an over-spray for straw mulch in landscaping, erosion control, and soil reclamation.
(b) Compost made from yard trimmings, leaves, and/or grass clippings for use in landscaping, seeding of grass or other plants on roadsides and embankments, as a nutritious mulch under trees and shrubs, and in erosion control and soil reclamation.
(c) Garden and soaker hoses containing recovered plastic or rubber.
(d) Lawn and garden edging containing recovered plastic or rubber.

§ 247.16 Non-paper office product.

(a) Office recycling containers and office waste receptacles.
(b) Plastic desktop accessories.
(c) Toner cartridges.
(d) Binders.
(e) Plastic trash bags.
(f) Printer ribbons.
(g) Plastic envelopes.

§ 247.17 Miscellaneous products.

Pallets containing recovered wood, plastic, or paperboard.

INDEX OF DRAWINGS

SHEET NO.	TITLE	REVISION NUMBER	DATE
	MISSOULA TECHNOLOGY AND DEVELOPMENT CENTER, MISSOULA, MT.		
	Cover		
	Cover Vicinity Map, Drawing List		20OCT99
	General		
GO.1	Abbreviations & Legends		20OCT99
GO.2	Code Analysis		20OCT99
	Civil		
C1	Existing Site Plan		20OCT99
C2	MTDC Area Site Plan		20OCT99
C3	Overall Improvement Plan (1 OF 3)		20OCT99
C4	Overall Improvement Plan (2 OF 3)		20OCT99
C5	Overall Improvement Plan (3 OF 3)		20OCT99
C6	Horizontal Control		20OCT99
C7	General Notes		20OCT99
C8	MTDC Layout Plan		20OCT99
C9	Staking Plan		20OCT99
C10	Highway 10 Plan and Profile		20OCT99
C11	Highway 10 Plan and Profile		20OCT99
C12	Highway 10 Typicals, Signs And Striping		20OCT99
C13	Truck Route A & North Drive Plan & Profiles		20OCT99
C14	Site Improvement Details And Typicals		20OCT99

SHEET NO.	TITLE	REVISION NUMBER	DATE
C15	Area Grading Plan		20OCT99
C16	Site Details		20OCT99
C17	Area Utility Plan		20OCT99
C18	Watermain Line A Plan and Profile		20OCT99
C19	Watermain Line B Plan and Profile		20OCT99
C20	Water System Details		20OCT99
C21	Storm Sewer Line A & B Plan & Profile		20OCT99
C22	Storm Sewer Line C-E Plan & Profile		20OCT99
C23	Footing And Subdrain Plan		20OCT99
C24	Storm Sewer & Footing Drain Details		20OCT99
C25	Sanitary Sewer Line A Plan & Profile		20OCT99
C26	Sanitary Sewer Line C Plan & Profile		20OCT99
C27	Sanitary Sewer Line C Plan & Profile		20OCT99
C28	Sanitary Sewer Line B & D Plan & Profile		20OCT99
C29	Sanitary Sewer Force Main Plan & Profile		20OCT99
C30	Sanitary Sewer Details		20OCT99
C31	Lift Station Details		20OCT99
C32	Landscaping Plan		20OCT99
C32A	Irrigation Plan		20OCT99
C33	Irrigation Details		20OCT99
C34	Truck Route A X-Sections		20OCT99
C35	Truck Route A X-Sections		20OCT99
C36	North Drive X-Sections		20OCT99

SHEET NO.	TITLE	REVISION NUMBER	DATE
C37	Highway 10 X Sections		20OCT99
C38	Highway 10 X-Sections		20OCT99
C39	Highway 10 X-Sections		20OCT99
C40	Highway 10 X-Sections		20OCT99
C41	Highway 10 X-Sections		20OCT99
C42	Highway 10 X-Sections		20OCT99
C43	Highway 10 X-Sections		20OCT99
	Architectural		
A1.1	First Floor Plan North		20OCT99
A1.2	Second Floor Plan		20OCT99
A1.3	Textile Lab Floor Plan		20OCT99
A1.4	Training Center Floor Plan		20OCT99
A1.5	Shops, Floor Plan		20OCT99
A1.6	Roof Plan & Details		20OCT99
A1.7	Roof Plan & Details		20OCT99
A1.8	Clerestory Plans		20OCT99
A1.9	Shops Alternate		20OCT99
A1.10	Textile Lab Alternate		20OCT99
A2.1	North & West Exterior Elevations		20OCT99
A2.2	East & South Exterior Elevations		20OCT99
A2.3	East & West Courtyard Exterior Elevations		20OCT99
A2.4	North & South Textile Lab Exterior Elevations		20OCT99
A2.5	Training Center Exterior Elevations		20OCT99

SHEET NO.	TITLE	REVISION NUMBER	DATE
A2.6	Shops Elevations (North & South)		20OCT99
A2.7	Shops Elevations (East & West)		20OCT99
A2.8	Shops Alternate Exterior Elevation		20OCT99
A3.1	Building Sections		20OCT99
A3.2	Building Sections		20OCT99
A3.3	Building Sections		20OCT99
A3.4	Building Sections		20OCT99
A4.1	Wall Sections		20OCT99
A4.2	Wall Sections		20OCT99
A4.3	Wall Sections		20OCT99
A4.4	Wall Sections		20OCT99
A4.5	Wall Sections		20OCT99
A4.6	Wall Sections		20OCT99
A4.7	Not Used		
A4.8	Wall Sections		20OCT99
A4.9	Wall Sections		20OCT99
A4.10	Wall Sections		20OCT99
A4.11	Wall Sections		20OCT99
A5.1	Construction Details		20OCT99
A5.2	Construction Details		20OCT99
A5.3	Construction Details		20OCT99
A5.4	Plan Details		20OCT99

SHEET NO.	TITLE	REVISION NUMBER	DATE
A5.5	Construction Details		20OCT99
A5.6	Shade Plans		20OCT99
A6.1	Stair Plans		20OCT99
A6.2	Stair Sections		20OCT99
A6.3	Stair Sections		20OCT99
A7.1	Door Schedule		20OCT99
A7.2	Door Types		20OCT99
A7.3	Window Types		20OCT99
A7.4	Door Details		20OCT99
A7.5	Door Details		20OCT99
A7.6	Window & Door Details		20OCT99
A7.7	Window & Door Details		20OCT99
A7.8	Window & Door Details		20OCT99
A7.9	Window & Door Details		20OCT99
A8.1	Enlarged Plans & Interior Elevations		20OCT99
A8.2	Interior Elevations		20OCT99
A8.3	Interior Elevations		20OCT99
A8.4	Interior Elevations		20OCT99
A8.5	Interior Details		20OCT99
A9.1	Lab Plans		20OCT99
A9.2	Lab Interior Elevations		20OCT99

SHEET NO.	TITLE	REVISION NUMBER	DATE
A9.3	Lab Interior Elevations		20OCT99
A9.4	Lab Details & Utilities		20OCT99
A10.1	First Floor Reflected Ceiling Plan		20OCT99
A10.2	Second Floor Reflected Ceiling Plan		20OCT99
A10.3	Textile Lab Reflected Ceiling Plan		20OCT99
A10.4	Training Center Reflected Ceiling Plan		20OCT99
A10.5	Shops Reflected Ceiling Plan		20OCT99
A10.6	Textile Lab Alternate Reflected Ceiling Plan		20OCT99
A11.1	Interior Finish Schedule		20OCT99
A11.2	Interior Details		20OCT99
A11.3	Interior Details		20OCT99
A11.4	Interior Details		20OCT99
A11.5	Interior Details		20OCT99
	Structural		
S1.0A	Foundation Plan (North Portion)		20OCT99
S1.0B	Foundation Plan (North (Dimensions)		20OCT99
S1.1	Foundation Plan (South Portion)		20OCT99
S1.2	Foundation Plan (Training Center)		20OCT99
S1.3	Foundation Plan (Shops)		20OCT99
S1.4	Main Floor Framing (North Portion)		20OCT99
S1.5	Upper Level Framing Plan		20OCT99
S1.6A	Roof Framing Plan (North Portion)		20OCT99

SHEET NO.	TITLE	REVISION NUMBER	DATE
S1.6B	Roof Framing Plan (North Portion)		20OCT99
S1.7	Roof Framing Plan (South Portion)		20OCT99
S1.8	Roof Framing Plan (Training Center)		20OCT99
S1.9	Roof Framing Plan (Shops)		20OCT99
S1.10	Shops Alternate		20OCT99
S1.11	Stair Framing Plans		20OCT99
S1.12	Shade and Entry Structure		20OCT99
S2.0	Wall Sections		20OCT99
S2.1	Wall Sections		20OCT99
S2.2	Wall Sections		20OCT99
S2.3	Wall Sections		20OCT99
S2.4	Wall Sections		20OCT99
S2.5	Wall Sections		20OCT99
S2.6	Wall Sections		20OCT99
S2.7	Wall Sections		20OCT99
S3.0	Foundation and Main Floor Details		20OCT99
S3.1	Upper Floor and Stair Details		20OCT99
S3.2	Roof and Misc. Details		20OCT99
S3.3	Details		20OCT99
S3.4	Details		20OCT99
S3.5	Details		20OCT99
S4.0	Braced Frame Elevations		20OCT99

SHEET NO.	TITLE	REVISION NUMBER	DATE
S4.1	Shear Wall Plan (North & West)		20OCT99
S4.2	Shear Wall Plan (South)		20OCT99

Mechanical

M1.0	Mechanical Schedules & Legends		20OCT99
M1.1	Mechanical Schedules & Legends		20OCT99
M2.1	First Floor HVAC Plan		20OCT99
M2.2	Textile Lab and Phase 3 HVAC Plan		20OCT99
M2.3	Second Floor HVAC Plan		20OCT99
M2.4	Phase 2 Shop HVAC Plan		20OCT99
M2.5	Phase 2 Shop Alternate		20OCT99
M3.1	HVAC Piping for First and Second Floor		20OCT99
M3.2	HVAC Piping Plan for Textile Lab and Phase 3		20OCT99
M3.3	Mechanical Room Floor Plan and Sections		20OCT99
M3.4	Mechanical Sections		20OCT99
M3.5	Mechanical HVAC Piping for Textile Lab, Add. Alternate ?3		20OCT99
M4.1	Mechanical Details		20OCT99
M4.2	Mechanical Details		20OCT99

Electrical

E1.0	Legends, Schedules, 1-Line Riser		20OCT99
E2.0	First Floor Power Plan		20OCT99
E2.1	First Floor Lighting Plan	2	02FEB00
E2.2	First Floor Special Systems Plan		20OCT99
E2.3	Electrical Special Systems Plan, Section A		20OCT99
E2.4	Textile Lab Electrical Plan	2	02FEB00
E2.4A	Electrical First Floor Plans, Section B (Alternate)		20OCT99
E2.5	Training Center Electrical Plans		20OCT99

E3.1	Second Floor Power Plan		20OCT99
E3.2	Second Floor Lighting Plan		20OCT99
E3.3	Second Floor Special Systems Plan		20OCT99
E3.4	Electrical Roof Plan		20OCT99
E4.1	Shop Power Plan	2	02FEB00
E4.2	Shop Lighting Systems Plan	2	02FEB00
E4.3	Shop Special Systems Plan	2	02FEB00
E4.4	Shop Panel Schedules	2	02FEB00
E4.5	Shop Panel Schedules	2	02FEB00
E4.6	Shop Alternate Electrical Floor Plans	2	02FEB00
E5.0	Electrical Details		20OCT99
E6.0	Panel Schedules		20OCT99
E6.1	Electrical Panel Schedules		20OCT99
E7.0	Lift Station Electrical		20OCT99
	Plumbing		
P1.0	Plumbing Legends, Schedules, Details, Drawing List		20OCT99
P2.1	Overall First Floor Plan-Sanitary Water Distribution		20OCT99
P2.2	First & Second Floor - Enlarged Plumbing Plans		20OCT99
P2.3	Textile Lab - Enlarged Plumbing Plans		20OCT99
P2.4	Phase 3 Classroom - Enlarged Plumbing Plans		20OCT99
P2.5	Shops - Sanitary Waste/Vent Plan		20OCT99
P2.6	Shops - Water/Gas Piping Floor Plan		20OCT99
P2.7	Shop Plan Plumbing Alternate		20OCT99
P3.1	Enlarged Lab Sanitary Vent Plan		20OCT99
P3.2	Enlarged Lab Piping Plan		20OCT99

Security

SE1.1	First Floor Security Plan	20OCT99
SE1.2	Second Floor Security Plan	20OCT99
SE1.3	First Floor Security Plan Textile Lab	20OCT99
SE1.4	First Floor Security Plan Training Center	20OCT99
SE1.5	First Floor Security Plan Shops	20OCT99
SE1.6	IDS System Details	20OCT99
SE1.7	IDS System Details	20OCT99
SE1.8	Site Plan Gate Details	20OCT99

REVISIONS TO DRAWINGS BY NOTATION

Drawing, Sheet "Cover": Delete "Phase 2" from the titles for Sheets M2.4 and M2.5.

Drawing, Sheet C7.0: To General Note 18, add new sentence: "Refer to Specification Section 01001, Paragraph 1.11 for digging permit requirements.

Drawing Sheet C17.0: Add new Note 10, to read, "Underground piping from the ground water supply well and from the reinjection well to the building shall be C900 PVC installed in accordance with Specification Section 15060."

Drawing Sheet A5.1: In Details 4, 5 and 9, revise the callout "1/2" sheathing w/finish face" to read "1/2" exterior rated AC plywood with A side painted."

Drawing Sheet A5.3: Revise the note under "Perforated Metal Panels" to read, "11 gage panels, no hem, hole pattern to be industry standard staggered holes. Tack weld the panels to the frame prior to finishing at 1'0" on center."

Drawing Sheet A7.1: Delete the Note on the bottom of the Door Schedule regarding finished or unfinished frames. In the Remarks Schedule of the Door Schedule, delete the reference to "See Note Below" for Doors Number T100-1, T104-1, T106-1, and T110-1.

Drawing Sheet A9.3: In Detail 9, change "Section 13138 (NIC)" to "Section 13135 (NIC)".

Drawing Sheet A11.1: In the Finish Schedule, revise the first entry for Room 228 to Room 226, Detailer Room, with the same wall and floor finishes as shown for Office 228.

Drawing, Sheet A11.1: In the Finish Schedule, revise the entry for the Printers/Plotters room from Room 238 to Room 244.

Drawing, Sheet S1.2: To the two footings shown in the upper right of the Foundation Plan, add the following note: "Top of footing (TOF) is 96' 0".

Drawing, Sheet S1.3: Add the following note: "Pier sizes at corner locations shall be similar to the typical column base detail 2/S3.4."

Drawing Sheet S1.9: Add note to read, "A W10x5 header is required between the columns of Grids U and V along Grid Line 30 and along Grid Line 32 to support the painted metal grating (not in contract) as shown on Sheet A1.5."

Drawing, Sheet S1.12: Add the following note to Detail 6: "Top elevation of the tapered concrete pier is 101' 6". See Sheet A5.5 for additional information."

Drawing, Sheet S2.6: Add the following note to Detail 5: "The pier shape shown on this detail is representational only. For exact pier shape, see Details D/A4.10 and 2/A5.4. The top of the pier is 99'9-1/2" and the top of the pier base is 95" 0".

Drawing, Sheet S4.1: Revise Note 1, under Shearwall Schedule, to read, "Block all edges with metal studs of the same gage as the wall studs."

Drawing Sheet M1.0: In the Exhaust Fan Schedule, change EF9 to 480V, 2.6A.

Drawing Sheet M1.1: In the Expansion Tank schedule, change Acceptable Volume from 79 gallons to 43 gallons.

Drawing, Sheet M2.5: Add Note: "Paint Booth is Not In Contract."

Drawing Sheet M3.1: Change all HWS and HWR piping in Mechanical RM 142 from 3" to 4".

Drawing, Sheet M3.5: Delete the callout for CH-1 in Equipment Storage Room T108.

Drawing Sheet E1.0: Revise General Note 1 to read: "All work to be in accordance with 1999 National Electric Code."

Drawing Sheet E1.0: Add General Note 8: "Each building shall have identification plaques or directories as described in NEC 250-37 and NEC 230-2(e)."

Drawing Sheet E1.0: Revise Key Note 5 to read: "Exact breaker sizes and circuit for the cooling water pump cannot be determined until after the wells are drilled. Electrical contractor shall coordinate with the Well contractor and shall provide and install the properly sized circuit for the actual pump needed."

Drawing Sheet E2.0: Add General Note 3: "Refer to E1.0, Keyed Note #5 for Ground Water Cooling Pump Disconnect Information."

Drawing Sheet E2.0: Revise Keynote 1 to read: "Provide and install two 3" #40 PVC conduits in crawl space for data and communication cabling. Install "T" connectors every 10 feet in the first 50 feet for cable entry.

Drawing Sheet E2.1: In General Note 9, change "240 volt" to "208 volt."

Drawing Sheet E2.3: Revise General Note 2 to read: "Install P/A speakers in lay-in ceiling where possible. Any wall mounted speakers to be installed at 80" from AFF to bottom of device. Route cable in tray to amplifier location in Computer Room 239."

Drawing, Sheet E2.3: Revise Key Note 8 to read: "Owner-provided P/A head unit and microphone shall be located at reception desk. Electrical contractor shall provide and install conduit for low impedance balanced line from this location to owner provided amplifier location in Computer Room 239."

Drawing, Sheet E2.3: Replace Keynote 2, which was deleted by Amendment 0001, and add to it the following text: "In lieu of cable tray as shown through Lobby 105, the Contractor shall provide (3) 4" empty conduit with pull strings through the Lobby. Termination of the conduit shall be to the cable trays at Corridor 144 and at Mechanical Room 106. Provide fire proofing for conduit passing through the fire rated wall of the mechanical room."

Drawing Sheet E2.4A: Delete Exhaust Fan EF-* in Room T110.

Drawing, Sheet E2.5: Delete all smoke detectors from Training Center.

Drawing, Sheet E2.5: Revise General Note 3 to read: "Install P/A speakers at 80" to bottom of device. Route cable amplifier location in Computer Room 239 via PVC conduit in crawl space.

Drawing Sheet E3.3: Delete General Note 3. Delete Keynote 2.

Drawing, Sheet E3.3: Delete Key Note 3.

Drawing Sheet E3.3: Revise General Note 2 to read: "All P/A speakers on second floor to be wall mounted at 80" AFF to bottom of device. Route cable back to amplifier location in Computer Room 239 via cable tray in accessible floor where possible."

Drawing Sheet E3.3: Add General Note 4 to read: "Owner-provided P/A amplifier to be located in computer room 239. Route all P/A cabling to this location".

Drawing Sheet E3.3: Add a fire alarm control panel and one smoke detector in Phone Room 204.

Drawing Sheet E3.4: Delete Keynote 3.

Drawing Sheet E5.0: Delete Detail 6.

Drawing Sheet E5.0: Revise the Fire Alarm Riser Diagram to indicate six smoke detectors.

Drawing Sheet E6.0: Change the breaker for circuits 39 and 41 from a 2P-20A breaker to a 2P-30 breaker on Panel LC.

Drawing Sheet E7.0: Revise the first paragraph of Note 2 to read "Any generator that meets the requirements of this note is acceptable." Revise the ninth paragraph of Note 2 to delete the first three sentences and replace them with: "The generator must be mounted on a single axle trailer with a 3500 lb rating."

Drawing Sheet E7.0: To the One Line Diagram, add the following notes:

"1. The 100A disconnect, the automatic transfer switch, and the 100A panel shall be post mounted near the control panel for the sewage lift station.

2. Contractor shall use Sheet C31.0 to determine the length of conductor runs from the transformer to the sewage lift station service."

Drawing Sheet E7.0: To the end of General Note 4, add the following: "One of the convenience receptacles is to be installed at the 100A panel and the other shall be installed at the lift station with the keyless lampholders. Coordinate exact location with onsite representative of the Contracting Officer."

Drawing Sheet P3.2: Add to Keyed Note 8 to read, "Provide isolation valves on incoming and outgoing lines from water distiller."

STANDARD DETAILS BOUND IN THE SPECIFICATIONS

DRAWING NUMBER	SHEET NUMBER	TITLE	DATE
SECTION 01501 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS			
	1	Hard Hat Sign	10SEP90
SECTION 02721A - OIL AND SAND INTERCEPTOR			
Std Dwg - 194	02721A-2	Oil and Sand Interceptor	REV 03SEP90

END OF SECTION

This page intentionally left blank.

DESIGN AUTHENTICATION

MISSOULA TECHNOLOGY AND DEVELOPMENT CENTER
MISSOULA, MONTANA

This project was designed by the Federal Agency (Other than U.S. Army Corps of Engineers) and their consultants listed below. The drawings and specifications included in this solicitation were prepared, reviewed and certified in accordance with applicable policies of the agency. This project is issued for advertisement by the U.S. Army Corps of Engineers, Seattle District in accordance with Department of Army Engineer Regulation ER 1140-1-211 SUPPORT FOR OTHERS: REIMBURSABLE WORK.

(Signed Drawings on File)

PLACE ARCHITECTURE, L.L.C.
Bozeman, Montana

(Signed Drawings on File)

FOREST SERVICE
Northern Regional Headquarters
Missoula, Montana

Signatures affixed below indicate that prior to advertisement, the U.S. Army Corps of Engineers (USACE), Seattle District has performed a review of this project in accordance with Department of Army Engineer Regulation ER 415-1-11 BIDDABILITY, CONSTRUCTIBILITY, OPERABILITY AND ENVIRONMENTAL REVIEW and the interagency support agreements for this project.

Fred Brown
Project Manager

FOR Dean M. Schmidt, Chief
Tech. Eng. & Review Section,
Construction Branch

DESIGN AUTHENTICATION (Cont.)

MISSOULA TECHNOLOGY AND DEVELOPMENT CENTER
MISSOULA, MONTANA

for Rick Moshier, P.E.
Chief, Design Branch

for Phillip M. O'Dell, P.E.
Chief, Engineering & Construction Division

The initials and/or signatures and registration designations of U.S. Army Corps of Engineers individuals appear on this Design Authentication within the scope of their employment as required by ER 1110-1-8152, ENGINEERING AND DESIGN PROFESSIONAL REGISTRATION.

General Decision Number MT000033
Superseded General Decision No. MT990033 State: Montana
Construction Type:
BUILDING
County(ies):
MISSOULA
BUILDING CONSTRUCTION PROJECTS (Does not include residential construction consisting of single family homes and apartments up to and including 4 stories)
Modification Number Publication Date
0 02/11/2000

COUNTY(ies):
MISSOULA

BOIL0011A 10/01/1999

	Rates	Fringes
BOILERMAKERS	20.59	9.60

BRMT0007B 04/01/1999

	Rates	Fringes
BRICKLAYERS	19.36	5.55

ELEC0768D 06/01/1999

	Rates	Fringes
ELECTRICIANS (Including Low Voltage Wiring of Alarms, HVAC, Sound Systems, Communications, and Telephones; excluding Category 5 Cabling, TV distribution, and Card Access)	21.66	6.64

IRON0014H 07/01/1999

	Rates	Fringes
IRONWORKERS, STRUCTURAL	19.82	9.53

PLUM0459D 05/01/1999

	Rates	Fringes
PLUMBERS & PIPEFITTERS (Including HVAC Piping, and Set Unit)	21.36	6.95

SHEE0103D 07/01/1999

	Rates	Fringes
SHEET METAL WORKERS (HVAC Duct Work only)	21.23	6.10

SUMT1008A 02/23/1999

	Rates	Fringes

CARPENTERS (Including Installation of Drywall; excluding Batt Insulation, Cabinets, and Form Work)	13.57	3.70
CARPENTERS (Form Work only)	14.04	3.70
CEMENT MASONS	13.60	.58
GENERAL LABORERS	11.79	3.50
POWER EQUIPMENT OPERATORS:		
Backhoe	13.00	
Crane	17.25	4.13
Loader	14.00	
ROOFERS	12.00	
TRUCK DRIVERS:		
10 cu. yd Tandem Dump	12.00	

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

==========

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR?5.5(a

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the

requestor considers relevant to the issue.
3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U. S. Department of Labor
200 Constitution Avenue, N. W.
Washington, D. C. 20210

4.) All decisions by the Administrative Review Board are final.

END OF GENERAL DECISION

This page intentionally blank

TABLE OF CONTENTS

DIVISION 1: GENERAL REQUIREMENTS

01001: Supplementary Requirements…….
01005: Site Specific Supplementary Requirements……
01025: Payment……...
01035: Modification Procedures…….
01040: Project Coordination.....…
01045: Cutting and Patching .....
01061: Environmental Protection……..
01095: Reference Standards and Definitions .....
01330: Submittal Procedures .....
01451: Contractor Quality Control.....
01501: Construction Facilities and Temporary Controls .....
01702 As-Built Records and Drawings……..
01703: Warranty of Construction……
01710: Final Cleaning.....
01730: Operating and Maintenance Data .....

DIVISION 2: SITE WORK

02100: Site Clearing.....
02110: Geotextiles .....
02113: Adjusting Existing Manholes, Lampholes, Inlets, Water Valves, Water Valve Boxes, Water Services, and Fire Hydrants to Grade
02150: Construction Within Highway 10 Right-of-Way
02221: Trench Excavation and Backfill for Pipelines and Appurtenant Structures
02225: Flowable Fill
02226: Jacked or Bored Pipe Crossings
02230: Street Excavation, Backfill and Compaction
02232: Aggregates for Surfacing and Plant Miz A.C.
02234: Select Sub-Base Course
02235: Crushed Base Course
02250: Watering
02300: Earthwork.....
02501: Asphalt Materials .....
02503: Hot Plant Mix Asphalt Concrete Base and Surface Course – New and Overlay Applications
02528: Cement Concrete Pavement for Curbs and Walkways
02581: Pavement Markings and Markers
02610a: Water Main Materials
02610b: Sanitary Sewer Main Materials
02610c: Storm Drain Materials
02711: Foundation Drainage Systems.....
02713: Water Mains .....
02718: Water Valves and Fire Hydrants.....
02719: Water Service Connections .....

02721: Storm Drains and Culverts.....
02721a: Oil and Sand Interceptor……..
02722: Sanitary Sewer Mains.....
02724: Sanitary Sewer and Storm Drain Services.....
02730: Lift Stations .....
02810: Irrigation System.....
02831: Chain Link Fences and Gates.....
02900: Landscaping.....
02905: Drip Irrigation System.....

DIVISION 3: CONCRETE

03300: Cast-In-Place Concrete .....

DIVISION 4: MASONRY

04720: Cast Stone .....
04810: Unit Masonry Assemblies.....

DIVISION 5: METALS

05120: Structural Steel.....
05400: Cold-Formed Metal Framing.....
05500: Metal Fabrications.....
05521: Pipe and Tube Railings.....

DIVISION 6: WOOD AND PLASTICS

06100: Rough Carpentry.....
06155: Stressed-Skin Panels .....
06171: Wood Chord Metal Joists.....
06185: Structural Glued-Laminated Timber .....
06200: Finish Carpentry .....
06402: Interior Architectural Woodwork.....

DIVISION 7: THERMAL AND MOISTURE PROTECTION

07132: Elastomeric Sheet Waterproofing .....
07160: Bituminous Dampproofing.....
07210: Building Insulation.....
07311: Asphalt Shingles .....
07412: Manufactured Wall Panels .....
07531: EPDM Single-Ply Membrane Roofing .....
07620: Sheet Metal Flashing and Trim.....
07720: Roof Accessories
07840: Firestopping.....
07920: Joint Sealants.....

DIVISION 8: DOORS AND WINDOWS

08110: Steel Doors and Frames.....
08120: Aluminum Doors and Frames.....
08211: Flush Wood Doors .....
08310: Access Doors and Panels .....
08330: Coiling Doors and Grilles
08360: Overhead Doors.....
08410: Metal-Framed Storefronts.....
08520: Aluminum Windows .....
08711: Door Hardware.....
08800: Glazing.....
08950: Translucent Wall and Roof Assemblies.....

DIVISION 9: FINISHES

09255: Gypsum Board Assemblies.....
09310: Ceramic Tile .....
09512: Acoustical Tile Ceilings.....
09632: Stone Flooring.....
09653: Resilient Wall Base and Accessories.....
09654: Linoleum Floor Coverings .....
09680: Carpet.....
09900: Painting.....
09960: High-Performance Coating

DIVISON 10: SPECIALTIES

10100: Visual Display Boards.....
10105: Wall Display System.....
10155: Toilet Compartments.....
10500: Lockers.....
10520: Fire Protection Specialties .....
10651: Operable Panel Partitions.....
10801: Toilet and Bath Accessories.....

DIVISION 11: EQUIPMENT

11132: Projection Screens.....
11610: Laboratory Fume Hoods .....

DIVISION 12: FURNISHINGS

12348: Wood Laboratory Casework.....
12690: Floor Mats and Frames.....

DIVISION 13: SPECIAL CONSTRUCTION

13035: Laboratory Controlled Temperature Room.....

DIVISION 14: CONVEYING SYSTEMS

14240: Hydraulic Elevators.....

DIVISION 15: MECHANICAL

15000: Mechanical General Requirements……...
15030: Heating And Cooling System And Domestic Hot Water……..
Testing And Balancing……
15060: Pipe And Fittings
15070: Piping Specialties
15080: Valves
15090: Piping Identification
15100: Installation Of Equipment And Piping
15110: Excavation And Backfilling
15120: Vibration Isolation
15130: Insulation
15140: Motors And Controls
15205: Wells
15410: Sanitary Drainage System
15430: Domestic Water Piping
15440: Domestic Hot Water Equipment
15460: Plumbing Fixtures And Trim
15470: Fuel Piping Systems
15480: Special Plumbing Systems
15500: Fire Sprinklers
15610: Boilers
15650: Chemical Treatment
15660: Water Piping And Specialties
15680: Coils And Heat Exchangers
15690: Terminal Units
15810: Air Moving Equipment
15820: Packaged Central Station Air Handlers
15830: Air Duct Systems
15843: Carbon Monoxide Exhaust System
15850: Air Distribution Specialties
15870: Sound Attenuators
15890: Variable Air Volume Terminal Units
15930: Temperature Controls
15960– Infrared Heating Systems

DIVISION 16: ELECTRICAL

16000: Electrical General Requirements
16030: Electrical Systems Schedule
16035: RFI/EMI Shielding Enclosure
16050: EMI/RFI Shielding
16110: Raceways And Fittings
16112: Surface Raceways
16120: Wire And Cable

16130: Outlet Boxes
16132: Floor Boxes
16140: Wiring Devices
16190: Supporting Devices
16420: Underground Electric Service
16426: Fuses
16450: Secondary Grounding
16460: Transformers
16470: Panelboards
16500: Lighting Fixtures
16535: Emergency Lighting Equipment
~~16670: Lightning Protection System~~
16721: Fire Alarm
16740a: Telephone/Data System/Conduit Only
16770 Public Address Speaker System

This page intentionally left blank.

SECTION 01001

SUPPLEMENTARY REQUIREMENTS

PART 1 GENERAL

1.1 DEFINITIONS

The references listed below are to be defined as indicated wherever they may be used in the TECHNICAL SPECIFICATIONS.

"SUPPLEMENTARY REQUIREMENTS " shall be read to pertain to any of the sections of the DIVISION 1 as required by the content of the section or paragraph containing the reference.

"GENERAL CONDITIONS" and "SUPPLEMENTARY CONDITIONS" shall be read as "CONTRACT CLAUSES" and "SPECIAL CLAUSES" respectively.

Specification "SECTION 01300 – SUBMITTALS" shall be read as a specification "SECTION 01330 – SUBMITTAL PROCEDURES".

Specification "SECTION 01400 – CONTRACTOR QUALITY CONTROL" shall be read as a specification "SECTION 01451 – CONTRACTOR QUALITY CONTROL".

1.2 CONSTRUCTION SCHEDULING

1.2.1 CONSTRUCTION PROGRESS CHARTS AND STATUS REPORTS

1.2.1.1 The instructions and information herein supplement the requirements of Paragraph SCHEDULE FOR CONSTRUCTION CONTRACTS IN THE CONTRACT CLAUSES. The proposed Construction Progress Chart shall be prepared on ENG Form 2454. Additional instructions are obtained in INSTRUCTIONS AND INFORMATION FOR CONTRACTORS, a manual furnished to the Contractor by the Contracting Officer. This manual is available for inspection in the Office of the Seattle District, Corps of Engineers 4735 East Marginal Way South, Seattle, Washington.

1.2.1.2 The Minimum principal contract features (activities) to be included on ENG Form 2454 shall represent the work in each of the following divisions:

(a) Site Work (Separately include activities for work specified in Sections 02150, 02300, 02503, 02528, 02713, 02719, 02722, 02724 and 02730.)

(b) Concrete

(c) Masonry

(d) Metals (Include a separate activity for cold formed structural steel.)

(e) Wood and Plastics

(f) Thermal and Moisture Protection (Include a separate activity for roofing systems.)

(g) Doors, Windows, and Hardware

(h) Finishes (Include separate activities for walls, floors and painting.)

(i) Miscellaneous Specialties (Include a separate activity for toilet partitions.)

(j) Equipment (Include a separate activity for fume hoods.)

(k) Furnishings

(l) Special Construction

(m) Conveying Systems

(n) Mechanical (Separately include activities for work according to each individual Division 15 specifications section.)

(o) Electrical (Separately include activities for work according to each individual Division 16 specifications section.)

1.2.2 The Construction Progress Chart shall show the total bid amount distributed among the features shown on the chart. The schedule shall show the percentage of completion at the close of each weekly period. This percentage shall be based on percentage of physical completion of the work. (NOTE: Mobilization and demobilization shall not be listed as a separate payment item unless so noted in the schedule.)

1.2.3 The Construction Progress Chart shall be submitted within 10 calendar days after the date of receipt of notice to proceed.

1.2.4 The Contractor shall prepare and submit a monthly project status report. The report shall tell whether the project as a whole is on, ahead of, or behind schedule. If the project is behind schedule, the Contractor shall explain what actions he will take to regain his schedule. The report shall include a description of problem areas, delaying factors and their impact, and an explanation of corrective actions taken or proposed. Any delays caused by the Government shall be identified. Any significant items or events that occurred during the report month shall also be detailed.

1.3 CORRESPONDENCE

1.3.1 All correspondence shall be addressed to the Contracting Officer, shall be serially numbered commencing with Number 1, with no numbers missing or duplicated and shall be forwarded in quintuplicate, as directed by the authorized representative of the Contracting Officer, and shall include an additional copy forwarded to a separate designated location. All copies provided shall be legible. Enclosures attached or transmitted with the correspondence shall also be furnished with the original and

each copy. Each serial letter shall make reference to the contract name, contract number and shall have only one subject.

1.3.2 For submission of Contractor payment requests, See Section 01025, PAYMENT.

1.4 ADVANCED NOTICE OF CONTRACTOR PERFORMED ACCEPTANCE TESTING

The Contractor shall notify the Contracting Officer a minimum of 20 days prior to performing any acceptance or "buy off" testing of the following systems, (1) Elevator, (2) Fire Detection/Protection, (3) Wells, (4) Boilers and (5) HVAC. Advance notification is not required for testing performed as part of fabrication or installation.

1.5 CONTRACTOR'S FILES

Contractor shall maintain "Approved (Action Code "A") and "Approved Except as Noted (Action Code "B") shop drawing files in fabrication shops and at project sites for government use.

1.6 MECHANICAL AND ELECTRICAL LAYOUT DRAWINGS

The Contractor shall submit, for Contracting Officer's approval, scaled layout drawings, including appropriate elevations and sections, as required, showing the room arrangement the Contractor proposes for all pieces of mechanical and electrical equipment and appurtenances thereto, such as but not limited to: air conditioning equipment, boilers, compressors, hot water tanks, pumps, electrical control panels, ducts and piping, and all supports and seismic bracing. Mechanical and electrical layouts shall be coordinated to eliminate any conflicts of installed equipment. No payments will be made to the Contractor for furnishing or installing equipment until the layout drawings have been approved by the Contracting Officer. Mechanical and electrical equipment layout drawings shall be identified and submitted as specified herein. Equipment rooms shown on the drawings are of adequate size to accommodate equipment of required capacities as available from several manufacturers with sufficient space left for access, servicing, and removal. The use of equipment items with dimensions such as "to crowd the space" will not be permitted.

1.7 COLOR BOARDS

Two sets of color boards shall be submitted within 120 calendar days after receipt of Notice to Proceed. The board shall include samples of colors and finishes of every finish such as on walls, floors, and ceilings. This would include, but not be limited to, paint, floor and wall tile, acoustical panels, carpet, wall base, plastic laminate, etc. Where special finishes such as architectural concrete or prefinished metal panels are required, samples of not less than 12 inches square shall be submitted with the board. Boards shall include, where applicable, color samples of integrally colored block, brick, and prefinished metal roofing and siding. The board shall be 24 inches by 24 inches. If more space is needed, more than one board per set may be submitted. This is not meant to replace the samples called for in other portions of the specifications. The Contractor shall certify that he has reviewed the color boards in detail and that they are in strict accordance with the contract drawings and specifications, except as may be otherwise explicitly stated.

1.8 SPECIAL SAFETY REQUIREMENTS:

All construction activities shall be conducted in strict compliance with the Corps of Engineers Safety and Health Requirements Manual EM 385-1-1, and Occupational Safety and Health Administration regulations, as applicable. The manual is available on line at: http://www.usace.army.mil/inet/usace-docs/eng-manuals/em385-1-1/toc.htm. A hardcopy will be provided at the preconstruction conference.

1.8.1 In addition to Safety and Health Requirements Manual EM 385-1-1, and all applicable OSHA standards, the Contractor shall comply with the requirements listed below. Paragraph numbers refer to EM 385-1-1 or are added thereto.

(a) Paragraph 01.A.12: Add new paragraph: Safety Personnel. The Contractor shall designate a person on his staff to manage the Contractor's safety and accident prevention program. This person ~~will~~shall provide a point of contact for the Contracting Officer on matters of job safety, and shall be responsible for ensuring the health and safety of on site personnel.

(b) Paragraph 01.D.02, revise as follows:

(1) Replace paragraph 01.D.02c with the following:
"c. Property damage in excess of $2,000.00

(2) Add new paragraph d as follows:
"An injury resulting in a lost workday, not including the day of injury."

1.9 TIME EXTENSIONS FOR UNUSUALLY SEVERE WEATHER (ER 415-1-15 31 OCT 89)

This Paragraph specifies the procedure for the determination of time extensions for unusually severe weather in accordance with the CONTRACT CLAUSE entitled "Default (Fixed Price Construction)". In order for the Contracting Officer to award a time extension under this clause, the following conditions must be satisfied:

1.9.1 The weather experienced at the project site during the contract period must be found to be unusually severe, that is, more severe than the adverse weather anticipated for the project location during any given month.

1.9.2 The unusually severe weather must actually cause a delay to the completion of the project. The delay must be beyond the control and without the fault or negligence of the contractor.

1.9.3 The following schedule of monthly anticipated adverse weather delays is based on National Oceanic and Atmospheric Administration (NOAA) or similar data for the project location and will constitute the base line for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather dependent activities.

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY
WORK DAYS BASED ON (5) DAY WORK WEEK

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
15	12	9	3	3	3	1	1	2	4	9	13

1.9.4 Upon acknowledgment of the notice to proceed (NTP) and continuing throughout the contract, the contractor ~~will~~shall record on the daily QCQ report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delays must prevent work on critical activities for 50 percent or more of the contractor's scheduled work day.

1.9.5 The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in previous month), be calculated chronologically from the first to the last day of each month, and be recorded as full days. If the number of actual adverse weather delay days exceeds the number of days anticipated in paragraph 1.9.3, above, the Contracting Officer will convert any qualifying delays to calendar days, giving full consideration for equivalent fair weather work days, and issue a modification in accordance with the contract clause entitled " Default (Fixed Price Construction)".

1.10 SALVAGE MATERIALS AND EQUIPMENT FOR THE GOVERNMENT

The Contractor shall maintain adequate property control records for all materials or equipment specified to be salvaged. These records may be in accordance with the Contractor's system of property control, if approved by the property administrator. The Contractor shall be responsible for the adequate storage and protection of all salvaged materials and equipment, and shall replace, at no cost to the Government, all salvage materials and equipment which are broken or damaged during salvage operations as the result of his negligence, or while in his care. Point of contact concerning Government salvaged items is Bruce Crockett, Telephone (406) 329-3161.

1.11 PERMITS AND CONTRACTOR RESPONSIBILITIES

It will be the responsibility of the Contractor to obtain all other permits/licenses required for this project. See the Contract Clause paragraph entitled PERMITS AND RESPONSIBILITIES. Sewer connection fees shall be limited to the excavation permit fee. All permits in conjunction with work located adjacent to, on or under Montana Rail Link and Montana Department of Transportation property have been, or will be obtained by the Forest Service. The Contractor shall be responsible for complying with all the requirements of the permits. A full copy of the permits will be provided to the Contractor during the pre-work meeting

1.11.1 Contractor responsibilities when working adjacent to, on or under Montana Rail Link property shall include but may not be limited to the following:

A. All work shall be done in a good and workmanlike manner so as not to interfere with the tracks, operation of trains, communications and other facilities of RAILROAD.

B. If RAILROAD's Roadmaster, Randy Gustin, Telephone number (406) 523-1526, determines that it will be necessary to furnish a flagman during the roadway fill operations, CONTRACTOR agrees to reimburse RAILROAD for the expense of flagging incurred by RAILROAD.

C. All work on RAILROAD property shall be done and premises shall be filled, leveled and/or recontoured by CONTRACTOR in a manner satisfactory to the RAILROAD's Roadmaster.

D. If it is necessary to remove any right-of-way fences to facilitate the roadway fill operations, they will be removed and restored by RAILROAD personnel, all at the expense of CONTRACTOR, upon request made by CONTRACTOR.

E. The CONTRACTOR shall be responsible for its own employees and equipment.

F. The Contractor shall indemnify and hold harmless Montana Rail Link, Inc., and any other railroad company permitted to use its line of RAILROAD, against all loss and damages arising from activities of Contractor personnel, or any of the Contractor's subcontractors or agents; and shall further provide that the Contractor, subcontractors and agents will carry insurance of the kind and amount hereinafter specified:

1. Commercial General Liability Insurance, to include contractual liability and products completed operations, against claims arising out of bodily injury, illness, and death and from damage to or destruction of property of others, including loss of use thereof, and including liability of all the RAILROAD, with minimum limits for bodily injury and property damages of $1,000,000 for each occurrence with an aggregate of $2,000,000. This policy shall contain a "Waiver of Transfer Rights" endorsement to waive any right-of-recovery that the insurance company may have against the RAILROAD because of payments made for bodily injuries or property damage.

2. Business Automobile Policy Insurance, including owned, non-owned, and hired vehicles with minimum limits for bodily injury and property damage of $1,000,000 per occurrence on all vehicles used while performing any work pursuant to this Agreement.

3. Worker's Compensation Insurance or coverage as required under the Workers Compensation Act of the State. The policy should include occupational disease to required statutory limits, employers liability of $1,000,000 to include FELA, if appropriate, and an "all States" endorsement.

A Certificate of Insurance must be provided to the RAILROAD prior to commencement of work, and the RAILROAD shall be named insured under the above policies.

Additionally, the Contractor shall furnish to the RAILROAD:

4. A Railroad Protective Liability Insurance policy with limits of $2,000,000 per occurrence and $6,000,000 aggregate for bodily injury and property damage. This policy shall remain in force during the construction phase of the agreement and the RAILROAD

is the named insured. The original policy must be provided and approved by the RAILROAD prior to commencement of work and shall include endorsements shown in Section 4, below.

MONTANA RAIL LINK, INC. shall be provided with a separate and individual Railroad Protective Policy.

ALL Certificates of insurance required for Contractor performed construction and/or maintenance work shall be forwarded to the RAILROAD at the following address:

MONTANA RAIL LINK, INC.
Richard L. Keller, Chief Engineer
P.O. Box 16390
Missoula, MT 59808-6390
(406) 523-1440 Office
(406) 523-1529 Fax

If the CONTRACTOR, its subcontractor(s), or agents, in the performance of the work herein provided for or by the failure to do or perform anything for which it is responsible under the provisions hereof, shall damage or destroy any property of the RAILROAD, such damage or destruction shall be corrected by the CONTRACTOR in the event its subcontractor or the insurance carriers fail to repair or restore the same.

The CONTRACTOR or subcontractor(s) shall telephone the RAILROAD'S Communication Network Control Center at (800) 533-2891 (a 24 hour number), and Utilities Underground Location Center (800) 424-5555 to determine if underground utilities or communication facilities are buried anywhere in the area.

G. Five (5) days advance notice if intention to enter upon RAILROAD's premises for the performance of activities permitted hereunder shall be given by CONTRACTOR to said Roadmaster, Randy Gustin whose telephone number is (406) 523-1526.

H. The location and log of any borings or survey made on said property shall be kept by CONTRACTOR or its subcontractors and a copy thereof furnished upon request to RAILROAD.

PARTS 2 AND 3 NOT USED

END OF SECTION

This page intentionally left blank.

SECTION 01005

SITE SPECIFIC
SUPPLEMENTARY REQUIREMENTS

1. CONDUCT OF WORK:

1.1 COORDINATION AND ACCESS TO SITE

1.1.1 Coordination with using agencies shall be made through the Contracting Officer to assist the Contractor in completing the work with a minimum of interference and inconvenience.

1.2 FIRE REGULATIONS

Contractor shall comply with NFPA 241 Building Construction and Demolition requirements. Contractor shall provide adequate fire extinguishers for the construction site and remove them upon acceptance of the facility.

1.3 Fire Extinguishers

Motorized equipment shall be equipped with fire extinguishers as follows:

a. Pickup truck or other light passenger vehicles, one extinguisher per vehicle, rating 5 BC.
b. All other trucks and heavy motorized equipment, two extinguishers per vehicle, rating 10 BC.

1.4 REPAIR OF ROAD CUTS

Asphaltic surface shall be completely in place within 48 hours after placement of base gravel. Between placement of base gravel and pavement, road shall be kept in driveable and passable condition.

1.5 UTILITY OUTAGES

Contractor shall coordinate unavoidable utility outages with the Contracting Officer at least 10 days in advance. The 'Utility Outage Notice' shall be completed by the Contractor and submitted to the Contracting Officer for approval. No interruptions shall be made until the approved Notice is returned to the Contractor. Outages shall be kept to a minimum and any one outage shall not last more than 2 hours. Unavoidable power or other utility system interruptions shall be scheduled in advance. All outages longer than 2 hours shall be after normal duty hours or on a weekend at the Government option. All outages that shut down motors which support a heating system shall require backup power by the Contractor to be connected during the outage, as requested by the Government. Unless indicated otherwise, Contractor shall give 14 days preliminary notice of future outage. Final notice shall be given 10 calendar days before outage and shall specify date and time of outage.

1.6 SOILS REPORT

Attached to this Section as an appendix is a partial copy of the soils report drilling log descriptions and soils encountered. A complete copy of the soils report is available for review by contacting the COR. Refer to the contract drawings for soil boring locations.

1.7 PROFESSIONAL ENGINEER CERTIFICATION

In accordance with the State of Montana requirements, the Contractor shall be required to provide certification that a professional engineer will be retained for construction inspection of the water main loop and sanitary sewer lines and will prepare as-builts as stated in Section 01702, As-Built Records and Drawings. The as-builts for the water main loop and the sanitary sewer line shall be stamped by the professional engineer retained. These as-builts will be required to be submitted within 30 days after completion of water main loop and within 30 days after completion of the sanitary sewer lines.

PART 2. NOT USED.

(Attachment follows.)

END OF SECTION

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SUMMARY OF CLASSIFICATION TESTS

PROJECT NAME: Geotechnical Investigation - Missoula Technical Development Center U. S. Forest Center
PROJECT NUMBER: 980909-0012
LAB NUMBER: 98-3427
PROJECT MANAGER J. Crawford
DATE: 11/11/98

CLIENT: Charles S. Johnson III, P.E.
Druyvestein, Johnson & Anderson, Inc.
ADDRESS: 3203 S. Russell St.
Missoula, MT 59801

HOLE #	DEPTH (feet)	M/C (%)	ATTERBERG		% PASSING SIEVE				SOIL CLASS	SOIL DESCRIPTION
			LL	PI	#4	#10	#40	#200		
B-2	7.5 to 9.0	7.7	-	-	83	68	47	27.8	SC	Red.-Brown Clayey SAND w/ Fine Gravel
B-3	10.0 to 11.5	23.4	54	28				70.1	CH	Reddish-Tan Plastic CLAY
B-4	7.5 to 9.0	24.9	43	17				96.5	CL	Reddish-Brown CLAY
B-5	5.0 to 6.5	21.6	37	15				68.9	CL	Reddish-Brown Sandy CLAY
B-6	7.5 to 9.0	25.5	42	20				79.1	CL	Light Reddish-Brown Sandy CLAY
B-7	5.0 to 6.5	23.6	-	-				75.3	CL	Light Reddish-Brown Sandy CLAY
B-8	2.0 to 3.5	17.7	-	-				60.8	CL	Light Grayish-Brown Sandy CLAY
B-9	2.0 to 3.5	7.9	-	-	96	80	57	36.5	SM	Light Grayish-Brown Silty SAND
B-10	5.0 to 6.5	31.4	48	21				99.2	CL	Reddish Brown CLAY
B-12	5.0 to 6.5	30.2	46	22				97.3	CL	Reddish Brown CLAY
B-13	2.0 to 3.5	2.1	-	-	53	38	22	11.3	SP-SM	Light Brown Gravelly to Silty SAND
B-15	2.0 to 3.5	10.2	-	-				34.3	SM	Light Red.-Brown Silty SAND w/Gravel

Checked: William M. Hoffman
William M. Hoffman, C.E.T.

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/15/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 1 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-1.0' **TOPSOIL**: silty, dry to slightly moist, light gray
1				ML			1.0'-3.5' **SILT**: sandy, stiff, slightly moist, gray to tan
2							
3	X	4					
	X	4	60				
4	X	6		SC			3.5'-8.5' **SAND**: clayey, loose to medium dense, moist, medium reddish brown
5							
	X	5					
6	X	5	70				
	X	5					
7							
8	X	4					
	X	5	30				
9	X	6					Total depth of boring = 8.5 feet
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/15/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 2 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.5' **TOPSOIL**: slightly moist, medium grayish brown
1				SC			0.5'-2.8' **SAND**; clayey, loose, slightly moist, light brown
2							
3	X	7					
	X	4	40	CL			2.8'-5.0' **CLAY**; sandy, medium consistency, slightly moist, light brown
4	X	3					
5							
	X	3		CL			5.0'-7.0' **CLAY**; stiff, slightly moist, light reddish brown
6	X	5	70				
	X	5					
7				SC	7.7		7.0'-9.0' **SAND**; coarse, clayey with fine gravel medium dense, moist, light reddish brown
8	X	8					
	X	9	60				
9	X	10					
				CL			9.0'-26.5' **CLAY**; silty, stiff to very stiff, moist, reddish brown
10							
	X	6					
11	X	8	90				
	X	11					
12							
13	X	4					
	X	6	100				
14	X	7					
15							
	X	3					
16	X	5	100				
	X	5					
17							
18							
19							
20							
	X	4					
21	X	4	100				
	X	5					
22							
23							
24							
25							
	X	3					
26	X	4	100				No groundwater encountered
	X	7					Total depth of boring = 26.5 feet

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/15/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 3 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.2' **TOPSOIL**: silty, medium grayish brown
				ML			0.2'-1.0' **SILT**: gravelly with sand, dry, light brown
1				SP			1.0'-4.0' **SAND**: gravelly, medium dense, dry, medium brown
2							
3	X	16					
	X	16	60				
4	X	9					
				SC			4.0'-5.5' **SAND**: clayey, stiff, moist, grayish tan
5							
	X	3					
6	X	2	60	CL			5.5'-6.0' **CLAY**: silty, soft, moist, light tan to gray
	X	2		CH			6.0'-13.5' **CLAY**: plastic, medium stiff to stiff, moist, reddish tan
7							
	X	4					
8	X	4	70				
	X	7					
9							
10	X	3			23.4		
	X	7	80				
11	X	7					
12							
	X	2					
13	X	3	90				
	X	4		CL			13.5'-26.5' **CLAY**: medium stiff to stiff, moist to wet, reddish brown
14							
15							Shelby tube sample 15.0'-17.0'
16							
	X	4					
17	X	6	100				
	X	7					
18							
19							
	X	5					
20	X	3	90				
	X	4					
21							
22							
23							
24							
25							
	X	3					
26	X	4	100				No groundwater encountered
	X	5					Total depth of boring = 26.5 feet

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/15/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 4 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-2.0' TOPSOIL: silty to sandy, reddish tan
1							
2				SP			2.0'-3.5' SAND: gravelly, medium dense, dry, light brown
3	X	15					
	X	11	20				
4	X	4		CL			3.5'-5.5' CLAY: stiff, wet, medium reddish tan
5	X	3					
6	X	6	60	CL			5.5'-9.5' CLAY: very stiff, slightly moist, reddish brown
	X	8					
7							
8	X	8			24.9		
	X	11	60				
9	X	15					
				CH			9.5'-21.5' CLAY: stiff to medium stiff, slightly moist to moist, reddish brown
10	X	5					
11	X	7	100				
	X	8					
12							
13							
14							
15	X	3					
16	X	5	100				
	X	5					
17							
18							
19							
20	X	4					
21	X	4	100				No groundwater encountered
	X	7					Total depth of boring = 21.5 feet
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/15/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 5 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.7' TOPSOIL: silty, dry, medium gray brown
1				SP			0.7'-2.8' SAND: gravelly, medium dense, dry, light brown
2							
3	X	8					
	X	5	40	CL			2.8'-13.0' CLAY: with sand lenses, medium stiff to stiff, moist, grayish to reddish brown
4	X	3					
5							
	X	4			21.6		
6	X	5	70				
	X	7					
7							
8	X	4					
	X	6	50				
9	X	6					
10							Shelby tube sample 10.0'-12.0'
11							
12	X	4					
	X	5	60				
13	X	6		SP			13.0'-14.0' SAND: medium dense, slightly moist, reddish brown
14				CL			14.0'-21.5' CLAY: sandy, medium dense, moist reddish brown
15	X	3					
	X	4	60				
16	X	5					
17							
18							
19							
20	X	3					
	X	3	60				No groundwater encountered
21	X	5					Total depth of boring = 21.5 feet
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 6 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-1.5' **TOPSOIL**: silty, dry, medium gray brown
1							
2				SM			1.5'-2.5' **SAND**: silty, medium dense, slightly moist, tan
3	X	7		ML			2.5'-4.0' **SILT**: sandy, medium stiff, slightly moist, tan
	X	4	40				
4	X	4		SP-SM			4.0'-7.0' **SAND**: gravelly, with silt, medium dense, slightly moist, light brown
5	X	7					
6	X	13	90				
	X	12					
7				CL			7.0'-11.5' **CLAY**: sandy, medium stiff, moist, light brown
8	X	4			25.5		
	X	5	90				
9	X	5					
10							Shelby tube sample 10.0'-12.0'
11							
12				SC			11.5'-14.0' **SAND**: clayey, medium dense, slightly moist, light brown
	X	3					
13	X	5	60				
	X	5					
14				SP			14.0'-24.0' **SAND**: gravelly, medium dense to dense, slightly moist, light brown
15	X	10					
16	X	13	60				
	X	17					
17							
18							
19							
20	X	14					
21	X	18	80				
	X	18					
22							
23							
24				CL			24.0'-26.5' **CLAY**: medium stiff, moist, reddish brown
25	X	4					
26	X	5	90				No groundwater encountered
	X	6					Total depth of boring = 26.5 feet

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 7 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.8' **TOPSOIL**; sandy, dry, medium gray
1				SP			0.8'-1.0' **SAND**; gravely, dense, dry, light brown
				CL			1.0'-6.5' **CLAY**; sandy, stiff, slightly moist
2							light reddish brown
3	X	7					
	X	7	30				
4	X	8					
5							
	X	3			23.6		
6	X	5	60				
	X	4					Total depth of boring = 6.5'
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 8 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-1.0' **TOPSOIL**: sandy, dry, medium gray
1				SP			1.0'-1.5' **SAND**: gravely, dense, dry, light brown
2				CL	17.7		1.5'-4.5' **CLAY**: sandy, medium stiff, moist light grayish brown
3	X	3					
	X	3	20				
4	X	3					
5				SP			4.5'-6.5' **SAND**: gravely, dense, slightly moist, light brown
	X	14					
6	X	18	50				
	X	20					Total depth of boring = 6.5'
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 9 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-1.0' TOPSOIL: dry, medium gray brown
1				SM			1.0'-4.0' SAND: silty, medium dense, slightly moist, light grayish brown
2							
3	X	6			7.9		
	X	4	20				
4	X	2					
				CL			4.0'-6.5' CLAY: stiff, moist, reddish brown
5							
	X	5					
6	X	5	80				
	X	7					Total depth of boring = 6.5'
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 10 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.8' TOPSOIL; dry, medium gray brown
1				CL			0.8'-3.5' CLAY; stiff, moist, reddish brown
2							
3	X	6					
	X	7	60				
4	X	8		CL			3.5'-6.5' CLAY; stiff, moist, reddish brown
5							
	X	5			31.4		
6	X	7	100				
	X	8					Total depth of boring = 6.5'
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 11 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.7' **TOPSOIL**; dry, medium gray brown
1				CL			0.7'-2.0' **CLAY**; stiff, slightly moist, light gray
2				CL			2.0'-6.5' **CLAY**; stiff, moist, reddish brown
3	X	5					
	X	7	90				
4	X	7					
5							
	X	5					
6	X	6	100				Total depth of boring = 6.5'
	X	7					
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 12 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.5' TOPSOIL; dry, medium gray brown
1				CL			0.5'-2.0' CLAY; stiff, slightly moist, light gray
2				CL			2.0'-6.5' CLAY; stiff, moist, reddish brown
3	X	6					
	X	9	80				
4	X	10					
5							
	X	4			30.2		
6	X	7	100				
	X	8					Total depth of boring = 6.5'
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 13 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.5' **TOPSOIL**; dry, medium gray brown
1				CL			0.5'-1.5' **CLAY**; stiff, dry, light brown
2				SP-SM	2.1		1.5'-6.5' **SAND**; gravelly, very dense, dry, light brown
3	X	13					
	X	18	25				
4	X	20					
5							
	X	14					
6	X	37	15				
	X	46					Total depth of boring = 6.5'
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 14 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.2' TOPSOIL: dry, medium gray brown
				CL			0.2'-6.5' CLAY: stiff, moist, reddish brown
1							
2							
3	X	4					
	X	6	90				
4	X	7					
5							
	X	4					
6	X	5	95				
	X	7					Total depth of boring = 6.5'
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

GMT CONSULTANTS, INC.
GEOTECHNICAL ENGINEERING
CONSTRUCTION MATERIALS TESTING
1151 West Broadway, Missoula, MT 59802
Phone: (406)-721-2182 Fax: (406)-543-4220

SOIL BORING LOG

PROJECT NAME: USFS - MTDC Facility
PROJECT NUMBER: 980909-0012
PROJECT MANAGER: Jay Crawford
DRILL TYPE: Auger
SAMPLE METHOD: Split spoon
DRILLER: William Weikel
DATE: 10/16/98

CLIENT: Druyvestein Johnson & Anderson, Inc
ADDRESS: 3203 Russell Street
Missoula, MT 59801

BORING #: 15 BORING LOCATION: See site map

DEPTH (FEET)	SAMPLE	SPT	% REC.	UNIFIED SOILS CLASS SYMBOL	DEPTH TO WATER & % MOISTURE	PROFILE	DESCRIPTION
				OL			0.0'-0.5' **TOPSOIL**; dry, medium gray brown
1				CL			0.5'-2.5' **CLAY**; sandy, stiff, dry, light brown
2							
3	X	5		SM	10.2		2.5'-6.5' **SAND**; coarse, silty with fine gravel,
	X	4	50				medium dense, slightly moist, light reddish
4	X	2					brown
5							
	X	8					
6	X	13	25				
	X	12					Total depth of boring = 6.5'
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							

UNIFIED SYMBOLS

LETTER SYMBOL	TYPICAL DESCRIPTION
GW	WELL-GRADED GRAVELS GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES LITTLE OR NO FINES
GM	SILTY GRAVELS. GRAVEL-SAND-SILT MIXTURES
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
SW	WELL GRADED SANDS, SAND WITH GRAVEL, LITTLE OR NO FINES
SP	POORLY-GRADED SANDS, SANDS WITH GRAVEL, LITTLE OR NO FINES
SM	SILTY-SANDS, SAND-SILT MIXTURES
SC	CLAYEY SANDS, SAND-CLAY MIXTURES
ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
CL	INORGANIC LEAN CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELY CLAYS, SANDY CLAYS, SILTY CLAY
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MH	INORGANIC ELASTIC SILTS WITH HIGH LIQUID LIMITS
CH	INORGANIC FAT CLAYS OF HIGH PLASTICITY
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY

▼ GROUNDWATER SYMBOL

GENERAL NOTES

DESCRIPTIVE TERMINOLOGY FOR SOIL BORING LOGS

DENSITY TERM COARSE-GRAINED SOIL	"N" VALUE
Very Loose	<4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	>50

CONSISTENCY TERM FINE-GRAINED SOIL	"N" VALUE
Very Soft	<2
Soft	2 - 4
Medium Stiff	4 - 8
Stiff	8 - 15
Very Stiff	15 - 30
Hard	>30

Standard "N" Penetration: Blows Per Foot of a 140 Pound Hammer Falling 30 inches on a 2 inch OD Split Barrel Sampler

Parting	<1/16" thick stratum
Seam	1/16" to 1/2" thick stratum
Layer	1/2" to 12" thick stratum
Lens	1/2" to 12" discontinuous stratum, pocket
Varved	Alternating laminations of clay, silty and/ or fine grained sand, or colors thereof
Dry	Powdery, no noticeable water
Moist	Below saturation
Wet	Saturated, above liquid limits
Waterbearing	Pervious soil below water
Plastic	Engineering properties of the soil tend to be more reactive to moisture

RELATIVE PROPORTIONS

CONDITION	RANGE	TERM
Coarse Grained Soils		
SAND	<15%	Trace Sand
	15 - 30%	With Sand
	>30%	Sandy
GRAVEL	<15%	Trace Grave
	15 - 30%	With Gravel
	>30%	Gravelly
Fine Grained Soils		
CLAY	<5%	Trace Clay
	5 - 12%	With Clay
	>12%	Clayey
SILT	<5%	Trace Silt
	5 - 12%	With Silt
	>12%	Silty

RELATIVE SIZES

Boulder	Over 12"
Cobble	3" - 12"
Gravel	
Coarse	3/4" - 3"
Fine	#4 - 3/4"
Sand	
Coarse	#4 - #10
Medium	#10 - #40
Fine	#40 - #200
Silt & Clay	Minus #200, Based on Plasticity

WATER LEVEL

Water levels shown on the boring logs are the levels measured in the borings at the time and under the conditions indicated. In sand, the indicated levels may be considered reliable ground water levels. In clay soil, it may not be possible to determine the ground water level within the normal time required for test borings, except where lenses or layers of more pervious waterbearing soil are present. Even then, an extended period of time may be necessary to reach equalibrium. Therefore, the position of the water level symbol for cohesive or mixed texture soils may not indicate the true level of the ground water table. Perched water refers to water above an impervious layer, thus impeded in reaching the water table. The available water level information is given at the bottom of the log sheet.

SYMBOLS

Water Level Symbol

2" O.D. Split-Spoon Barrel Sample

3" O.D. Split-Spoon Barrel Sample

Shelby Tube Undisturbed Specimen

SECTION 01025

PAYMENT

PART 1 GENERAL

1.1 GENERAL

The contract price for each item shall constitute full compensation for furnishing all plant, labor, materials, appurtenances, and incidentals and performing all operations necessary to construct and complete the items in accordance with these specifications and the applicable drawings, including surveying performed by the Contractor. Payment for each item shall be considered as full compensation, notwithstanding that minor features may not be mentioned herein. Work paid for under one item will not be paid for under any other item. No separate payment will be made for the work, services, or operations required by the Contractor, as specified in DIVISION 1, GENERAL REQUIREMENTS, to complete the project in accordance with these specifications; all costs thereof shall be considered as incidental to the work.

1.2 PAYMENT

1.2.1 ITEM 0001 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0001, All Work for Missoula Technology and Development Center, Except for Items 0002 through ~~0008~~0009, payment of which shall constitute full compensation for Item No. 0001, complete. Work this item includes interior finishes in restrooms, all sleeves necessary for irrigation piping (part of Optional Item ~~0006~~0007) and all electrical conduits necessary for the security system (Optional Item ~~0007~~0008). All work for lines noted as FD (footing drainage line) on the drawings is included in this item.

1.2.2 ITEM 0002 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0002, All Roadwork for Missoula Technology and Development Center, payment of which shall constitute full compensation for Item No. 0002, complete. Work this item includes all roads, including Highway 10 improvements, truck route "A" and North Drive, all parking lots including visitor parking area, any area covered with asphalt, all curbs, striping, signage including entrance sign, fence around compound, gravel in staging area, gravel and truck unloading ramp area, concrete apron around shop building, conduits under roadways for utilities and sprinkler system and storm sewer directly related to all roads (to include all lines noted as SS [storm sewer line] and SD [subdrain line] as shown on the drawings) as stated above.

1.2.3 ITEM 0003 (BASE ITEM)

Payment will be made at the contract lump sum price for Item No. 0003, All Work to Furnish One 276 Gpm Capacity Groundwater Supply Well and One Reinjection Well, payment of which shall constitute full compensation for Item No. 0003, complete, including all work to drill hole with casing and drive shoe, perforated casing and well screen.

1.2.4 ITEM ~~0003~~0004 (OPTIONAL ITEM)

Payment will be made at the contract lump sum price for Item No. ~~0003~~0004, Lab Equipment, Building 3203, payment of which shall constitute full compensation for Item No. ~~0003~~0004, complete, including associated rough carpentry for cabinets, fittings and connections, and electrical raceways. Optional Item ~~0003~~0004 is shown on the drawings as Additive Alternate No. 1, Sheets A9.1 through A9.4.

1.2.5 ITEM ~~0004~~0005 (OPTIONAL ITEM)

Payment will be made at the contract lump sum price for Item ~~0004~~0005, East End Extension of Shop Building, payment of which shall constitute full compensation for Item No. ~~0004~~0005, complete, as indicated on the drawings. Optional Item No.~~0004~~0005 is shown on the drawings as Additive Alternate No. 2, Sheet A1.9.

1.2.6 ITEM ~~0005~~0006 (OPTIONAL ITEM)

Payment will be made at the contract lump sum price for Item No. ~~0005~~0006, Interior Work, Building 3200, payment of which shall constitute full compensation for Item No. ~~0005~~0006, complete. Work this item includes all work for air conditioning system, all interior finishes except in restrooms, light fixtures and interior walls indicated on the drawings as optional work for this area. Optional Item ~~0005~~0006 is shown on the drawings as Additive Alternate No. 3, Sheet A10.6.

1.2.7 ITEM ~~0006~~0007 (OPTIONAL ITEM)

Payment will be made at the contract lump sum price for Item No. ~~0006~~0007, Landscaping, payment of which shall constitute full compensation for Item ~~0006~~0007, complete. Work this item includes all work for planting and irrigation, except the sleeves related to irrigation that cross roads, sidewalks and hard surfaces, which are part of the base work. Optional Item ~~0006~~0007 is shown on the drawings as Additive Alternate No. 4, Sheets C32 and C33.

1.2.8 ITEM ~~0007~~0008 (OPTIONAL ITEM)

Payment will be made at the contract lump sum price for Item No. ~~0007~~0008, Security System, payment of which shall constitute full compensation for Item No. ~~0007~~0008, complete. Work this item includes all work for the security system except conduit and boxes inside walls, which is included in Base Item 0001. Optional Item ~~0007~~0008 is shown on the drawings as Additive Alternate No. 5, Sheets SE1.6 and SE1.7.

1.2.9 ITEM ~~0008~~0009 (OPTIONAL ITEM)

Payment will be made at the contract lump sum price for Item No. ~~0008~~0009, Water Main Loop, payment of which shall constitute full compensation for Item No. ~~0008~~0009, complete. Optional Item ~~0008~~0009 is shown on the drawings as Additive Alternate No.6, Sheet C18.0.

1.3 PROGRESS PAYMENT INVOICE

Requests for payment shall be submitted in accordance with Federal Acquisition Regulations (FAR) Subpart 32.9, entitled "PROMPT PAYMENT", and Paragraphs 52.232-5 and 52.232-27, entitled

"Payments Under Fixed-Price Construction Contracts", and "Prompt Payment for Construction Contracts", respectively. In addition each request shall be submitted in the number of copies and to the designated billing office as shown in the Contract.

1.3.1 When submitting payment requests, the Contractor shall complete Blocks 1 through 12 of the "PROGRESS PAYMENT INVOICE" Form as directed by the Contracting Officer. (A sample form is attached at the end of this Technical Specification Section.) The completed form shall then become the cover document to which all other support data shall be attached.

1.3.2 One additional copy of the entire request for payment, to include the "PROGRESS PAYMENT INVOICE" cover document, shall be forwarded to a separate address as designated by the Contracting Officer.

1.3.3 The Contractor shall submit with each pay request, a list of subcontractors that have worked during that pay period. The listing shall be broken down into weeks, identifying each subcontractor that has worked during a particular week, and indicate the total number of employees that have worked on site for each subcontractor for each week. The prime Contractor shall also indicate the total number of employees for its on site staff for each week.

PARTS 2 and 3 NOT USED

PROGRESS PAYMENT INVOICE

See Federal Acquisition Regulations (FAR) 32.900, 52.232-5, & 52.232-27

1. PROJECT AND LOCATION	2. DATE
3. CONTRACTOR NAME AND ADDRESS (Must be the same as in the Contract)	4. CONTRACT NO. _____ 5. INVOICE NO.
6. DESCRIPTION OF WORK	7. PERIOD OF PERFORMANCE From: To:
8. DISCOUNT TERMS	
9. OFFICIAL TO WHOM PAYMENT IS TO BE FORWARDED Name: Title: Phone: ( ) -	10. OFFICIAL TO BE NOTIFIED OF DEFECTIVE INVOICE Name: Title: Phone ( ) -

11. CERTIFICATION: I hereby certify, to the best of my knowledge and belief, that

(1) The amounts requested are only for the performance in accordance with the specifications, terms, and conditions of this contract;

(2) Payments to subcontractors and suppliers have been made from previous payments received under the contract, and timely payments will be made from the proceeds of the payment covered by this certification, in accordance with subcontract agreements and the requirements of Chapter 39 of Title 31, United States Code; and

(3) This request for progress payment does not include any amounts which the prime contractor intends to withhold or retain from a subcontractor or supplier in accordance with the terms and conditions of the subcontract.

_____ _____ _____

(Signature) **(Title)** **(Date)**

12. OTHER INFORMATION OR DOCUMENTATION required by Contract. Provide two (2) copies of each (check and attach if applicable): _____ Updated Progress Chart/Schedule _____ Progress Narrative _____ Certified Payrolls (submitted weekly) _____ Safety Exposure Report _____ Updated Submittal \register _____ Progress Photos _____ Subcontractor/Employee Listings	(FOR GOVERNMENT USE ONLY) Retainage: _____% Amt.: $_____ Withholdings: $ _____ Reason: _____ _____ _____ Following items are current: As-Builts _____ Yes _____ No O & M Manuals _____ Yes _____ No Submittal Register _____Yes _____No

END OF SECTION

SECTION 01035

MODIFICATION PROCEDURES

PART 1 GENERAL

1.1 PROPOSED PROJECT MODIFICATIONS:

Price proposals for proposed modifications shall be submitted in accordance with the requirements of the Contract Clause MODIFICATION PROPOSALS - PRICE BREAKDOWNS. If change order work impacts or delays other unchanged contract work, the costs of such impacts or delays shall be included in the proposals and separately identified. Additional instructions for submitting price proposals can be found in NPSP-415-1-1, INSTRUCTION AND INFORMATION FOR CONTRACTORS, a copy of which will be furnished to the Contractor at the Preconstruction Conference. For information applicable to equipment rates used in contract modifications, refer to 00800 - SPECIAL CLAUSES, clause "EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE".

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

This page intentionally left blank.

SECTION 01040

PROJECT COORDINATION

A. General Installation Provisions:

1. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

2. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

3. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

4. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

5. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the COR for final decision.

6. Recheck measurements and dimensions, before starting each installation.

7. Install each component during weather conditions and project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

8. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

9. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Meet accessibility standards when appropriate. Refer questionable mounting height decisions to the COR for final decision.

B. Cleaning and protection:

1. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

2. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

3. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

A. Other Sections may expand or further define the requirements and limitations applicable to cutting and patching individual parts of the Work.

B. Quality Assurance:

1. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

2. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

3. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the COR's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.

C. Inspection:

1. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

a. Before proceeding, meet at the site with the parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Preparation:

1. Temporary Support: Provide temporary support of Work to be cut.

2. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

3. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

4. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

E. Performance:

1. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

2. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with specified recommendations.

3. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

a. Where removal of walls or partitions extends from one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, necessary to achieve uniform color and appearance.

1) Where patching occurs in a smooth painted surface, extend fine paint coat over entire unbroken area containing the patch, after the patched area has received primer and second coat.

b. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

F. Cleaning:

1. Thoroughly clean areas and spaces where cutting and patching is performed used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

END OF SECTION

SECTION 01061

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 SCOPE

This Section covers prevention of environmental pollution and damage as the result of construction operations under this contract. For the purpose of this specification, environmental pollution, and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for esthetic, cultural, and/or historical purposes. The control of environment pollution and damage requires consideration of air, water, and land, and includes management of visual esthetics, noise, and solid waste, as well as other pollutants.

1.2 QUALITY CONTROL

The Contractor shall establish and maintain quality control for environmental protection of all items set forth herein. The Contractor shall record any problems in complying with laws, regulations, and ordinances, and corrective action taken.

1.2.1 Subcontractors

Assurance of compliance with this Section by subcontractors will be the responsibility of the Contractor.

1.2.2 Asbestos Containing Materials

No asbestos-containing materials shall be used or installed under this project work.

1.3 NOTIFICATION

When the Contracting Officer notifies the Contractor in writing of any observed noncompliance with Federal, state, or local laws, regulations, or permits, the Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and take such action as may be approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or costs or damage allowed to the Contractor for any such suspension.

1.4 PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the drawings and specifications. Environmental protection shall be as stated in the following subparagraphs:

1.4.1 Protection of Land Resources

The Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without special permission from the Contracting Officer except as otherwise specified or indicated. See Paragraph 1.5 for additional requirements relating to protection of trees during excavation in the vicinity of a tree.

1.4.2 Disposal of Garbage

Garbage shall be placed in containers which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination.

1.4.3 Refuse

Refuse shall be defined as debris other than organic materials such as brush or tree stumps.

1.4.3.1 Refuse Disposal and Cleanup

The cost of refuse disposal, such as transportation, handling, dumping fees as applicable, and similar cost, shall be included in the contract price. Refuse shall be disposed of off site, in accordance with all local, state, and Federal rules and regulations, at the Contractor's expense.

1.4.3.2 Fire Hazard

Cloths, cotton waste, and other combustible materials that might constitute a fire hazard shall be placed in closed metal containers and placed outside or destroyed at the end of each day.

1.4.4 Restrictions

The Contractor will not be permitted to deposit refuse in existing garbage cans or refuse dumpsters. Cleaners shall not be poured, drained, or washed into plumbing fixtures or sanitary or storm sewers. Debris, dirt, dust, and stains attributable to or resulting from the work effort shall be removed, cleaned, or effaced by the Contractor to the satisfaction of the Contracting Officer prior to acceptance of the job. Refuse shall not be burned. Burning of vegetation or tree stumps will not be allowed unless the work site is in an area approved for burning.

1.4.4.1 Waste Management and Disposal

State of Montana environmental regulations classify disposal sites for their respective abilities to handle various types of solid waste. Asphalt and concrete waste products are to be disposed of in licensed Class II and Class III disposal sites respectively. Contractor shall be responsible for complying with the "Montana Solid Waste Management Act" and the "Administrative Rules of Montana" concerning waste management and disposal.

1.4.5 Disposal of Chemical or Hazardous Waste

Hazardous waste generated by construction operations remains the property of the Contractor and shall be removed from the site. Except as specified below, removal of this hazardous waste shall be coordinated

with the Contracting Officer. Contractor operations shall be, at all times, in compliance with the Resource Conservation and Recovery act (RCRA), 40 CFR, and Montana State Department of Health and Environmental Sciences (MSDHES). The Contractor shall maintain Material Safety Data Sheets (MSDS) for all material used on base and the MSDS' shall be on file on site at the job shack.

1.4.5.1 All hazardous materials used by the Contractor shall be stored properly in special areas in accordance with all regulatory requirements. The Contractor shall:

- Keep containers closed when not in use.
- Label containers with warning labels.
- Post hazardous signs if required.
- Check routinely for leaks and spills.
- Keep materials at central location.

1.4.5.2 Spills

No hazardous materials shall be sprayed or spilled on the ground, asphalt, or concrete covered surfaces at job sites. The Contractor will be charged for any cleanups and disposal costs done by base personnel. All spill cleanups shall be handled by trained personnel only. Refer to CFR 1910.120. Any hazardous product cleanup shall be disposed of according to State of Montana regulations.

1.4.5.2.1 Spill Response Procedure:

The Contractor shall:

- Notify COR and the local Fire Department of any spills.
- Stop source of spill without undue risk of personnel injury. Use on site containment, safety equipment, and materials.
- Make spill scene off limits to all non-cleanup personnel.
- Restrict all sources of ignition if flammable material in spill.
- Report to Environmental Flight, (telephone (406) 731-6165).

1.4.6 Disposal of Solid Waste

1.4.6.1 The Contractor is responsible for handling and disposal of all solid waste generated at the job site. The Contractor shall make all arrangements for disposal of any wastes including wastes requiring special handling such as asbestos, rubble, or non-hazardous chemical wastes. The Contractor is responsible for laboratory testing and any documentation submittals required by the landfill owner. Montana State Department of Health and Environmental Sciences (MSDHES) written approval is required for any non-

inert materials such as asphalt containing materials, asphalt roofing materials, steel containing materials, etc., that are to be disposed of in the Class III landfill site.

1.4.6.2 All non-hazardous wastes shall be properly disposed of through a licensed landfill site. No landfill site is available on base. Demolition rubble shall not be buried anywhere on base or at the work site. Any cleanups and the costs of these cleanups of improper waste disposals or removals of improperly placed hazardous waste materials shall be the responsibility of the Contractor.

1.4.7 Protection of Water Resources

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters.

1.4.7.1 Storm Water and Waste Water System Discharge

1.4.7.1.1 The Contractor shall not dump any restricted materials down the sanitary sewer or waste water disposal system. All discharges to the sewer shall meet Federal, State, and Local regulatory requirements.

1.4.7.1.2 The Contractor will be required to obtain a General Discharge Permit for Storm Water Associated with Construction Activity (GPDSW – Construction) from the Montana Department of Environmental Quality. The Contractor will be responsible for meeting all the permit requirements which contain, but may not be limited to the following:

A. Construction Storm Water Runoff and Erosion Control Map
B. Best Management Practices and Erosion Controls – Narrative Plan and Commitments
C. Project Schedule
D. Monitoring
E. Corrective Actions
F. Reporting Requirements

1.4.7.1.3 The Contractor shall submit all the required application documents to the COR for review and approval. The COR will return the documents within seven days to the Contractor. If approved by the COR, the Contractor shall then submit the application form and Erosion Control Plan to the Montana Department Of Environmental Quality, Water Protection Bureau, at least thirty (30) days prior to beginning any construction activity (clearing, grading and/or excavating). Signed copies of the approved permit will be required to be submitted to the COR prior to any construction activity.

~~1.4.7.1.2 The Contractor shall submit an Erosion Control Plan for Contracting Officer's approval. The plan shall include detailed information on how the surface runoff will be controlled during construction to minimize soil erosion in the construction area and adjacent areas on the base. The Contractor will be required to control all construction operations in strict compliance with the approved Erosion Control Plan.~~

~~1.4.7.1.3 The Contractor shall submit to the Contracting Officer a Notice of Intent (NOI) for Storm Water Discharges Associated with Industrial Activity under a NPDES General Permit, EPA Form 3510-6.~~

1.4.8 PROTECTION OF AIR RESOURCES

1.4.8.1 Burning of material is not allowed.

1.4.8.2. The maintenance and repair work to air conditioning and refrigeration systems shall require that all CFC handling standards be met. Maintenance and repair work on any equipment used or covered by this contract shall require all CFC handling standards be met.

1.4.8.3. The Contractor shall not vent or cause to be vented CFC and HCFC refrigerants (R-11, R-12, R-22, R-113, R-114, R-115, R-500, R-501, R-502 or other mixtures containing CFCs) to the atmosphere during repair or maintenance work on any equipment covered by this contract.

1.4.8.4. The Contractor shall have available refrigerant recovery or reclaim equipment to perform the work.

1.4.8.5. The Contractor personnel who operate refrigerant reclaim or recycling equipment shall possess the necessary state and local certifications for operating the equipment.

1.4.8.6. The Contractor shall be responsible for meeting all requirements, permitting, licensing and certification required by state or local ordinance to work on refrigeration systems.

1.4.8.7 Particulates

Dust particles, aerosols, and gaseous byproducts from construction activities, processing, and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and state allowable limits at all times.

1.4.9 Nuclear Densometers

Where nuclear densometers or other devices containing radioactive elements are used on the project, the Contractor must have a proof of a Nuclear Regulatory Committee (NRC) permit for its use. The Contractor must also keep all radioactive equipment locked up when not in use and remove it from the base at completion of the work day.

1.5 MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain all constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

1.6 PRESERVATION OF HISTORICAL, ARCHEOLOGICAL AND CULTURAL RESOURCES (1985 JAN OCE):

If, during construction activities, the Contractor observes items that might have historical or archeological value, such observations shall be reported immediately to the Contracting Officer so that the appropriate authorities may be notified and a determination can be made as to their significance and what, if any, special disposition of the finds should be made. The Contractor shall cease all activities that may result in the destruction of these resources and shall prevent his employees from trespassing on, removing, or otherwise damaging such resources.

1.7 RESTORATION OF LANDSCAPE (VEGETATION - SUCH AS TREES, PLANTS, AND GRASS) DAMAGE

All landscape features (vegetation - such as trees, plants, and grass) damaged or destroyed during Contractor operations outside and within the work areas shall be restored to a condition similar to that which existed prior to construction activities unless otherwise indicated on the drawings or in the specifications. This restoration shall be done at no additional cost to the Government. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

All plant material shall meet specifications outlined in ANSI Z60.1 - current publication, "American Standard for Nursery Stock."

Grass areas shall be replaced in kind by sodding. Sod shall be required in all regularly maintained lawn areas and shall be installed according to specification section: 02900 LANDSCAPING.

END OF SECTION

SECTION 01095

REFERENCE STANDARDS AND DEFINITIONS

A. Definitions:

1. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.

2. Directed: Terms such as "directed," "requested," " authorized," "selected," "approved," "required" and "permitted" mean "directed by the COR," "requested by the COR," and similar phrases.

3. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

4. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, packing, assembly, installation, and similar operations."

5. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

6. Provide: The term "provide" means "to furnish and install" complete and ready for the intended use."

7. Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

a. The term "experienced," when used with the term "Installer," means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.

b. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited to unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

8. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

9. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

B. Specification Format and Content Explanation:

1. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and MASTERFORMAT numbering system.

2. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

a. Abbreviated Language: Language used in Specifications and other Contract Documents is the abbreviated type. Words and meanings shall be interpreted as appropriate. Words that are implied, but not stated shall be interpolated as the sense required. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the context of the Contract Documents so indicates.

b. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

1) The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 CONTROL AND SCHEDULING OF SUBMITTALS

1.1.1 Submittal Coordination Meeting

At the preconstruction conference and before any submittals are sent to the Contracting Officer's Representative (COR), with the exception of Division 1 submittals, the Contractor shall meet with the CO to develop an approved preliminary submittal register, ENG Form 4288. During the meeting all required items will be identified and grouped into three categories:

- Government Approved (GA)

Government approval is required for extensions of design, critical materials, variations/deviations, an "or equal" decision, equipment whose compatibility with the entire system must be checked, architectural items such as Color Charts/Patterns/Textures, and other items as designated by the COR. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," these submittals will be acted on as "shop drawings."

- For Information Only (FIO)

Submittals not requiring Government approval will be for information only. These are items such as Installation Procedures, Certificates of compliance, Samples, Qualifications, etc. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction," these submittals will not be acted on as "shop drawings."

- Those items that can be visually inspected by the Contractor's Quality Control Representative (CQC) on site or are provided to the Government other than with an ENG Form 4025: The items that fall into this category shall remain on the register but shall not be submitted to the COR. For these items, the "Classification" column on the submittal register shall remain blank.

1.1.2 Final Submittal Register

The final submittal register shall be coordinated with the progress schedule and submitted within 40 days of Notice to Proceed. In preparing the final document, adequate time (minimum of 30 days) shall be allowed for review and approval, and possible resubmittal of each item on the register.

1.1.3 Submittal Register Updates

The Contractor's quality control representative shall review the listing at least every 30 days and take appropriate action to maintain an effective system. Copies of updated or corrected listings shall be submitted to the CO at least every 30 days in the quantity specified.

1.2 SUBMITTAL TYPES

Throughout these specifications submittals may be identified with the prefix "SD" (submittal data) followed by a number (category, i.e., data, drawings, reports, etc.). This is for bookkeeping and record sorting in the system:

Data

Submittals which provide calculations, descriptions, or documentation regarding the work.

Drawings

Submittals which graphically show relationship of various components of the work, schematic diagrams of systems, details of fabrication, layouts of particular elements, connections, and other relational aspects of the work.

Instructions

Preprinted material describing installation of a product, system or material, including special notices and material safety data sheets, if any, concerning impedances, hazards, and safety precautions.

Schedules

Tabular lists showing location, features, or other pertinent information regarding products, materials, equipment, or components to be used n the work.

Statements

A document, required of the Contractor, or through the Contractor from a subcontractor, supplier, installer, or manufacturer to confirm the quality or orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel, qualifications, or other quality verifications.

Reports

Reports of inspections or tests, including analyses and interpretation of test results. Each report shall be properly identified. Test methods used shall be identified and test results shall be recorded.

Certificates

Statement signed by an official authorized to certify on behalf of the manufacturer that a product, system or material meets specified requirements. The statement must be dated after the award of this contract and state the Contractor's name and address, project and location, and list specific requirements which are being certified.

Samples

Fabricated and/or unfabricated physical examples of materials, products, and/or units of work as complete units or as portions of units.

Records

Documentation to record compliance with technical or administrative requirements.

Operation and Maintenance Manuals

Data which forms a part of an operation and maintenance manual.

Submittals required by the Contract Clauses and other non-technical parts of the contract are not necessarily included in this section. These type of submittals can be added to the register before or during the submittal coordination meeting.

1.3 APPROVED SUBMITTALS

The approval of submittals by the CO shall not be construed as a complete check, but will indicate only that the general method of construction, materials, detailing and other information are satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist. The Contractor, under the CQC requirements of this contract, is responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work. After submittals have been approved by the COR, no resubmittal for the purpose of substituting materials or equipment will be given consideration.

1.4 DISAPPROVED SUBMITTALS

The Contractor shall make all corrections required by the CO and promptly furnish a corrected submittal in the format and number of copies specified for the initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, written notice, as required under the Contract Clause entitled "Changes," shall be given to the COR.

1.5 PAYMENT

Separate payment will not be made for submittals, and all costs associated therein shall be included in the applicable unit prices or lump sum prices contained in the schedule. Payment will not be made for any material or equipment which does not comply with contract requirements.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

Prior to submittal, all items shall be checked and approved by the Contractor's CQC and each item of the submittal shall be stamped, signed, and dated. Each respective transmittal form (ENG Form 4025) shall be signed and dated by the CQC certifying that the accompanying submittal complies with the contract requirements. This procedure applies to all submittals. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including, but not limited to, catalog cuts, diagrams; operating charts or curves; test reports; test cylinders; samples; O&M manuals including parts lists; certifications; warranties and other such required items. Units of weights and measures used on all submittals shall be the same as the contract drawings. Each submittal shall be

complete and in sufficient detail to allow ready determination of compliance with contract requirements. GA submittals shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. The CO may request submittals in addition to those listed when deemed necessary to adequately describe the work covered in the respective sections. The Contractor shall maintain a complete and up-to-date file of all submittals/items on site for use by both the Contractor and the Government.

3.2 SUBMITTAL REGISTER (ENG Form 4288)

The Contractor shall prepare the preliminary submittal register - ENG Form 4288 - listing each item of equipment and material for which submittals are required throughout the specifications. The Contractor shall approve all items listed on the submittal register. During the submittal coordination meeting, the preliminary submittal register will be reviewed and annotated. When the final submittal register is submitted for approval, the Contractor shall complete the column entitled “Item No.” and all data under “Contractor Schedule Dates” and return five completed copies to the CO for approval. The Contractor shall review the list to ensure its completeness and may expand general category listings to show individual entries for each item. The numbers in column “Item No.” are to be assigned sequentially starting with "1" for each specification section. DO NOT pre-assign transmittal numbers when preparing the submittal register. When a conflict exists between the submittal register and a submittal requirement in the technical sections, other than those submittals referenced in Paragraph 3.9: Field Test Reports, the approved submittal register shall govern. The preliminary, and then the final approved submittal register, will become the scheduling documents and will be updated monthly and used to control submittals throughout the life of the contract. Names and titles of individuals authorized by the Contractor to approve shop drawings shall be submitted to CO with the final 4288 form. Supplier or subcontractors certifications are not acceptable as meeting this requirement. (Blank ENG Form 4288 is attached at the end of this specification.)

3.3 SCHEDULING

Submittals covering component items forming a system, or items that are interrelated, shall be coordinated and submitted concurrently. Certifications shall be submitted together with other pertinent information and/or drawings. Additional processing time beyond 30 days, or number of copies, may be shown by the CO on the submittal register attached in the “Remarks” column, or may be added by the CO during the coordination meeting. No delays damages or time extensions will be allowed for time lost due to the Contractor not properly scheduling and providing submittals.

3.4 TRANSMITTAL FORM (ENG Form 4025)

Transmittal Form 4025 (sample at end of this section) shall be used for submitting both GA and FIO submittals in accordance with the instructions on the reverse side of the form. Transmittal numbers shall be assigned sequentially. Electronic generated 4025 forms shall be printed on carbonyls paper and be a reasonable facsimile of the original 4025. If electronic forms are not used, the original 4025 forms shall be used (do not photo copy) and will be furnished by the COR. These forms shall be filled in completely prior to submittal. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.. Each submittal item shall be listed separately on the form, naming subcontractor, supplier, or manufacturer, applicable specification paragraph number(s), drawing/sheet number, pay item number, and any other information needed to identify the item, define its use, and locate it in the work. One or more 4025 forms may be used per specification section, however, DO NOT include more than one specification section per transmittal.

3.5 CROSS-REFERENCE (ENG FORM 4288/ENG FORM 4025)

To provide a cross-reference between the approved submittal register and transmittal forms, the Contractor shall record the "transmittal numbers" assigned when submitting items in column “Transmittal No.” of the ENG FORM 4288. The item numbers in column “Item No.” of submittal register shall correspond to the item numbers on ENG Form 4025.

3.6 SUBMITTAL PROCEDURE

3.6.1 General

Shop drawings with 4025 forms shall be submitted in the number of copies specified in subparagraphs "Government Approved Submittals" and "Information Only Submittals," or as indicated on the submittal register in the “Remarks” column. Submit a complete collated “reviewers copy” with one 4025 form and attachments (not originals). The remaining copies (4 for GA, 2 for FIO) of 4025 forms and attachments shall not be collated. This would not apply to a series of drawings.

3.6.2 Approval of Submittals by the Contractor

Before submittal to the COR, the Contractor shall review and correct shop drawings prepared by subcontractors, suppliers, and itself, for completeness and compliance with plans and specifications. The Contractor shall not use red markings for correcting material to be submitted. Red markings are reserved for COR’s use. Approval by the Contractor shall be indicated on each shop drawing by an approval stamp containing information as shown in this section. Submittals not conforming to the requirements of this section will be returned to the Contractor for correction and resubmittal.

3.6.3 Variations

For submittals which include proposed variations requested by the Contractor, column “h” of ENG Form 4025 shall be checked and the submittal shall be classified as GA, and submitted accordingly. The Contractor shall set forth in writing the justification for any variations and annotate such variations on the transmittal form in the REMARKS block. Variations are not approved unless there is an advantage to the Government. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted variations.

3.6.4 Drawings

Each drawing shall be not more than 28 inches high by 40 inches wide, with a title block in lower right hand corner and a 3” x 4” clear area adjacent. The title block shall contain the subcontractor's or fabricator's name, contract number, description of item(s), bid item number, and a revision block. Provide a blank margin of ¾ inch at bottom, 2 inches at left, and ½ inch at top and right. Where drawings are submitted for assemblies of more than one piece of equipment or systems of components dependent on each other for compatible characteristics, complete information shall be submitted on all such related components at the same time. The Contractor shall ensure that information is complete and that sequence of drawing submittal is such that all information is available for reviewing each drawing. Drawings for all items and equipment, of special manufacture or fabrication, shall consist of complete assembly and detail drawings. All revisions after initial submittal shall be shown by number, date, and subject in revision block.

3.6.4.1 Submittals Containing Drawings Larger than A3 size

For GA submittals containing drawings larger than A3 size, one reproducible and one blue line copy will be required to be submitted with five copies of the ENG Form 4025. The marked-up reproducible (and/or any review comments contained on the page-size comment sheet(s) at the Government's option) will be returned to the Contractor upon review. Three copies of blue line drawings (generated from the reviewed reproducible) will be provided to the Government within 10 days of Contractor's receipt of the reviewed reproducible. The Contractor shall not incorporate approved work into the project until the Government has received the three blue line copies. The Contractor shall use the marked-up reproducible to make any additional copies as needed. For FIO submittals, one reproducible and two blue line copies will be required to be submitted with the appropriate number of copies of ENG Form 4025.

3.6.5 Printed Material

All requirements for shop drawings shall apply to catalog cuts, illustrations, printed specifications, or other data submitted, except that the 3" x 4" clear area adjacent to the title block is not mandatory. Inapplicable portions shall be marked out and applicable items such as model numbers, sizes, and accessories shall be indicated by arrow or highlighted.

3.7 SAMPLES REQUIRING LABORATORY ANALYSIS

See Section 01451 CONTRACTOR QUALITY CONTROL for procedures and address for samples requiring Government testing.

3.8 SAMPLES REQUIRING VISUAL INSPECTION

Samples requiring only physical inspection for appearance and suitability shall be coordinated with the on-site Government quality assurance representative (QAR).

3.9 FIELD TEST REPORTS

Routine tests such as soil density, concrete deliveries, repetitive pressure testing shall be delivered to the QAR with the daily Quality Control reports. See SECTION: 01451 CONTRACTOR QUALITY CONTROL.

3.10 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

3.11 GOVERNMENT APPROVED SUBMITTALS (GA)

The Contractor shall submit 5 copies of GA submittals with 5 corresponding 4025 forms. Upon completion of GA submittal review, copies as specified below will be marked with an action code, dated, and returned to the Contractor. See "Drawings" above for special instructions if drawings larger than size A3 are used.

3.11.1 Processing of GA Submittals

Submittals will be reviewed and processed as follows:

a. Approved as Submitted (Action Code "A"): Shop drawings which can be approved without correction will be stamped "Approved" and two copies will be returned to the Contractor. No resubmittal required.

b. Approved Except as Noted (Action Code "B"): Shop drawings which have only minor discrepancies will be annotated in red to indicate necessary corrections. Marked material will be stamped "Approved Except as Noted" and two copies returned to the Contractor for correction. No resubmittal required.

c. Approved Except as Noted (Action Code "C"): Shop drawings which are incomplete or require more than minor corrections will be annotated in red to indicate necessary corrections. Marked material will be stamped "Approved Except as Noted - Resubmission Required" and two copies returned to the Contractor for correction. Resubmittal of only those items needing correction required.

d. Disapproved (Action Code "E"): Shop drawings which are fundamentally in error, cover wrong equipment or construction, or require extensive corrections, will be returned to the Contractor stamped "Disapproved." An explanation will be furnished on the submitted material or on ENG Form 4025 indicating reason for disapproval. Complete resubmittal required.

e. Resubmittal will not be required for shop drawings stamped "A" or "B" unless subsequent changes are made by Contractor or a contract modification. For shop drawings stamped "C" or "E," Contractor shall make corrections required, note any changes by dating the revisions to correspond with the change request date, and promptly resubmit the corrected material. Resubmittals shall be associated with the “parent” by use of sequential alpha characters (for example, resubmittal of transmittal 8 will be 8A, 8B, etc). Government costs incurred after the first resubmittal may be charged to the Contractor.

3.12 INFORMATION ONLY SUBMITTALS (FIO)

The Contractor shall submit three copies of data and four copies of ENG Form 4025. FIO submittals will not be returned. Government approval is not required on FIO submittals. These submittals will be used for information purposes. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the Contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications and will not prevent the CO from requiring removal and replacement if nonconforming material is incorporated in the work. This does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or check testing by the Government in those instances where the technical specifications so prescribe.

3.12.1 Processing of FIO Submittals

FIO submittals shall be submitted prior to delivery of the material or equipment to the job site. ENG Form 4025 shall be marked with the words "contractor approved - information copy only" in the REMARKS block of the form. Submittals will be monitored and spot checks made. When such checks indicate noncompliance, the Contractor will be notified by the same method used for GA submittals. Resubmittal of nonconforming FIO submittals shall be reclassified GA and shall be in five copies.

3.13 CONTRACTOR APPROVAL STAMP

The stamp used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

CONTRACTOR:
_____
CONTRACT NUMBER
_____

TRANSMITTAL NUMBER _____
ITEM NUMBER _____
SPECIFICATION SECTION _____
PARAGRAPH NUMBER _____
_____ APPROVED AS SUBMITTED
_____ APPROVED WITH CORRECTIONS AS NOTED

SIGNATURE: _____
TITLE: _____
DATE _____

CONTRACTORS REVIEW STAMP

MAXIMUM SIZE:

3 INCHES BY 3 INCHES

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE *(Read instructions on the reverse side prior to initiating this form)*	DATE	TRANSMITTAL NO.

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS *(This section will be initiated by the contractor)*

TO:	FROM:	CONTRACT NO.	CHECK ONE: ☐ THIS IS A NEW TRANSMITTAL ☐ THIS IS A RESUBMITTAL OF TRANSMITT/_____
SPECIFICATION SEC. NO. *(Cover only one section with each transmittal)*	PROJECT TITLE AND LOCATION		CHECK ONE: THIS TRANSMITTAL IS FOR ☐ FIO ☐ GOV'T. APPROVAL

ITEM NO. *a.*	DESCRIPTION OF ITEM SUBMITTED *(Type size, model number/etc.)* *b.*	MFG OR CONTR. CAT., CURVE DRAWING OR BROCHURE NO. *(See instruction no. 8)* *c.*	NO. OF COPIES *d.*	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE *g.*	VARIATION *(See instruction No. 8)* *h.*	FOR CE USE CODE *i.*
				SPEC. PARA. NO. *e.*	DRAWING SHEET NO. *f.*			

REMARKS

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

_____

NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED *(List by Item No.)*	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE

ENG FORM 4025-R, MAR 95 *(ER 415-1-10)* EDITION OF SEP 93 IS OBSOLETE. SHEET ___ OF ___ (Reverse, CEMPCE)

INSTRUCTIONS

1. Section I will be initiated by the Contractor in the required number of copies.

2. Each transmittal shall be numbered consecutively in the space provided for "Transmittal No.". This number, in addition to the contract number, will form a serial number for identifying each submittal. For new submittals or resubmittals mark the appropriate box; on resubmittals, insert transmittal number of last submission as well as the new submittal number.

3. The "Item No." will be the same "Item No." as indicated on ENG FORM 4288-R for each entry on this form.

4. Submittals requiring expeditious handling will be submitted on a separate form.

5. Separate transmittal form will be used for submittals under separate sections of the specifications.

6. A check shall be placed in the "Variation" column when a submittal is not in accordance with the plans and specifications--also, a written statement to that effect shall be included in the space provided for "Remarks".

7. Form is self-transmittal, letter of transmittal is not required.

8. When a sample of material or Manufacturer's Certificate of Compliance is transmitted, indicate "Sample" or "Certificate" in column c, Section I.

9. U.S. Army Corps of Engineers approving authority will assign action codes as indicated below in space provided in Section I, column i to each item submitted. In addition they will ensure enclosures are indicated and attached to the form prior to return to the contractor. The Contractor will assign action codes as indicated below in Section I, column g. to each item submitted.

THE FOLLOWING ACTION CODES ARE GIVEN TO ITEMS SUBMITTED

A	--	Approved as submitted.	E	--	Disapproved (See attached).
B	--	Approved, except as noted on drawings.	F	--	Receipt acknowledged.
C	--	Approved, except as noted on drawings. Refer to attached sheet resubmission required.	FX	--	Receipt acknowledged, does not comply as noted with contract requirements.
D	--	Will be returned by separate correspondence.	G	--	Other *(Specify)*

10. Approval of items does not relieve the contractor from complying with all the requirements of the contract plans and specifications.

(Reverse of ENG Form 4025-R)

SUBMITTAL REGISTER

(ER 415-1-10)

CONTRACT NUMBER

TITLE AND LOCATION

CONTRACTOR

SPECIFICATION SECTION

				TYPE OF SUBMITTAL										CLASSIFICATION			CONTRACTOR SCHEDULE DATES			CONTRACTOR ACTION			GOVERNMENT ACTION		
TRANSMITTAL NO	ITEM NO	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	DATA	DRAWINGS	INSTRUCTIONS	SCHEDULES	STATEMENTS	REPORTS	CERTIFICATES	SAMPLES	RECORDS	OPERATION AND MAINTENANCE	INFORMATION ONLY	GOVERNMENT APPROVED	REVIEWER	SUBMIT	APPROVAL NEEDED BY	MATERIAL NEEDED BY	CODE	DATE	SUBMIT TO GOVERNMENT	CODE	DATE	REMARKS

ENG FORM 4288, MAY 91

EDITION OF AUG 89 IS OBSOLETE

This page intentionally blank

SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740	(1996) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM E 329	(1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled "Inspection of Construction." The quality control system shall consist of plans, procedures, and organization necessary to produce an end product which complies with the contract requirements. The system shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 10 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the

Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 60 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project manager. If the project manager and project superintendent are the same person, the CQC System Manager shall report to someone higher in the Contractor's organization than the project manager.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities will be approved by the Contracting Officer.)

f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

g. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

h. Reporting procedures, including proposed reporting formats.

i. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 5 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 General

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The Contractor shall provide a CQC organization which shall be at the site at all times during progress of the work and with complete authority to take any action necessary to ensure compliance with the contract. All CQC staff members shall be subject to acceptance by the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of 5 years construction experience on construction similar to this contract or a construction person with a minimum of 10 years in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. The CQC System Manager shall be assigned as System Manager but may have duties as project superintendent in addition to quality control. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be the same as for the designated CQC System Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager for the following areas: electrical, mechanical. These individuals may be employees of the prime or subcontractor; be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.

3.4.4 Additional Requirement

In addition to the above experience education requirements the CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors". This course is periodically offered at AGC offices throughout the state of Washington and Oregon.

3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS

Submittals shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals are in compliance with the contract requirements.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least

three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

a. A review of each paragraph of applicable specifications.

b. A review of the contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. A review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.

j. Discussion of the initial control phase.

k. The Government shall be notified at least 48 hours in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 24 hours in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Contractor shall submit all materials test reports on forms standard to industry standards such as ACI, ASTM and AASHTO or with laboratory accreditation forms such as AALA, NIST or NVLAP. Upon request, the Contractor shall furnish to

the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Costs of testing the Contractor Laboratory facilities for Government acceptance shall be borne by the Contractor. Laboratory facilities, including personnel and equipment, utilized for testing soils, concrete, asphalt and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329, and be accredited by the American Association of Laboratory Accreditation (AALA), National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO), or other approved national accreditation authority. All personnel performing concrete testing shall be certified by the American Concrete Institute (ACI). The contractor shall submit documentation showing the AALA, or other approved testing facility, certification, personnel ACI certifications, and the name and work experience of the Registered Professional Engineer on the staff.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials will be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to the Corps of Engineers Division Laboratory, f.o.b., at the following address:

U.S. Army Corps of Engineers
Materials Testing Center
Waterways Experiment Station
3909 Hall Ferry Road
Vicksburg, MS 39180-6199
Phone: (610) 634-3974

ATTN: Project _____, Contract Number _____

Coordination for each specific test, exact delivery location and dates will be made through the Area Office.
If samples are scheduled to arrive at the laboratory on a weekend (after 1700 Friday through Sunday) notify the laboratory at least 24 hours in advance at (601) 634-3974 to arrange for delivery.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a punch list of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform this inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be on an acceptable form that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase shall be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.

f. Submittals reviewed, with contract reference, by whom, and action taken.

g. Off-site surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both

conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. The original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 SAMPLE FORMS

Sample forms are attached at the end of this specification section.

3.11 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

(sample of typical Contractor's Daily Report)
DAILY CONSTRUCTION QUALITY CONTROL REPORT

Contract Number: _____ Date: _____ Rpt. No._____

Contract Title: _____ Location: _____

Weather: Clear __ P. Cloudy __ Cloudy __ Rainfall __ (__% of workday)

Temperature during workday: High ____ degrees F. Low ___ degrees F.

1. WORK PERFORMED BY CONTRACTOR/SUBCONTRACTOR(S):

Contractor Name	No. of Workers	Crafts/Hours	Work performed

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

2. EQUIPMENT DATA:

Type, Size, Etc.	Owned/Rented	Hours Used	Hours Standby

_____

_____

_____

_____

_____

3. QUALITY CONTROL INSPECTIONS AND RESULTS: (Include a description of preparatory, initial, and/or follow up inspections or meetings; check of subcontractors work and materials delivered to the site compared to submittals and/or specifications; comments on the proper storage of materials; include comments on corrective actions to be taken):

_____

_____

_____

_____

4. QUALITY CONTROL TESTING AND RESULTS (comment on tests and attach test reports):

_____

_____

_____

5. DAILY SAFETY INSPECTIONS (Include comments on new hazards to be added to the Hazard Analysis and corrective action of any safety issues):

_____

_____

6. REMARKS (Include conversations with or instructions from the Government representatives; delays of any kind that are impacting the job; conflicts in the contract documents; comments on change orders; environmental considerations; etc.):

_____

_____

_____

_____

_____

CONTRACTOR'S VERIFICATION: The above report is complete and correct. All material, equipment used, and work performed during this reporting period are in compliance with the contract documents except as noted above.

_____
CONTRACTOR QC REPRESENTATIVE

(Sample of Typical Contractor's Test Report)

TEST REPORT

STRUCTURE OR BUILDING _____

CONTRACT NO. _____

DESCRIPTION OF ITEM, SYSTEM, OR PART OF SYSTEM TESTED:
_____

_____

DESCRIPTION OF TEST: _____

_____

_____

NAME AND TITLE OF PERSON IN CHARGE OF PERFORMING TESTS FOR THE CONTRACTOR:

NAME_____

TITLE_____

SIGNATURE_____

I HEREBY CERTIFY THAT THE ABOVE DESCRIBED ITEM, SYSTEM, OR PART OF SYSTEM HAS BEEN TESTED AS INDICATED ABOVE AND FOUND TO BE ENTIRELY SATISFACTORY AS REQUIRED IN THE CONTRACT SPECIFICATIONS.

SIGNATURE OF CONTRACTOR
QUALITY CONTROL INSPECTOR_____

DATE_____

REMARKS
_____

_____

_____

END OF SECTION

This page intentionally left blank

SECTION 01501

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 AVAILABILITY OF UTILITY SERVICES

1.1.1 The Government will make all reasonably required amounts of utilities available to the Contrctor from existing outlets and supplies, as specified in the contract. Unless otherwise provided in the contract, the amount of each utility service consumed shall be charged to or paid for by the Contractor at prevailing rates charged to the Government or, where the utility is produced by the Government, at reasonable rates determined by the Contracting Officer. The Contractor shall carefully conserve any utilities furnished without charge.

1.1.2 The Contractor, at its expense and in a workmanlike manner satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of each utility used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connection, distribution lines, meters, and associated paraphernalia.

1.2 SANITARY PROVISIONS

Contractor shall provide sanitary accommodations for the use of employees as may be necessary and shall maintain accommodations approved by the Contracting Officer and shall comply with the requirements and regulations of the State Health Department, County Sanitarian, or other authorities having jurisdiction.

1.3 TEMPORARY ELECTRIC WIRING

1.3.1 Temporary Power and Lighting

The Contractor shall provide construction power facilities in accordance with the safety requirements of the National Electric Code NFPA No. 70 and the SAFETY AND HEALTH REQUIREMENTS MANUAL EM 385-1-1. The Contractor, or its delegated subcontractor, shall enforce the safety requirements of electrical extensions for the work of subcontractors. Work shall be accomplished by skilled electrical tradesmen.

1.3.2 Construction Equipment

In addition to the requirements of SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, temporary wiring conductors installed for operation of construction tools and equipment shall be either Type TW or THW contained in metal raceways, or shall be hard usage or extra hard usage multiconductor cord. Temporary wiring shall be secured above the ground or floor in a workmanlike manner and shall not present an obstacle to persons or equipment. Open wiring may only be used outside of buildings, and then only in accordance with the provisions of the National Electric Code.

1.3.3 Submittals

Submit detailed drawings of temporary power connections. Drawings shall include, but not be limited to, main disconnect, grounding, service drops, service entrance conductors, feeders, GFCI'S, and all site trailer connections.

1.4 FIRE PROTECTION

During the construction period, the Contractor shall provide fire extinguishers in accordance with the safety requirements of the SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, SEP 96. The Contractor shall remove the fire extinguishers at the completion of construction.

1.5 STAGING AREA

Contractor will be provided adequate open staging area as directed by the Contracting Officer. Area is unsecured, and Contractor shall make provisions for its own security.

Contractor shall be responsible for keeping staging area, and office area clean and free of weeds and uncontrolled vegetation growth. Weeds shall be removed by pulling or cutting to within 25 mm (1-inch) of ground level. Lawn areas shall be mown to keep growth to less than 51 mm (2-inches). All loose debris and material subject to being moved by prevailing winds in the area shall be picked up or secured at all times.

If the area is not maintained in a safe and clean condition as defined above the Contracting Officer may have the area cleaned by others with the costs being deducted from the contractor's payment.

1.6 HOUSEKEEPING AND CLEANUP

Pursuant to the requirements of Clause CLEANING UP and Clause ACCIDENT PREVENTION, of the CONTRACT CLAUSES, the Contractor shall assign sufficient personnel to insure compliance. The Contractor shall submit a detailed written plan for implementation of this requirement. The plan will be presented as part of the preconstruction safety plan and will provide for keeping the total construction site, structures, and accessways free of debris and obstructions at all times. Work will not be allowed in those areas that, in the opinion of the Contracting Officer, have unsatisfactory cleanup and housekeeping at the end of the preceding day's normal work shift. At least once each day all areas shall be checked by the Quality Control person of the Contractor and the findings recorded on the Quality Control Daily Report. In addition, the Quality Control person shall take immediate action to insure compliance with this requirement. Housekeeping and cleanup shall be assigned by the Contractor to specific personnel. The name(s) of the personnel shall be available at the project site.

1.7 CONSTRUCTION NEAR COMMUNICATIONS CABLES

1.7.1 Excavation Near Communication Cables

Digging within 3 feet of communication cables (including fiber optic cables) shall be performed by hand digging until the cable is exposed. The Contracting Officer shall be notified a minimum 3 days prior to digging within a 3-foot area near cable. A representative from the local utility company must be present

during excavation of communications cables. The cable route will be marked by the Government prior to excavation in the area. A digging permit shall be obtained by the Contractor before performing any excavation. The Contractor shall be held responsible for any damage to the cable by excavation procedures. Once the cable is exposed, mechanical excavation may be used if there is no chance of damage occurring to the cable.

1.7.2 Reburial of Exposed Utilities

When existing utility lines are reburied a tape, detectable by pipe detector systems, shall be installed above the uncovered length of the utility at a depth of 305 mm (12 inches) below grade. Tape shall be a minimum .127 mm (5 mil) plastic tape with metallic tracer, minimum 76 mm (3 inches) wide, lettering on tape to show buried utility, and brightly colored.

1.7.4 Cable Cuts or Damage

If a communications cable is cut or damaged the Contractor shall immediately notify the Contracting Officer (CO) and begin gathering personnel and equipment necessary to repair the cut or damage, in coordiantion with the local utility company.

1.8 ELEVATED WORK AREAS

Workers in elevated work areas in excess of 6 feet above an adjoining surface require special safety attention. In addition to the provisions of SAFETY AND HEALTH REQUIREMENTS MANUAL, EM 385-1-1, the following safety measures are required to be submitted to the Contracting Officer's Representative. Prior to commencement of work in elevated work areas, the Contractor shall submit drawings depicting all provisions of his positive fall protection system including, but not limited to, all details of guardrails. Positive protection for workmen engaged in the installation of structural steel and steel joist shall be provided by safety nets, tie-offs, hydraulic man lifts, scaffolds, or other required means. Decking crews must be tied-off or work over nets or platforms not over 6 feet below the work area. Walking on beams and/or girders and the climbing of columns is prohibited without positive protection. Perimeter guardrails shall be installed at floor, roof, or wall openings more than 6 feet above an adjoining surface and on roof perimeters. Rails shall be designed to protect all phases of elevated work including, but not limited to, roofing operations and installation of gutters and flashing. Rails around roofs may not be removed until all work on the roof is complete and all traffic on or across the roof ceases. Rails shall be designed by a licensed engineer to provide adequate stability under any anticipated impact loading. As a minimum, the rails shall consist of a top rail at a height of 42 inches, a mid-rail, and a toe board. Use of tie-offs, hydraulic man lifts, scaffolds, or other means of roof edge protection methods may be utilized on small structures such as family housing, prefabricated metal buildings, etc. If safety belts and harnesses are used, the positive fall protection plan will address fall restraint versus fall arrest. Body belts will ONLY be used for fall restraint, they will not be used for fall arrest.

1.9 TRAFFIC CONTROL

The Contractor shall provide for movement of traffic through and around the construction zone in a manner that is conducive to the safety of motorists, pedestrians, and workers. This shall include placement and maintenance of traffic control devices in accordance with the U.S. Department of Transportation, Federal Highway Administration publication, Manual on Uniform Traffic Control Devices.

Streets (except dead end) may be closed to traffic temporarily by approved written request to the Contracting Officer at least 10 working days prior to street closure. Street closures shall at all times allow street access to a building from one direction. A traffic olan for all phases of work shall be submitted for approval prior to proceeding with work in and affected area. Excavations shall not remain open for more than 1 working day without approval.

1.10 UTILITIES NOT SHOWN

The Contractor can expect to encounter, within the construction limits of the entire project, utilities not shown on the drawings and not visible as to the date of this contract. If such utilities will interfere with construction operations, he shall immediately notify the Contracting Officer verbally and then in writing to enable a determination by the Contracting Officer as to the necessity for removal or relocation. If such utilities are removed or relocated as directed, the Contractor shall be entitled to equitable adjustment for any additional work or delay. The types of utilities the Contractor may encounter are waterlines, sewerlines (storm and sanitary), gaslines, fueling lines, steamlines, buried fuel tanks, septic tanks, other buried tanks, communication lines, and powerlines. These utilities may be active or abandoned utilities.

1.11 GOVERNMENT WITNESSING AND SCHEDULING OF TESTING

The Contractor shall certify that all equipment, materials, and personnel necessary to conduct such testing will be available on the scheduled date and that the systems have been prechecked by him and are ready for performance and/or acceptance testing. Contractor shall also confirm that all operations and maintenance manuals have been submitted and approved. NO PERFORMANCE AND/OR ACCEPTANCE TESTING WILL BE PERMITTED UNTIL THE OPERATIONS AND MAINTENANCE MANUALS HAVE BEEN APPROVED.

Government personnel, at the option of the Government, will travel to the site to witness testing. If the testing must be postponed or canceled for whatever reason not the fault of the government, the Contractor shall provide the Government not less than 3 working days advance notice (notice may be faxed) of this postponement or cancellation. Should this 3 working day notice not be given , the Contractor shall reimburse the Government for any and all out of pocket expenses incurred for making arrangements to witness such testing including, but not limited to airline, rental car, meal, and lodging expenses. Should testing be conducted, but fail and have to be rescheduled for any reason not the fault of the Government, the Contractor shall similarly reimburse the Government for all expenses incurred.

1.12 HARD HAT SIGNS

The Contractor shall provide 610 mm by 610 mm (24 by 24 inch) square Hard Hat Area signs at each entry to the project or work area as directed by the Contracting Officer. A minimum of two signs will be required. Signs shall be in accordance with the sketch at the end of this section.

1.13 CONSTRUCTION PLANNING MEETINGS

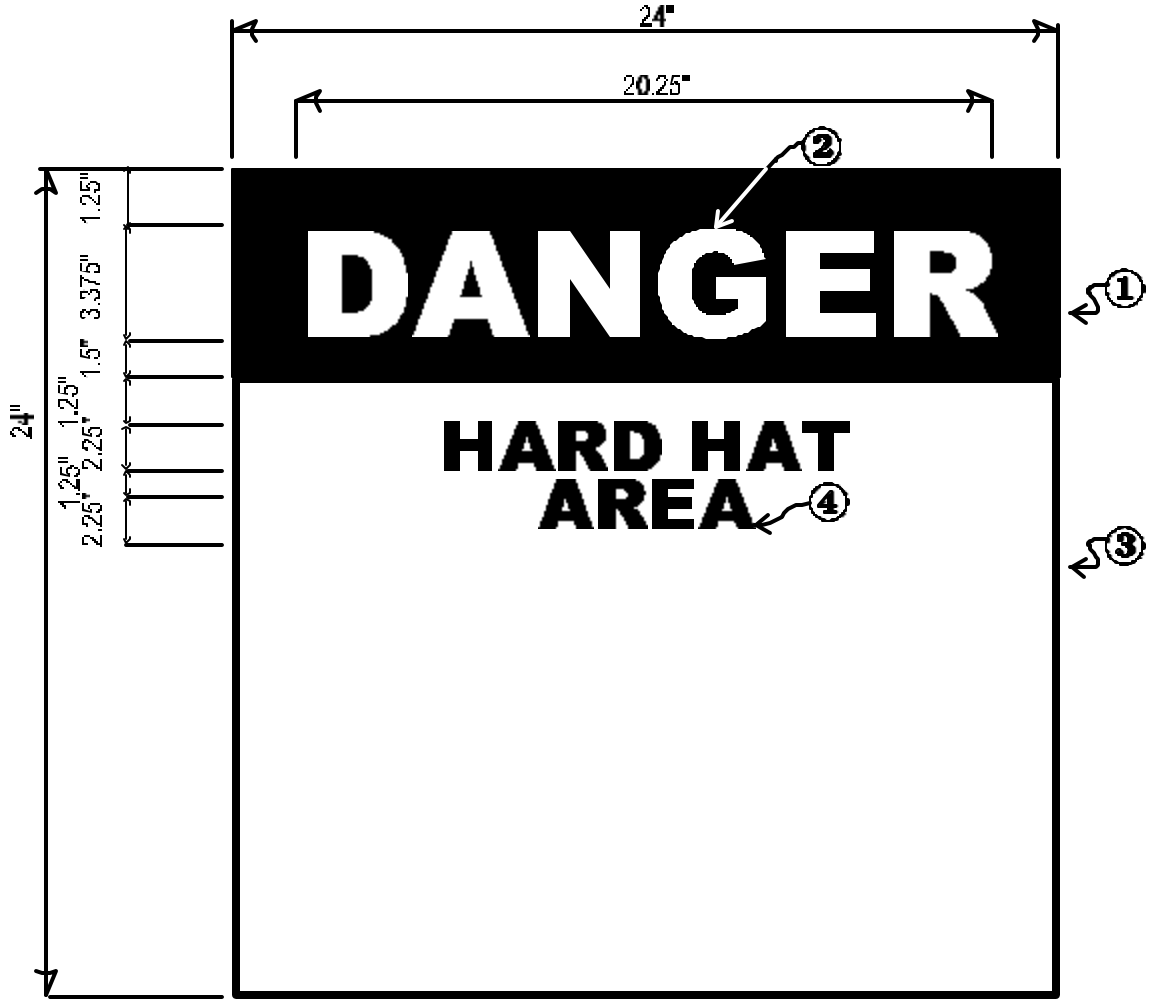
Contractor shall attend a weekly scheduling meeting with the Contracting Officer's Representative and a representative of the using service. During the meeting, the Contractor shall be required to present in writing, and discuss his specific construction plans for, the following 2-week period. The first week's schedule shall be firm and the second weeks' schedule may be tentative and subject to change as

conditions warrant. The schedule shall be detailed describing planned work activities, crew sizes and locations, and any utility and access restrictions to base activity which may be caused by planned construction. Any scheduling of outages will be performed at this meeting. Any Contractor activity affecting base security needs, such as scattered crews and number of workers per crew, will be detailed in the written schedule and discussed during the meeting. This weekly meeting is in addition to the construction progress charts or network analysis submission requirements.

1.14 FIELD OFFICE TRAILER

The Contractor shall furnish a trailer, containing approximately 200 square feet, in a location designated by and for the use of the Contracting Officer. The trailer shall be furnished with two desks. One desk shall be 5 feet long by 3 feet wide, with a side drawer and a center drawer that can be locked. The second desk shall be 3 feet by 4 feet minimum, suitable for laying out full-scale contract plans. Two chairs and one stool shall be furnished.. A wall locker shall be furnished which is suitable for hanging coats and rain gear and as general storage. It shall be 60 inches to 72 inches high, 18 inches to 24 inches wide, and 18 inches deep (minimum). The building shall have two windows and shall have a door with a lock set with two keys. Each window shall have not less than 6 square feet of glass area, and the door shall be 2 feet, 8 inches wide by 6 feet, 8 inches high. Contractor shall provide a ten pound, multipurpose, dry chemical fire extinguisher, rated for type A, B, and C fires. Extinguisher shall be mounted at a strategic location, coordinated with the Contracting Officer. The Contractor shall furnish and maintain adequate electric lights and wall outlets, heat, air-conditioning, and drinking water for the building, and shall perform any necessary maintenance and disposal of waste to the building. Drinking water shall be either supplied and maintained daily in insulated water can or be provided via piping to an indoor sink. Suitable enclosed sanitary toilet and lavatory facilities shall be furnished in the immediate vicinity of the building and kept clean by the Contractor. Contractor shall be responsible for installing all utility hookups, tie downs, skirting, slabs, foundations, steps and landings as necessary to meet all local, county, state and federal codes and regulations. The trailer will remain property of the Contractor and shall be removed from the site upon completion of the project. (As an alternative, the office space may be a lockable room within a larger structure. This office space shall meet all other requirements of this paragraph.)

PART 2 PRODUCTS AND PART 3 EXECUTION (NOT APPLICABLE)



- SIGN SHALL BE FABRICATED FROM .125 THICK 6061-T6 ALUMINUM PANEL
- COLOR
    1. SAFETY RED (SR)
    2. WHITE
    3. WHITE
    4. BLACK
- LETTERING SHALL BE HELVETICA BOLD TYPOGRAPHY.
- LETTERS AND BACKGROUND SHALL BE REFLECTIVE SHEETING MATERIAL.
- SIGNS SHALL BE POSTED AT 6’-6” (BOTTOM SIGN TO GRADE) OR AS DIRECTED BY THE CONTRACTING OFFICER.

LETTERING TO BE CENTERED ON PANEL.

SECTION 01702

AS BUILT RECORDS AND DRAWINGS

PART 1 GENERAL

1.1 SUBMITTALS

Data listed in PART 3 of this section shall be submitted in accordance with section 01330 SUBMITTAL PROCEDURES. Due dates shall be as indicated in applicable paragraphs and all submittals shall be completed before final payment will be made.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 AS-BUILT FIELD DATA

3.1.1 General

The Contractor shall keep at the construction site two complete sets of full size blueline prints of the contract drawings, reproduced at Contractor expense, one for the Contractor's use, one for the Government. During construction, both sets of prints shall be marked to show all deviations in actual construction from the contract drawings. The color red shall be used to indicate all additions and green to indicate all deletions. The drawings shall show the following information but not be limited thereto:

a. The locations and description of any utility lines and other installations of any kind or description known to exist within the construction area. The location includes dimensions and/or survey coordinates to permanent features.

b. The locations and dimension of any changes within the building or structure, and the accurate location and dimension of all underground utilities and facilities.

c. Correct grade or alignment of roads, structures, and utilities if any changes were made from contract plans.

d. Correct elevations if changes were made in site grading from the contract plans.

e. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor including, but not limited to, fabrication erection, installation, and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.

f. The topography and grades of all drainage installed or affected as part of the project construction.

g. All changes or modifications from the original design and from the final inspection.

h. Where contract drawings or specifications allow options, only the option actually used in the construction shall be shown on the as-built drawings. The option not used shall be deleted.

These deviations shall be shown in the same general detail utilized in the contract drawings. Marking of the prints shall be pursued continuously during construction to keep them up to date. In addition, the Contractor shall maintain full size marked-up drawings, survey notes, sketches, nameplate data, pricing information, description, and serial numbers of all installed equipment. This information shall be maintained in a current condition at all times until the completion of the work. The resulting field-marked prints and data shall be referred to and marked as "As-Built Field Data," and shall be used for no other purpose. They shall be made available for inspection by the Contracting Officer's representative whenever requested during construction and shall be jointly inspected for accuracy and completeness by the Contracting Officer's representative and a responsible representative of the Contractor prior to submission of each monthly pay estimate. Failure to keep the As-Built Field Data (including Equipment-in-Place lists) current shall be sufficient justification to withhold a retained percentage from the monthly pay estimate.

3.1.2 Submittal of the As-Built Field Data

Two sets of the As-Built Field Data shall be submitted to the Contracting Officer for review and approval a minimum of 20 calendar days prior to the date of final inspection. If review of the preliminary as-built drawings reveals errors and/or omissions, the drawings will be returned to the Contractor for corrections. The Contractor shall make all corrections and return the drawings for backcheck to the Contracting Officer within 10 calendar days of receipt. When submitted drawings are accepted, one set of marked drawings will be returned to the Contractor for the completion of the as-built drawings.

3.2 AS-BUILT ELECTRONIC FILE DRAWINGS

3.2.1 No earlier than 30 days after award the Government will have available for the Contractor one set of AutoCAD electronic file format contract drawings, to be used for preparation of as-built drawings. The electronic file drawings will be available on either 89 mm (3-1/2 inch) 1.44 MB floppy disks or ISO-9660 CD-ROM, as directed by the Contracting Officer. The Contractor has 30 days after the receipt of the electronic files to verify the usability of the AutoCAD files, and bring any discrepancies to the attention of the Contracting Officer. Any discrepancies will be corrected within 15 days and files returned to the Contractor. The Contractor shall incorporate all deviations from the original contract drawings as recorded in the approved 'As-built Field Data' (see paragraph 3.1.2). The Contractor shall also incorporate all the written modifications to the contract drawings which were issued by amendment or contract modification. All revisions and changes shall be incorporated, i.e. items marked "deleted" shall be deleted, clouds around new items shall be removed, etc.

3.2.2 No later than 30 days after final acceptance a complete set of as-built drawings shall be submitted in AutoCAD electronic file format. The electronic file format, layering standards and submittal requirements are specified in paragraphs below. The as-built drawings shall be done in a quality equal to that of the originals. Line work, line weights, lettering, and use of symbols shall be the same as the original line work, line weights, lettering, and symbols. If additional drawings are required they shall be prepared in electronic file format under the same guidance. When final revisions have been completed, each drawings shall be identified with the words "AS-BUILT" in block letters at least 10 mm high placed above the title block if space permits, or if not, below the title block between the border and the trim line. The date of completion and the words "REVISED AS-BUILT" shall be placed in the revision block above the latest revision notation.

3.2.3 Electronic File Submittal Requirements

3.2.3.1 The AutoCAD electronic file(s) deliverable shall be in AutoCAD release 14 'DWG' binary format. All support files required to display or plot the file(s) in the same manner as they were developed shall be delivered along with the files. These files include but are not limited to Font files, Menu files, Plotter Setup, and Referenced files.

3.2.3.2 Layering shall remain as provided in the electronic files. An explanatory list of which layers are used in each drawing, including any additional layers needed to complete incorporation of the As-Built data, shall be provided with each submittal.

3.2.3.3 Electronic File Deliverable Media: All electronic files shall be submitted ISO 9660 format CD-ROM (CD). Zip drive disks shall not be provided. Two complete sets of CD(s) shall be submitted along with one complete set of prints and one complete set of full size mylars taken from the CD(s). The mylars are to be submitted only after corrections are made, if any. See paragraph 3.2.4 below. Each CD shall have a clearly marked label stating the Contractor's firm name, project name and location, submittal type (AS-BUILT), and date the CD was made. Each submittal shall be accompanied by a hard copy transmittal sheet that contains the above information along with tabulated information about all files submitted, as shown below:

Electronic File Name	Plate Number	Drawing Title

Electronic version of the table shall be included with each submittal set of disks.

3.2.4 Submittal of the Final As-Built Drawings

The final as-built record drawings shall be completed and returned together with the approved preliminary as-built drawings to the COE, Seattle District Office, Technical Branch, Records and Information Section, within 30 calendar days of final acceptance. All drawings from the original contract drawings set shall be included, including the drawings where no changes were made. The Government will review all final as-built record drawings for accuracy and conformance to the drafting standards and other requirements contained in DIVISION 1 GENERAL REQUIREMENTS. The drawings will be returned to the Contractor if corrections are necessary. The Contractor shall make all corrections and shall return the drawings to the same office within 7 calendar days of receipt.

3.3 AS-BUILT BLUELINE PRINTS FOR SYSTEM ACCEPTANCE TESTING

One set of marked-up as-built blueline prints shall be furnished at the time of system acceptance testing. These as-built blueline prints shall be in addition to the submittals of marked-up as-built blueline prints specified elsewhere in the contract.

END OF SECTION

This page intentionally blank

SECTION 01703

WARRANTY OF CONSTRUCTION

PART 1 GENERAL

1.1 SUBMITTALS

Submittals shall be made in accordance with SECTION 01330: SUBMITTAL PROCEDURES. Submittal dates shall be as defined in PART 3 of this section.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 WARRANTY OF CONSTRUCTION (APR 1984) (FAR52.246-21):

3.1.1 In addition to any other warranties in this contract, the Contractor warrants, except as provided in paragraph 3.1.9 of this Clause, that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier.

3.1.2 This warranty shall continue for a period of 1 year from the date of final acceptance of the work. If the Government takes possession of any part of the work before final acceptance, this warranty shall continue for a period of 1 year from the date the Government takes possession.

3.1.3 The Contractor shall remedy at the Contractor's expense, any failure to conform, or any defect. In addition, the Contractor shall remedy, at the Contractor's expense, any damage to Government-owned or controlled real or personal property, when that damage is the result of:

a. the Contractor's failure to conform to contract requirements or

b. any defect of equipment, material, workmanship, or design furnished.

3.1.4 The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

3.1.5 The Government will notify the Contractor, in writing or by telephone, after the discovery of any failure, defect, or damage and the Contractor shall respond and be on-site to investigate the problem within 1 working day after notification. The Contractor shall furnish, and maintain, a 24 hour emergency telephone number as the point of contact. For failures, defects, or damage causing loss of power or heat, the Contractor shall respond and mitigate problem within 4 hours.

3.1.6 If the Contractor fails to remedy any failure, defect, or damage within 5 working days after receipt of notice, the Government will have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

3.1.7 With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall:

a. obtain all warranties that would be given in normal commercial practice;

b. require all warranties to be executed, in writing, for the benefit of the Government, if directed by the Contracting Officer; and

c. enforce all warranties for the benefit of the Government, if directed by the Contracting Officer.

3.1.8 In the event the Contractor's warranty under paragraph 3.1.2 of this clause has expired, the Government may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

3.1.9 Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage that results from any defect in Government-furnished material or design.

3.1.10 This warranty shall not limit the Government's rights under the Inspection of Construction clause of this contract with respect to latent defects, gross mistakes, or fraud.

3.1.11 After final acceptance of the work, the Contractor shall furnish and install an Equipment Warranty Sticker on Contractor-installed equipment. Lettering shall be block-type upper case and easily readable. Sticker shall be of a durable type material and of a type that can be written on. Sticker shall state the following:

a. The title "Equipment Warranty."

b. Contractor's name and Contract Number.

c. Date warranty expires.

d. Point of contact, including name and telephone number.

e. Manufacturer.

END OF SECTION

SECTION 01710

FINAL CLEANING

A. This Section specifies administrative and procedural requirements for final cleaning at completion of project.

B. Environmental Requirements: Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

C. Materials:

1. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer of fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.

D. Final Cleaning:

1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion for the entire Project or a portion of the Project.

a. Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted or paved, to a smooth even-textured surface.

b. Remove tools, construction equipment, machinery and surplus material from the site.

c. Remove snow and ice to provide safe access to the building.

d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.

f. Broom clean concrete floors in unoccupied spaces.

g. Vacuum clean carpet and similar soft surfaces, removing debris and excess nap. Shampoo if required.

h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

i. Remove labels that are not permanent labels.

j. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plates.

k. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.

l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

m. Replace air disposable filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills. Clean ducts, blowers, and coils if units were operated without filters during construction.

n. Clean food service equipment to a sanitary condition, ready and acceptable for its intended use.

o. Clean light fixtures, lamps, globes and reflectors to function with full efficiency Replace burned out bulbs, and defective and noisy starters in florescent and mercury vapor fixtures.

p. Leave the Project clean and ready for occupancy.

2. Removal of Protection: Remove temporary protection and facilities used during construction.

3. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of in all lawful manner.

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE DATA

A. This Section specifies administrative and procedural requirements for operating and maintenance manuals including the following:

1. Preparation and submittal of operating and maintenance manuals for building operating systems or equipment.

2. Preparation and submittal of instruction manuals covering the care, preservation and maintenance of architectural products and finishes.

3. Instruction of the USDA-FS's operating personnel in operation and maintenance of building systems and equipment.

B. Special operating and maintenance data requirements for specific pieces of equipment or building operating systems are included in the appropriate Sections of Divisions-2 through -16.

C. Quality Assurance:

1. Maintenance Manual Preparation: In preparation of Maintenance Manuals, use personnel thoroughly trained and experienced in operation and maintenance of the equipment or system involved.

a. Where written instructions are required, use personnel skilled in technical writing to the extent necessary for communication of essential data.

b. Where Drawings or diagrams are required, use draftsmen capable of preparing Drawings clearly in an understandable format.

2. Instruction for the USDA-FS's Personnel: For instruction of the USDA-FS's operating and maintenance personnel, use experienced instructors thoroughly trained and experienced in the operation and maintenance of the building equipment or system involved.

D. Submittals:

1. Submittal Schedule: Comply with the following schedule for submittal of operating and maintenance manuals.

a. Before Substantial Completion, when each installation that requires submittal of operating and maintenance manuals is nominally complete, submit two draft copies of each manual to the COR for review. Include a complete index or table of contents of each manual.

1) The COR will return one copy of the draft with comments within fifteen days of receipt.

b. Submit one copy of data in final form at least fifteen days before final inspection. This copy will be returned within fifteen days after final inspection, with comments.

c. After final inspection make corrections or modifications to comply with the COR's comments. Submit the specified number of copies of each approved manual to the COR within fifteen days of receipt of the COR's comments.

2. Form of Submittal: Prepare operating and maintenance manuals in the form of an instructional manual for use by the USDA-FS's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into a single binder.

a. Binders: For each manual, provide heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, in thickness necessary to accommodate contents, size to receive 8-1/2" by 11" paper. Provide a clear plastic sleeve on the spine, to hold labels describing the contents. Provide packets in the covers to receive folder sheets.

1) Where two or more binders are necessary to accommodate data, correlate data in each binder into related groupings in accordance with the Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of the piece of equipment or system.

2) Identify each binder on the front and spine, with the typed or printed title "OPERATION AND MAINTENANCE MANUAL", Project title or name, and subject matter covered. Indicate the volume number for multiple volume sets of manuals.

b. Dividers: Provide heavy paper dividers with clear plastic covered tabs for each separate Section. Mark each tab to indicate contents. Provide a typed description of the product and major part of equipment included in the Section on each divider.

c. Protective Plastic Jackets: Provide protective transparent plastic jackets designed to enclose diagnostic software for computerized electronic equipment.

d. Text Material: Where written material is required as part of the manual use the manufacturer's standard printed material, or if it is not available, specially prepared data, neatly typewritten, on 8-1/2" by 11", 20 pound white bond paper.

e. Drawings: Where drawings or diagrams are required as part of the manual, provide reinforced punched binder tabs on the drawings and bind in with the text.

1) Where oversize drawings are necessary, fold the drawings to the same size as the text pages and use as a fold-out.

2) If drawings are too large to be used practically as a fold-out, place the drawing, neatly folded, in the front or rear pocket of the bonder. Insert a typewritten page indicating the drawing title, description of contents and drawing location at the appropriate location in the manual.

E. Manual Content:

1. In each manual include information specified in the individual Specification Section, and the following information for each major component of building equipment and its controls:

a. General system or equipment description.

b. Design factors and assumptions.

c. Copies of applicable Shop Drawings and Product Data.

d. System or equipment identification, including;

1) Name of manufacturer.

2) Model number.

3) Serial number of each component.

4) Operating instructions.

e. Emergency instructions.

f. Wiring diagrams.

g. Inspection and test procedures.

h. Maintenance procedures and schedules.

i. Precautions against improper use and maintenance.

j. Copies of warranties.

k. Repair instructions including spare parts listing.

l. Sources of required maintenance materials and related services.

m. Manual Index.

2. Organize each manual into separate Sections for each piece of related equipment. As a minimum each manual shall contain a title page, a table of contents, copies of Product Data, supplemented by drawings and written text, and copies of each warranty, bond and service Contract issued.

a. Title page: Provide a title page in a transparent plastic envelope as the first sheet of each manual. Provide the following information:

1) Subject matter covered by the manual.

2) Name and address of the Project.

3) Date of submittal.

4) Name, address, and telephone number of the Contractor.

5) Name and address of the COR;

6) Cross reference to related systems in other operating and maintenance manuals.

b. Table of Contents: After the Title Page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

1) Where more than one volume is required to accommodate data for a particular system, provide a comprehensive table of contents for all volumes in each volume of the set.

c. General Information: Provide organized information similar to manual description above.

F. Material and Finishes Maintenance Manual:

1. Submit three copies of each manual, in final form, on material and finishes to the COR for distribution. Provide one section for architectural products, including applied materials and finishes, and a second for products designed for moisture-protection and products exposed to the weather.

a. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

2. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.

a. Manufacturer's Data: Provide complete information on architectural products, including the following, as applicable:

1) Manufacturer's catalog number.

2) Size.

3) Material composition.

4) Color.

5) Texture

6) Reordering information for specially manufactured products.

b. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information regarding cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

3. Moisture-Protection and Weather-Exposed Products: Provide complete manufacturer's data with instruction on inspection, maintenance and repair of products exposed to the weather or designed for moisture-protection purposes.

a. Manufacturer's Data: Provide manufacturer's data giving detailed information, including the following, as applicable:

1) Applicable standards.

2) Chemical composition.

3) Installation details.

4) Inspection procedures.

5) Maintenance information.

6) Repair procedures.

4. Schedule: Provide complete information in the materials and finishes manual on products listed for submittal in Section 01330 SUBMITTAL PROCEDURES.

G. Equipment and Systems Maintenance Manual:

1. Submit six copies of each completed manual on equipment and systems, in final form, to the COR for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic system.

a. Refer to Specification Sections for additional requirements on operating and maintenance of the various pieces of equipment and operating systems.

2. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric and electronic system.

a. Description: Provide a complete description of each unit and related component parts, including the following:

1) Equipment or system function.

2) Operating characteristics.

3) Limiting conditions.

4) Performance curves.

5) Engineering data and tests.

6) Complete nomenclature and number of replacement parts.

b. Manufacturer's Information: For each manufacturer of a component part or piece of equipment provide the following:

1) Printed operating and maintenance instructions.

2) Assembly drawings and diagrams required for maintenance.

3) List of items recommended to be stocked as spare parts.

c. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:

1) Routine operations.

2) Trouble-shooting guide.

3) Disassembly, repair and reassembly.

4) Alignment, adjusting and checking.

d. Operating Procedures: Provide information on equipment and system operating procedures, including the following:

1) Start-up procedures.

2) Equipment or system break-in.

3) Routine and normal operating instructions.

4) Regulation and control procedures.

5) Instructions on stopping.

6) Shut-down and emergency instructions.

7) Summer and winter operating instructions.

8) Required sequences for electric or electronic systems.

9) Special operating Instructions.

e. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.

f. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.

g. Coordination Drawings: Provide each Contractor's Coordination Drawings.

1) Provide as-installed color-coded piping diagrams, where required for identification.

h. Valve Tags: Provide charts of valve tag numbers, with the location and function of each valve.

i. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panelboards, including the following:

1) Electric service.

2) Controls.

3) Communication.

3. Schedule: See Division 15 for complete requirements.

H. Instructions of the USDA-FS Personnel:

1. Prior to final inspection, instruct the USDA-FS personnel in operation, adjustment, and maintenance of products, equipment and systems. Provide instruction at mutually agreed upon times.

a. For equipment that requires seasonal operation, provide similar instruction during other seasons.

b. Use operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

END OF SECTION

This page intentionally blank

SECTION 02100 - SITE CLEARING

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes the following:
   1. Clearing and grubbing.

B. Topsoil stripping. Related Sections include the following:
   1. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
   2. Division 2 Section "Landscaping" for finish grading, including placing and preparing topsoil for lawns and planting.

1.3. DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.

1.4. MATERIALS OWNERSHIP

A. Except for materials indicated to be stockpiled, placed in designated waste areas or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.5. SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by site clearing.

1.6. PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

B. Notify utility locator service for area where Project is located before site clearing.

C. Contractor shall mark and prevent construction operations from occurring within the protection zone around the DeSmet historical structure. Delete paragraph below if not required. Coordinate with Owner.

PART 2 PRODUCTS (not applicable)

PART 3 EXECUTION

3.1. PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water run-off or airborne dust to adjacent properties and walkways. Protect existing site improvements to remain from damage during construction.
   1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2. CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.3. TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Limit height of topsoil stockpiles to 72 inches (1800 mm).

D. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.4. DISPOSAL

A. Disposal: Remove obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property. Surplus soil and unsuitable topsoil can be placed in areas not requiring engineered fill to the lines and grades indicated on the plans. Excess soil can be placed in designated waste area.

END OF SECTION 02100

This page intentionally blank

SECTION 02110 – GEOTEXTILES

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 2 - PRODUCT

2.1 PHYSICAL AND CHEMICAL REQUIREMENTS AND 2.2 CERTIFICATION

Delete "Table 1" and add the following:

A. Physical Requirements for Subsurface Drainage Geotextile

Physical Requirements for Subsurface Drainage Geotextile			
Property	Test Method	Units	Specifications[a]
Grab Strength	ASTM D 4632	N	1,100/700
Sewer Seam Strength	ASTM D 4632	N	990/630
Tear Strength	ASTM D 4533	N	400[c]/250
Puncture Strength	ASTM D 4833	N	400/250
Burst Strength	ASTM D 3786	kPa	2,700/1,300
Permittivity	ASTM D 4491	s^{-1}	0.2
Apparent Opening Size	ASTM D 4751	mm	0.25[b]
Ultraviolet Stability	ASTM D 4355	%	50[d]

B. Physical Requirements for Separation Geotextile

Physical Requirements for Separation Geotextile			
Property	Test Method	Units	Specifications[a]
Grab Strength	ASTM D 4632	N	1,100/700
Sewer Seam Strength	ASTM D 4632	N	990/630
Tear Strength	ASTM D 4533	N	400[c]/250
Puncture Strength	ASTM D 4833	N	400/250
Burst Strength	ASTM D 3786	kPa	2,750/1,300
Permittivity	ASTM D 4491	s^{-1}	0.02
Apparent Opening Size	ASTM D 4751	mm	0.60[b]
Ultraviolet Stability	ASTM D 4355	%	50[d]
Ultraviolet Stability	ASTM D 4355	%	50[d]

[a]The first values in a column apply to geotextiles that break at <50 percent elongation (ASTM D 4632). The second values in a column apply to geotextiles that break at ≥50 percent elongation (ASTM D 4632).
[b]Maximum average roll value.
[c]The minimum average roll tear for woven monofilament geotextile is 245 N.

[d]After 500 hours of exposure.

2.4 SUBMITTALS

A. Product Data for the following:

1. Drainage Textile

2. Separation Textile

PART 3 - EXECUTION

Add:

"3.4 SUBDRAINAGE APPLICATIONS

A. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch (150-mm) course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches (300 mm) of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches (150 mm).
1. Compact each course of filter material.

PART 4 – MEASUREMENT AND PAYMENT

Delete all of Part 4.

END OF SECTION 02110

misc99_3\mtdc02110

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02113 – ADJUSTING EXISTING MANHOLES, LAMPHOLES, INLETS, WATER VALVES, WATER VALVE BOXES, WATER SERVICES, AND FIRE HYDRANTS TO GRADE

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 3 – EXECUTION

Paragraph 5 - delete entire paragraph and insert "Provide backfill material matching the type and depth of the material adjacent to the item adjusted. Compact to at least 95 percent of the maximum dry density as determined by AASHTO T99 or ASTM 698.
Paragraph 6 - delete last sentence and insert "Fire hydrants to be relocated will be shown on the plans."
Paragraph 7 - delete second sentence.

PART 4 – MEASUREMENT AND PAYMENT

Delete all of Part 4.

END OF SECTION 02113

misc99_3\mtdc02113

This page intentionally blank

THIS ENTIRE SECTION IS ADDED BY AMENDMENT 0001

SECTION 02150 - CONSTRUCTION OF FACILITIES IN HIGHWAY 10 RIGHT OF WAY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. The following special provisions are hereby made a part of this contract and supplement and/or supersede any sections of the Standard Specifications for Road and Bridge Construction, 1995 Edition adopted by the Montana Department of Transportation and the Montana Transportation Commission and all supplements thereto in conflict therewith

The following books are also hereby made a part of this contract and are available upon request to the CONTRACT PLANS SECTION, MONTANA DEPARTMENT OF TRANSPORTATION, 2701 PROSPECT AVENUE, PO BOX 201001, HELENA, MT 59620-1001.

Book entitled "Standard Specifications for Road and Bridge Construction 1995 Edition." (Including supplements)

Drawings entitled "Detail Drawings 1996 English Edition with Revisions Dated December 1997."

1.2 SUMMARY

A. This section includes all work required within the Highway 10 Right of Way and adjacent areas as shown on the construction plans including the driveway approach and Butler Creek Road Approach. The Highway 10 work involves widening the existing roadway to provide a center left turn lane and right turn lane involving the following:

1. Clearing and Grubbing
2. Topsoil Removal and Replacement
3. Pavement Removal & Disposal
4. Construction Staking & Layout
5. Excavation and Embankment
6. Removal of Structures and Obstructions
7. Culvert Excavation and Trench Excavation
8. Culvert Installation and Pipe Extension
9. Water Pollution Control and Stream Preservation
10. Aggregate Surfacing- Furnishing and Placing
11. Plant Mix Bituminous Surfacing
12. Curb and Gutter With Concrete Median

13. Seeding and Fertilizing
14. Traffic Control
15. Pavement Marking
16. Sign Removal & Installation

1.3 MATERIALS OWNERSHIP

A. Except for materials indicated to remain under the Ownership of the Montana Department of Transportation shall become Contractor's property and shall be removed from the site. Suitable excess excavation can be used on the Forest Service portion of the project. Excess material can be wasted in the designated waste area shown on the plans. Excess material can be used to flatten slopes as specified in these special provisions.

B. All existing signs, and delineators not reset on the project remain the property of the Montana Department of Transportation. Deliver removed signs and post materials to the MDT District office at 2100 W. Broadway Avenue, Missoula MT.

1.4 SUBMITTALS

A. The contractor is responsible for all materials testing and quality assurance to comply with these specifications. The contractor shall employ an independent testing lab to perform the materials testing. Conform all materials testing with MDT requirements as contained in the MDT Materials Manual, including the following.
MT 601 - Materials Sampling, Testing and Acceptance Guide
MT 602 - Acceptance, Independent Assurance and Final Record Sampling

B. Submittals shall be as listed under each individual section of the incorporated standard specifications and the above referenced documents. Submit test results and certifications for the engineer's approval. Failure to comply with the specifications will result in rejection of the materials.

1.5 PROJECT CONDITIONS

A. Traffic: Contractor shall coordinate with the Missoula District of the Department of Transportation when working within their Right of Way. All necessary traffic control plans and sequence of operations shall be prepared by the Contractor, submitted and approved by the Department.

B. Montana Rail Link: A portion of this work occurs within the Montana Rail Link Right of Way. Contractor shall obtain all necessary permits and coordinate it's activities with Montana Rail Link.

1.6. STATUS OF UTILITIES

Attention is directed to the utility facilities which are potentially in conflict with proposed construction of Highway 10 improvements. In the event underground utilities are encountered in excavation work, coordinate work with utility companies in areas where utility moves are

required to relocate or lower existing utilities. Delays resulting in work required in relocating utility facilities is not justification for additional contract time or compensation.

1.7. CONTRACTOR FURNISHED SOURCES - HAZARDOUS OR TOXIC SUBSTANCES

Add as a third paragraph to Subsection 106.02.3 of the Standard Specifications. Materials must meet statutory and regulatory requirements for being non-toxic and non-hazardous. Mine tailings and waste, slag, sources within state or federal superfund sites, or sources within areas known or suspected to be contaminated with toxic substances or petroleum products will not be allowed unless acceptable laboratory reports of Toxicity Characteristics Leaching Process (TCLP) and Total Petroleum Hydrocarbons (THP) are provided.

1.8 CONSTRUCTION SURVEYING AND LAYOUT

A. General

Furnish all surveys and calculations necessary to lay out and control the work to specified lines, grades, and tolerances. Surveys must produce accuracy and control equal to or better than methods and accuracy requirements of the Montana Department of Transportation Survey Manual of 1993. Conduct all surveys under the responsible charge of a Registered Land Surveyor licensed in Montana.

B. Materials and Equipment

Furnish all materials and equipment required to perform this work.

C. Construction Requirements

1. Survey Controls.

Refer to the project plans for survey control information and centerline coordinates.

2. Staking. Set all stakes necessary to control all work under the contract. This includes but is not limited to:
   a) centerline stations
   b) reference points
   c) clearing limits
   d) slope stakes
   e) drainage structures
   f) surfacing courses
   g) pavement
   h) signs, pavement markings, guardrailing)
   i) fencing

Special conditions for particular layout items are:
Slope Stakes. Determine on the ground the intersection point of the planned template and the existing ground for the slope stake catch point.

Do not begin grading operations until all slope stakes have been set on at least 20 percent of the project. Do not start grading operations within a balance until slope stakes within the balance have been set.

Culverts. Take cross sections, as well as profiles. Profiles and cross sections must be approved before culverts are ordered. Confirm elevations and lengths shown in the plans before culverts and pipe are ordered.

D. Inspection

The right to make inspections and random checks of any portion of the layout and control work is reserved. The engineer may order work not done with sufficient accuracy to be re-done. The contractor is solely responsible for securing proper dimensions, lines, grades, and elevations of all parts of the work. Inspection will not relieve the contractor of this responsibility.

PART 2 - INCORPORATED SPECIFICATIONS

2.1 GENERAL SUPPLEMENTS TO MONTANA DEPARTMENT OF TRANSPORTATION SPECIFICATIONS

Delete all references to MEASUREMENT and PAYMENTS.
Delete all references to Engineer, Department and Project Manager and insert "Contracting Officers Representative."
Delete all references to Engineer, Project Manager or Owner staking and marking construction items. Contractor shall be responsible for all construction control staking.
Delete all references to Department or Project Manager testing. Contractor shall use an accredited testing lab to determine compliance with contract specifications.

2.2 SPECIFICATIONS

A. SECTION 201 – CLEARING AND GRUBBING

1. General
   Delete Subsections 201.04 through 201.05.4

B. SECTION 202 – REMOVAL OF STRUCTURES AND OBSTRUCTIONS

1. General
   Delete Subsections 202.04 through 202.05

C. SECTION 203 – EXCAVATION AND EMBANKMENT

1. General

203.01.1B.1.	Delete last sentence
203.01.1B.2.	Delete in its entirety
203.01.1C.	Delete in its entirety
203.03.1A.	Delete last sentence

203.03.4A. Delete 2nd and 3rd paragraphs
Delete Subsections 203.04 through 203.05

2. DISPOSAL OF EXISTING PAVEMENTS

Dispose of all existing bituminous or Portland cement concrete pavement to be removed unless specified otherwise. Process, handle and transport these materials to utilize them in embankments on the project, or crush, screen, mix and otherwise process for use as base or traffic gravel or dispose of them as solid waste in conformance with applicable laws, rules, regulations and in particular the Montana Solid Waste Management Act. Existing pavement used as embankment or base gravel must meet requirements of specifications for the particular item. Pieces used as embankment must not exceed 6-inch (150 millimeter) in size. Do not use removed bituminous pavement in areas exposed to extended periods of water flow, in or near standing water, or close to groundwater wells.

3. COMPACTION OF SAFETY SLOPE FLATTENING EMBANKMENTS

Compact safety slope embankments to a minimum of 90% of maximum density. For purposes of this provision, safety slopes are defined as embankment placed from an existing roadway shoulder to a catch point on original ground and not supporting any portion of the surfacing. The Compaction Requirement Table 203-1 in Subsection 203.03.3 is hereby changed to a minimum of 90% of maximum density and the optimum moisture requirement is deleted for safety slopes.

4. COMPACTION EQUIPMENT

The contractor is responsible for all damage caused to the work or adjacent property through the use of vibratory compaction equipment.

5. P.T.W. EXCAVATION

Process and dry material excavated or subexcavated which contains excess moisture if it can be utilized as acceptable embankment material. If the material is acceptable and the contractor elects to waste the material, replace with acceptable embankment material. Disposal of excavated material to flatten slopes within the right-of-way is permissible, provided it does not affect drainage. If the Contractor elects to waste the material, replacement borrow material will not be measured or paid for.

D. SECTION 207 - CULVERT EXCAVATION AND TRENCH EXCAVATION

1. General
Delete Subsections 207.04 and 207.05

E. SECTION 208 - WATER POLLUTION CONTROL AND STREAM PRESERVATION

1. General
Subsection 208.03.2 First paragraph Delete last sentence and insert “Dispose of all wastes, refuse, and discarded materials meeting all Local, State and Federal rules and regulations.

Delete Subsections 208.04 through 208.05

F. SECTION 210 – EQUIPMENT USE

1. General
Delete Subsections 210.03.6 through 210.05

G. SECTION 301 – AGGREGATE SURFACING

1. General
Subsection 301.02.1 - Delete in its entirety and insert "Aggregates shall be furnished by the Contractor. Materials must meet Montana Department of Transportation minimum requirements for the materials specified. Contractor shall pay for all testing required to obtain approval of all Aggregates to be furnished and installed under this specification."

Delete Subsection 301.03.2C.
Delete Subsection 301.03.3
Subsection 301.03.5D. Delete references to Project Manager taking samples. All sampling and testing will be the responsibility of the Contractor
Delete Subsection 301.04.1 through 301.05

2. Materials
Provide Type A, Grade 2 Crushed Top Surfacing for roadway widening. Provide Type A, Grade 5 Crushed Base Course for roadway widening.
Replace Table 701-10 Table of Gradations-Crushed Top Surfacing Type "A," Subsection 701.02.6, with the following:

Table 701-10
Table of Gradations - Crushed Top Surfacing Type "A"

Percentage By Weight Passing Square Mesh Sieves

Sieve Size	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
1" (25 mm)	100				
¾" (19.0 mm)		100			
N" (16.0 mm)			100		
½" (12.5 mm)				100	
M" (9.5 mm)					100
No. 4 (4.75 mm)	40-70	40-70	40-70	40-70	50-80
No. 10 (2.00 mm)	25-55	25-55	25-55	25-60	35-70
No. 200 (75 1m)	2-8	2-8	2-8	2-8	2-8

H. SECTION 401 – PLANT MIX PAVEMENT

1. General

Subsection 401.02.1 Aggregate. Delete first sentence and insert "Use aggregate sources which will produce aggregates meeting Section 701 requirements.
Subsection 401.03.1A. Delete second paragraph and insert "Furnish a mix design formula approved by the Montana Department of Transportation for the mix to be used.
Subsection 401.03.1B. Delete "The Engineer" and insert "An accredited testing lab….."
Delete Subsection 401.03.2A. through 401.03.2E.
Subsection 401.03.3B.2. First sentence Delete the word Project manager and insert "…accredited testing lab…"
Subsection 401.03.6 Delete the 5th paragraph
Delete the 9th paragraph
Delete Subsection 401.04 through 401.05.

2. Materials

PLANT MIX BITUMINOUS SURFACING - GRADE D
Use Grade D Plant Mix Bituminous Surfacing for all Highway 10 and approach paving. Plant Mix Bituminous Surfacing Grade D conforms to all requirements of the Standard Specifications for Grade B except as changed below.

Subsection 701.03.2 Aggregate for Plant Mix Surfacing
Change Table 701-15 to:

Sieve Size	Target Limits	Job Mix Tolerance
3/4" (19.0 mm)	100	0
1/2" (12.5 mm)	79-83	±7
3/8" (9.5 mm)	68-72	±7
No. 4 (4.75 mm)	44-50	±7
No. 10 (2.00 mm)	27-33	±6
No. 40 (0.425 mm)	12-15	±4
No. 200 (0.075 mm)	4.5-6.5	±1.5

Change Subsection 701.03.2.2 to read not less than 60% of coarse aggregate particles by weight must have at least two mechanically fractured faces as determined by MT-217.
Aggregate used in the mix consists of crushed particles. Natural fines must be separated before crushing. The maximum amount of minus No. 4 sieve material allowed in the crusher feed is 5%.
The target Marshall field density will be established from results of tests made according to MT-311 from specimens molded with 75 blows per side.

I. SECTION 402 - BITUMINOUS MATERIALS

1. General

Delete Subsection 402.04 through 402.05

2. Materials
Use Penetration Grade 85-100 Asphalt Cement for all Highway 10 and approach paving.

J. SECTION 407 - BITUMINOUS PRIME AND TACK COAT

1. General
Delete Subsections 407.04 through 407.05.

2. Materials
Use SS-1 emulsified asphalt for tack coat. Use MC-70 medium curing liquid asphalt for prime coat.

K. SECTION 551 – PORTLAND CEMENT CONCRETE

1. General
Delete Subsections 551.04 through 551.05

L. SECTION 603 – CULVERTS, STORM DRAINS, SANITARY SEWERS, STOCKPASSES, AND UNDERPASSES

1. General
Subsection 603.03.1 First paragraph Delete last sentence and insert "Order pipe from field staking information.
Delete the 5th, 6th and 7th paragraphs.
Delete Subsection 603.04 through 603.05
Refer to MDT Detailed Drawings for culvert installation, racet, pipe extension, and pipe bedding details.

2. Optional Pipe

A. Description
Corrugated polyethylene pipe is an option to RCP, CSP or CAP for approach drainage pipes as indicated in the plans.

B. Material
Meet the requirements of Section 708.07 of the Standard Specifications for Road and Bridge Construction, and of Type S pipe as defined in Section 4 of AASHTO M294.

C. Construction Requirements
Provide steel Flared End Terminal Sections (FETS) or Road Approach Culvert End Treatment (RACET) in accordance with MDT Detailed Drawing 603-02 and 603-14. Provide hardware for connection of the end section to the polyethylene pipe as approved by the project engineer.

M. SECTION 609 – CURBS AND GUTTERS

1. General
Delete Subsections 609.03.5 through 609.03.6
Delete Subsections 609.04 through 609.05

N. SECTION 610 - ROADSIDE VEGETATION

1. General
Subsection 610.03.1 Delete first two paragraphs and insert "Contractor shall spread topsoil conserved in the stripping operations. Topsoil will be spread uniformly over the disturbed areas to depths of 4 inches."
Delete Subsections 610.03.2F. through 610.05

O. SECTION 618 – TRAFFIC CONTROL

1. General
Second paragraph delete the word alternate.
Subsection 618.03.5 Delete the last sentence.
Subsection 618.03.11 Delete in its entirety
Delete Subsection 618.04. through 618.05

2. Traffic Control Plan & Sequence of Operations

A. Traffic Control Plan

Submit a traffic control plan to the Montana Department of Transportation for approval in accordance with Subsection 618.03.2 and these contract provisions. Provide traffic control that results in the least amount of inconvenience possible to the traveling public.

Maintain two-way traffic on Highway 10 at all times at the end of each work day and at all times when specific grading, excavation, or paving work is not underway.

One way traffic control is permitted between the hours of 9:00 AM and 4:30 PM, Monday through Friday.

Under no circumstances close the present traveled way in both directions of travel for a period exceeding one-half hour in duration unless given specific approval by the engineer.

Maintain access to and from the premises of the adjacent property owners at all times.

Provisions, meeting approval of the County of Missoula, must be made to adequately provide for the travel of emergency and fire vehicles at all time.

Keep designated intersections open to general traffic at the end of each working day and on days when not working unless otherwise approved by the engineer. Detouring of traffic using the Butler Creek Road intersection is allowed with approval of a traffic detour and signing plan. Submit the proposed detour and signing plan to the Montana Department of Transportation and the Missoula County Surveyor for approval.

B. Sequence of Operations

Schedule operations in the sequences to provide the least amount of inconvenience possible to the traveling public. Before working in the area of the Highway 10 right-of-way, submit for approval a sequence of operations for this area that inconveniences, in the least possible degree, and assure the safety of the traveling public.

The left side of centerline must not be disturbed until all of the work through the first lift of plant mix bituminous base is completed on the right side of centerline.

Repair all damage to the primed surface and maintain a satisfactory riding surface for the traveling public. The contractor is responsible for all traffic control and maintenance costs of the primed roadway.

Culverts may be installed prior to grading operations. When the present traveled way is disturbed, replace the aggregate surfacing, place 0.20 foot (65 millimeters) of bituminous surfacing and maintain to provide a smooth riding surface. Costs of replacing and maintaining these areas must be absorbed in other culvert contract bid items.

Any of the above work sequences may be modified during construction upon request to the engineer, if such modifications would be in the best interest of the traveling public and adjacent property owners.

C. Public Notification

Notify the Missoula County Surveyor of all planned lane and roadway closures, and detours on a weekly basis. Submit a press release to the Missoulian for all planned lane and roadway closures, and detours, on a weekly basis. Submit notification no later than the Thursday prior to the upcoming week's work.

P. SECTION 619 – SIGNS, DELINEATORS, AND GUIDEPOSTS

1. General

All signs to be Type B high intensity grade reflective sheeting, designated as Type III per AASHTO M 268-84 Section 4.2.3.
Provide wooden sign posts per MDT standard details and specification. Drill posts for breakaway holes per detailed drawings.
Refer to MDT Detailed Drawings for mounting details, heights, and embodiment requirements.

Q. SECTION 620 – PAVEMENT MARKING APPLICATION EPOXY PAVEMENT MARKING MATERIAL - 100% SOLID

1. Description. This work consists of surface preparation, furnishing, and applying epoxy pavement lines, words, and symbols shown in the Contract or directed by the Engineer.

2. Materials

a. General. Use a two component 100 percent solids epoxy material. No fillers or pigment extenders are permitted in the material. Part A consists of pigment and epoxy resins. Part B consists of the curing agent. Follow the manufacturer's mixing ratio when mixing the two components. Mix components within +2 ½ percent of the manufacturers recommended mix ratio. The components, when combined, are not to contain or produce volatile solvents.

Assure Part A meets the following requirements:

Pigment	% by Weight
White: TiO_2, meeting ASTM D 476, Type II	18-23
Yellow: Med. chrome yellow meeting ASTM D 211, Type III	23-30

Epoxy Resins	% by Weight
White	77
Yellow	70

Use pigment consisting of either titanium dioxide (white) or medium chrome yellow (yellow).
Test the epoxy content of the epoxy resin in Part A under ASTM D 1652 and calculate as the weight per epoxy equivalent (WPE) for both white and yellow. Determine the epoxy content on a pigment free basis. The accepted epoxy content range(WPE) is +50 of the manufacturer’s target value.

Assure Part B meets the following requirements:

Test the amine value of Part B in accordance with ASTM D 2074 to determine total amine value. Assure the total amine value meets the manufacturer's target value with the acceptance range being +50 of the target value.

b. Glass beads. Use glass beads meeting the requirements of Subsection 714.05.
c. Hardness. Use epoxy having a Shore D hardness between 75 to 100 when tested under ASTM D 2240. Apply epoxy to a metal substrate.
d. Tensile Strength. Test tensile strength under ASTM D 8638, resulting in a minimum tensile strength of 6000 psi (42 MPa). Cast Type IV specimens in a mold not exceeding ¼ inch (6.38 mm) thick. Assure pull rate is ¼ inch (6.38 mm) per minute.
e. Compressive Strength. Test material under ASTM D 695, as modified herein; resulting in a cured sample with a minimum compressive strength of 12,000 psi (83

MPa), a maximum compression rate of ¼ inch (6.38 mm) per minute and measuring ½ inch (12.7 mm) high by ½ inch (12.7 mm) in diameter.

f. Weather Resistance. Apply mixed epoxy, both white and yellow, at 15 mils +1 mil (0.381 mm ± 0.0254 mm) thickness to 3 x 6 inch (75 mm x 150 mm) aluminum panels. Assure epoxy does not contain beads. Expose the cured sample in an Environmental Test Chamber as described in ASTM G 53. Conduct the test for 80 hours at 1220F (500C), alternating 4 hour cycles of condensation and ultraviolet light.

g. Specimen Requirements
White Material - ASTM E 1347, directional reflectance a minimum 80% after exposure
Yellow Material - Initially conform to V+ to C+ limits when visually compared with the highway yellow color tolerance chart, PR #1 of June 1965. The exposed material color must be within V+, C+ and H+ limits when compared.

h. Laboratory Drying Time. Mix epoxy marking material at the manufacturer's specified ratio and apply at 15 mils + 1½ mils (0.381 mm ± 0.0381 mm) wet film thickness at 750F ± 20F (240C ± 10C) with the specified glass bead application. Assure it has a maximum no tracking time of 15 minutes when tested using ASTM D 711.

i. Viscosity. Assure individual components viscosity is within 10 percent of each other at the recommended spray temperature and that Component B has a constant viscosity at the recommended spray temperature.

j. Mixing and Application. Mix and apply components following all of the manufacturer's recommendations.

k. Packaging and storage. Transport and store the epoxy marking material at the project in the manufacturers original container before being mixed for use. Follow the manufacturer's instructions regarding material storage and handling. Mark each container identifying the color, batch or lot number, manufacturer's name, address, and date of manufacture.

l. Material Acceptance. Furnish a certification consisting of a certified copy of a laboratory report listing the results of the specified tests and certifying that the materials furnished meet the specifications. Refer to the applicable specification in the certification. Perform tests in the manufacturers laboratory or another qualified independent laboratory. Conduct test on samples obtained from the lot or lots of material supplied for use in the work.

3. Construction Requirements.

a. General. The applicable requirements of Subsection 620.03 apply to the installation of epoxy pavement marking material. Provide the Engineer the Manufacturers certification before the material is delivered to the project. Materials not meeting the manufacturers product specifications will not be approved for use on the project. The Engineer may request a manufacturers sample or take field samples for testing. Use a sample weighing a minimum of two pounds (0.91 kg). Remove from the work and replace material represented by samples failing one or more tests.

b. Application Instructions. Provide the Engineer a copy of the manufacturers instructions for surface preparation and material application at least 24 hours before application work begins.
Include in the instructions:
Equipment Requirements
Approved Work Methods and Procedures
Material Application Range

Ambient & Surface Temperature Requirements
Weather Limitations
Precautions
All other requirements for successful application and material performance.
Do not use materials with incomplete or without instructions.

c. Surface and Temperature Requirements. Apply epoxy pavement marking material following the manufactures surface and temperature requirements.

d. Application. Apply a wet film thickness of 20 mils ± 2 mil (0.508 mm ± 0.0508 mm) immediately followed by applying glass beads to the wet epoxy at 25 pounds per gallon (3 kg per liter). Match the existing markings configuration unless otherwise directed by the Engineer.

e. Surface Preparation;
   (1) All Surfaces: Clean the substrate free of debris and deleterious material by high pressure air blast immediately ahead of the epoxy application.
   (2) Chip seals, friction courses: Prepare surfaces with a tightly adhered single coat of traffic paint and surfaces with multiple coats of traffic paint by lightly grinding all lines on the roadway surface. Light grinding is defined as surface abrasion to a depth of 20 mils + 10 mils (0.508 mm ± 0.254 mm) for the purpose of establishing a roughened surface, removal of loose paint chips, removal of loose seal aggregate and removal of surface impurities, for the purpose of effective epoxy bonding. Remove a depth of 20 mils + 10 mils (0.508 mm ± 0.254 mm). Depth of removal is measured vertically down, from the bottom of a three foot (0.92 meter) or longer straight edge placed on the surface of the roadway, to the ground surface. Immediately suspend surface removal if the 30 mils (0.762 mm) depth is exceeded and take corrective action.
   (3) Concrete Surfaces: Treat concrete surfaces the same as asphalt surfaces by lightly grinding the surface to remove any foreign material and any curing compound.
   (4) Meet the limits of removal as follows:
      (a) Not greater than 1 inch wider (25 mm) than the existing stripe.
      (b) Not longer than 4 inches (100 mm) from the beginning or end of the stripe being removed.
      (c) Any other removal deviating from 1 and 2 above will be at the direction of the Engineer.

f. Collect and dispose of all removed material and new traffic marking materials spilled during the performance of this contract. Process, handle, transport, and dispose of these materials as solid waste in conformance with applicable laws and regulations.

g. Equipment. Assure epoxy application machine precisely meters the two components, produces and maintains the mixing head temperature, all within the epoxy manufacturer's specifications. Equip the application machine with a high pressure air blast device for cleaning the surface ahead of the marking application. In addition, equip the machine with a guide pointer to maintain an accurate line; at least two spray guns operable separately or simultaneously; an automatic device that produces a broken line of the specified length; and an automatic glass bead dispenser(s) synchronized with the spray gun(s). Assure the machine has a metering device to register the applied gallons (liters) for each gun.

h. Marking Protection. Assume responsibility for traffic control devices used to prevent tracking of the new stripe. These devices will not be paid for separately and payment will be included in other contract bid items. The only traffic control devices that will be paid for is when the Engineer requires that they be installed.

END OF SECTION 02150

SECTION 02221 – TRENCH EXCAVATION AND BACKFILL FOR PIPELINES AND APPURTENANT STRUCTURES

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 – GENERAL

1.3 Delete this subsection

1.4 TESTING Delete this section and insert "Contractor shall be responsible for all quality control testing. In-place density tests meeting AASHTO T191 (ASTM D1556), Sand Cone Method; or by AASHTO T238 and T239(ASTM D2922 and D3017), Nuclear Densometer Methods. Quality assurance field density tests may be run by the owner. Contractor shall provide one density test for every other lift of backfill per 400 lineal feet of trench.

At the direction of the Engineer, provide necessary equipment and labor to excavate and replace materials for test holes up to 5 feet deep into the compacted backfill to allow testing below the surface of any layers covered without inspection and approval by the Contracting Officer. Contractor shall determine the laboratory maximum density values and optimum moisture content of each soil type to be used in backfilling trenches according to AASHTO T-99 OR ASTM D698."

PART 2 – PRODUCTS

2.1 PIPE BEDDING MATERIAL

Delete Subsection 2.1.1 and insert "PIPE EMBEDMENT. Unless otherwise shown on the drawings, pipe bedding material shall be placed in a thickness equal to 1/4 x pipe O.D. below the pipe (4 inches minimum) to 6 inches above the pipe. Bedding material shall be clean, non-cohesive, natural, unwashed gravel, sand or crushed hard stone graded as follows:

Sieve Size	Percent Passing
1"	100
#4	40 - 70
#200	Less than 10

except where groundwater is encountered at the trench bottom, in which case embedment material shall be washed, crushed rock passing a 1-inch screen. Native trench material shall not be used for pipe bedding material. In rock areas the minimum bedding below the pipe shall be

6". No stones or hard rock larger than 8 inches shall be placed within 2 feet above the pipe unless the bedding above the pipe is increased to 12 inches.

Bedding material shall be compacted to 90% of theoretical maximum proctor density as determined by AASHTO T-99."

Delete Subsections 2.1.2 through 2.1.4.

PART 3 – EXECUTION

3.1 GENERAL

Second paragraph first sentence, delete the words "…in accordance with Section 01041, PROJECT COORDINATION, Paragraph 1.2.2,…"
Subsection 3.1.2 - Delete in its entirety.
Subsection 3.1.5 - Delete in its entirety.
Subsection 3.4.1 - GENERAL
Paragraph 7 last sentence, delete the words "Type 2"
Subsection 3.4.2.2 - First paragraph last sentence delete the words "Type 1".
Subsection 3.4.3 - First paragraph last sentence delete the words "Type 2".
Subsection 3.7.2.1 - Bedding
Delete 3.7.2.1 through 3.7.2.4 in their entirety and insert "Placement and Compaction. All granular fill material beneath the pipe shall be spread and compacted to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface by the withdrawal of pipe slings or other lifting tackle. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular fill when the pipe is jointed.

After each pipe has been graded, aligned and placed in final position on the bedding materials, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof to hold the pipe in proper position and alignment during subsequent pipe jointing, embedment and backfilling operations.

Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement of the pipe."

Subsection 3.7.3 - Delete the second paragraph and insert "Trench backfill from the top of the pipe bedding to the ground surface or the design subgrade shall be native material from the trench excavation which will meet the Type A Trench Backfill density requirements shown below."

Delete paragraphs 5 through 7.
Subsection 3.7.5 - First paragraph third sentence delete the words … "Imported Backfill Material"... and insert "changed condition in the General Conditions."
Subsection 3.7.7 - Delete the first sentence

Subsection 3.8 - Delete the last sentence.

PART 4 – MEASUREMENT AND PAYMENT

Delete this section in its entirety.

END OF SECTION 02221

misc99_3\mtdc02221

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02225 – FLOWABLE FILL

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 2 - PRODUCTS

2.1 Third paragraph delete the word ENGINEER and insert the word "CONTRACTOR"

PART 4 – MEASUREMENT AND PAYMENT

Delete in its entirety.

END OF SECTION 02225

misc99_3\mtdc02225

This page intentionally blank

SECTION 02226 – JACKED OR BORED PIPE CROSSINGS

PART 1 – GENERAL

1.1 SUMMARY

A. Description:
1. Work necessary to construct jacked or bored pipe crossings or casings complete, as shown on the Contract Drawings and as specified herein.

B. Related Sections:
1. Section 02221 – Trench Excavation and Backfill

1.2 SUBMITTALS

Submittals shall be made as follows:

A. Product Data: Furnish the following:
1. Casing for jacked or bored crossings.

B. Quality Control submittals: Furnish the following:
1. Satisfactory evidence of compliance with Permitter's insurance requirements prior to starting work.
2. Proposed construction methods, equipment, and materials for undercrossing prior to starting crossing operation.
3. Written approval to proceed from Permitter.
4. Manufacturer's certification for products specified.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Casing for jacked or bored crossings
1. Size: Sufficiently large to provide adequate working space to properly install carrier pipe to lies and grades shown. Minimum of 2 inches clearance on each side of carrier pipe.
2. Type: Smooth steel pipe fabricated in sections for welded field joints. Conform to ASTM A53 for 1/4-inch thickness and AWWA C200 for 5/16-inch and greater thickness.
3. Welding: Continuos butt weld at joints for rigid, watertight encasement.
4. Minimum Wall Thickness: Correspond to casing size consistent with Contractor's operation and the permit, selected from the following:

Casing Diameter (Inches)	Smooth Steel Pipe Minimum Thickness
Under 14	0.188

14 and 16	0.281
18	0.312
20	0.344
24	0.406

B. Casings for Open-Cut Crossings:
   1. Meet requirements of casing for jacked or bored crossing.

C. Trench Foundation Stabilization Material:
   1. As specified in Section 02221.

D. Pipe Bedding and Pipe Zone Material:
   1. As specified in Section 02221.

E. Trench Backfill:
   1. Class as shown and meeting requirements of Backfill Above Pipe Zone in Section 02221.

PART 3 – EXECUTION

3.1 PREPARATION

A. General:
   1. Do not begin undercrossing(s) construction until all required labor, materials, and equipment are on-site.
   2. Notification: Provide at least 72 hours in advance of working near railroad or highway right-of-ways. Contracting Officer will obtain necessary easements from highway and railroad owners.
   3. Limits for Undercrossing(s): As shown or specified; length may be increased or decreased when final approval is obtained.

B. Jacked Pipe:
   1. Uniformly distribute jacking pressures through frame and parallel with axis of pipe.
   2. Use necessary care to prevent crushing or other damage to the pipe barrel and joints during jacking.

C. Field Quality Control:
   1. Settlement:
      a. Any settlement noted in backfill, fill, or structures within the limits of undercrossings and occurring within the warranty period will be considered to be caused by improper backfill and compaction or grouting methods, and shall be corrected by the Contractor. Structures damaged by settlement shall be restored to their original condition by the Contractor.

END OF SECTION 02226

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02230 – STREET EXCAVATION, BACKFILL AND COMPACTION

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 – GENERAL

1.3 DENSITY CONTROL TESTING
Delete Subsection in its entirety and insert
"Contractor shall be responsible for all quality control testing. In-place density tests meeting AASHTO T191 (ASTM D1556), Sand Cone Method; or by AASHTO T238 and T239 (ASTM D2922 and D3017), Nuclear Densometer Methods. Quality assurance field density tests may be run by the owner. Contractor shall provide one density test for each lift of backfill or existing subgrade per 400 lineal feet of roadway or 5,000 square feet of parking area. Contractor shall determine the laboratory maximum density values and optimum moisture content of each soil type to be used in fill areas according to AASHTO T-99 OR ASTM D698."

1.4 MATERIALS SUBMITTALS
Delete this Subsection and insert "Furnish copies of all laboratory and field tests to the Engineer for review and approval."

2.2 Add the following "The gradation specified in Subsection 2.3B) is suitable for imported borrow material."

3.5 Delete in its entirety an insert "Refer to Specification Section 02100-SITE CLEARING for disposal of debris and unused excavation."

3.6 Delete in its entirety and insert "Contractor shall control dust in accordance with all local, state and federal regulations."

3.9 Paragraph 3 - Delete the last sentence.

PART 4 – MEASUREMENT AND PAYMENT

Delete in its entirety.

END OF SECTION 02230

misc99_3\mtdc02230_2

This page intentionally blank

SECTION 02232 – AGGREGATES FOR SURFACING AND PLANT MIX A.C.

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 4 – MEASUREMENT AND PAYMENT

Delete in its entirety.

END OF SECTION 02232

misc99_3\mtdc02232

This page intentionally blank

SECTION 02234 – SUB-BASE COURSE

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 2 - PRODUCTS

2.4 GRADATION

A. Delete "Table of Graduations" and add the following table:

Table of Graduations Percentage By Weight Passing Square Mesh Sieves	
Sieve Size	2" Minus
4" (100 mm)	
3" (75 mm)	
2" (50 mm)	100
1 ½" (37.5 mm)	95-100
1" (25.0 mm)	
¾" (19.0 mm)	65-100
½" (12.5 mm)	
No. 4 (4.75 mm)	25-60
No. 10 (2.00 mm)	20-55
No. 200 (0.75 mm)	8 max

B. Add the following:
"The maximum amount of material finer than 0.02 mm in diameter shall be less than 3%."

PART 4 - MEASUREMENT AND PAYMENT

Delete in its entirety.

END OF SECTION 02234

misc99_3\mtdc02234

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02235 – CRUSHED BASE COURSE

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 2 - PRODUCTS

2.3 GRADATION

A. Delete "Table of Graduations" and add the following table:

Table of Graduations Percentage By Weight Passing Square Mesh Sieves	
Passing	¾" Minus
1" (25.0 mm)	
¾" (19.0 mm)	100
N" (16.0 mm)	
½" (12.5 mm)	
M" (9.5 mm)	
No. 4 (4.75 mm)	40-70
No. 10 (2.00 mm)	25-55
No. 200 (0.75 1m)	2-8

B. Add the following:

"The maximum amount of material finer than 0.02 mm in diameter shall be less than 3%."

PART 4 –MEASUREMENT AND PAYMENT

Delete in its entirety.

END OF SECTION 02235

misc99_3\mtdc02235

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02250 – WATERING

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 3 - EXECUTION

3.1 Delete the last sentence and insert "The Contractor shall be responsible for providing the water required for executing the work on this project."

PART 4 – MEASUREMENT AND PAYMENT

Delete in its entirety.

END OF SECTION 02250

misc99_3\mtdc02250

This page intentionally blank

SECTION 02300 – EARTHWORK FOR STRUCTURES, WALKS AND UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Drainage course for slabs-on-grade.
   2. Subbase course for concrete walks.

B. Related Sections include the following:
   1. Division 2 Section "Site Clearing" for site stripping, grubbing, and removing topsoil.
   2. Division 2 Section "Foundation Drainage Systems" for drainage of footings, slabs-on-grade, and walls.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.
   1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
   2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations.
   1. Additional Excavation: Excavation below subgrade elevations as directed by Contracting Officer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
   2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Contracting Officer. Unauthorized excavation, as well as remedial work directed by Contracting Officer, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subbase Course: Layer placed between the subgrade and a concrete pavement or walk.

I. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

J. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings. It does not include water, sewer and storm sewer lines.

1.4 SUBMITTALS

A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM, or a combination of these group symbols; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT, or a combination of these group symbols.
1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Backfill and Fill: Satisfactory soil materials.

E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (38-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (38-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch (38-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
   2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended for bearing surface.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.
   1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit, unless otherwise indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
   1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
   2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.
   3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 APPROVAL OF SUBGRADE

A. Notify Contracting Officer when excavations have reached required subgrade.

B. If Contracting Officer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
   1. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Contracting Officer.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Contracting Officer.
   1. Fill unauthorized excavations under other construction or utility pipe as directed by Contracting Officer.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
   1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:
   1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
   2. Surveying locations of underground utilities for record documents.
   3. Removing concrete formwork.
   4. Removing trash and debris.
   5. Removing temporary shoring and bracing, and sheeting.
   6. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.12 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase.

D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm), to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

E. Coordinate backfilling with utilities testing.

F. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.

G. Place and compact final backfill of satisfactory soil material to final subgrade.

H. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

3.14MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15COMPACTION OF BACKFILLS AND FILLS

A. Place backfill and fill materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
   1. Under structures, building slabs, steps, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill material at 98 percent.
   2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 92 percent.
   3. Under lawn or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill material at 85 percent.

3.16GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
   1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
   2. Walks: Plus or minus 1 inch (25 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17SUBSURFACE DRAINAGE

A. Drainage Piping: Drainage pipe is specified in Division 2 Section "Foundation Drainage Systems and “Storm Drains and Culverts."

3.18 SUBBASE AND BASE COURSES

A Under walks, place subbase course on prepared subgrade and as follows:
   1. Place base course material over subbase.
   2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 1557.
   3. Shape subbase and base to required crown elevations and cross-slope grades.

4. When thickness of compacted subbase or base course is 6 inches (150 mm) or less, place materials in a single layer.
5. When thickness of compacted subbase or base course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick when compacted.

3.19FIELD QUALITY CONTROL

A. Contractor will engage a qualified independent geotechnical engineering testing agency to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet (30 m) or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.

C. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.20PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Contracting Officer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.21DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove trash and debris, and legally dispose of it off Owner's property. Remove surplus satisfactory soil and waste material, including unsatisfactory soil, and place in owners designated water area.

END OF SECTION 02300

misc99_3\mtdc02300

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02501 – ASPHALT MATERIALS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 2 - PRODUCTS

2.1.1 Add the words "…120-150 penetration."

PART 4 – MEASUREMENT AND PAYMENT

4.1 Delete in its entirety.

END OF SECTION 02501

misc99_3\mtdc02501

This page intentionally blank

SECTION 02503 – HOT PLANT MIX ASPHALT CONCRETE BASE AND SURFACE COURSE NEW AND OVERLAY APPLICATIONS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 2 - PRODUCTS

2.2.2 Insert a new first paragraph as follows: "All Hot Plant Mix Asphalt on this project will contain Type B Surface Course Aggregate.

2.3 Delete "ASPHALT CEMENT, 85-100 PENETRATION".

3.3 Delete in its entirety and insert the following: "Contractor shall make gradation analyses of the completed mix to assure that the materials being used and produced are within the tolerances of the mix design and the specifications of the mix being used.
Contractor shall perform a minimum of two Marshall field tests to verify aggregates and other materials are consistent with the mix design. Field density tests by core testing will be used for acceptance purposes.

3.8.1 Delete the number "2 ½" and insert "3".

3.10 First paragraph delete the number "97" and insert "95".

3.11 All reference to owner testing shall be replaced with Contractor testing.
Add the following paragraph: "The Contractor shall provide one 4" diameter asphalt core sample for every 400 lineal feet of asphalt road and one 4" diameter core sample for every 10,000 square feet of parking lot surface. The location of the cores will be specified by the Contracting Officer."

PART 4 – MEASUREMENT AND PAYMENT

Delete in its entirety.

END OF SECTION 02503

misc99_3\mtdc02503

This page intentionally blank

SECTION 02528 - CEMENT CONCRETE PAVEMENT FOR CURBS & WALKWAYS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Curbs and gutters.
   2. Walkways.

B. Related Sections include the following:
   1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.
   2. Division 3 Section "Cast-in-Place Concrete" for general building applications of concrete.

1.3. DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, expansive hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4. SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials:

1.5. QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
   1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant and each aggregate from one source.

E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixes.

PART 2 PRODUCTS

2.1. FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2. STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

B. Reinforcement Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

C. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Cut bars true to length with ends square and free of burrs.

D. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

2.3. CONCRETE MATERIALS

A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.

B. Portland Cement: ASTM C 150, Type I or II.

C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
   1. Maximum Aggregate Size: 3/4 inch (19 mm) nominal.
   2. Do not use fine or coarse aggregates containing substances that cause spalling.

D. Water: ASTM C 94.

2.4. ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

2.5. FIBER REINFORCEMENT

A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1 inch (13 to 25 mm) long.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

C. Products: Subject to compliance with requirements, provide one of the following:
   1. Fibrillated Fibers:
      a. Fibermesh; Fibermesh, Div. of Synthetic Technologies.
      b. Forta CR; Forta Corporation.
      c. Grace Fibers; W. R. Grace & Co., Construction Products Div.

2.6. CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Evaporation retarder below temporarily reduces moisture loss from concrete surfaces awaiting finishing in hot, dry, and windy conditions. Evaporation retarders are neither curing compounds nor chemical surface retarders used to delay concrete setting.

D. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

A Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

B Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

1. Evaporation Retarder:
   a. Cimfilm; Axim Concrete Technologies.
   b. Finishing Aid Concentrate; Burke Group, LLC (The).
   c. Spray-Film; ChemMasters.
   d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
   e. Sure Film; Dayton Superior Corporation.
   f. Eucobar; Euclid Chemical Co.
   g. Vapor Aid; Kaufman Products, Inc.
   h. Lambco Skin; Lambert Corporation.
   i. E-Con; L&M Construction Chemicals, Inc.
   j. Confilm; Master Builders, Inc.
   k. Waterhold; Metalcrete Industries.
   l. Rich Film; Richmond Screw Anchor Co.
   m. SikaFilm; Sika Corporation.
   n. Finishing Aid; Symons Corporation.
   o. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.
2. Clear Waterborne Membrane-Forming Curing Compound:
   a. AH Curing Compound #2 DR WB; Anti-Hydro International, Inc.
   b. Aqua Resin Cure; Burke Group, LLC (The).
   c. Safe-Cure Clear; ChemMasters.
   d. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
   e. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.
   f. Nitocure S; Fosroc.
   g. Aqua Kure-Clear; Lambert Corporation.
   h. L&M Cure R; L&M Construction Chemicals, Inc.
   i. 1100 Clear; W. R. Meadows, Inc.
   j. Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
   k. Rich Cure E; Richmond Screw Anchor Co.
   l. Resi-Chem Clear Cure; Symons Corporation.

m. Horncure 100; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
n. Hydro Cure; Unitex.
o. Certi-Vex Enviocure; Vexcon Chemicals, Inc.

2.7. RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
1. Type: Class II, non-load bearing, for bonding freshly mixed to hardened concrete.

2.8. CONCRETE MIXES

A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.

B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.

C. Proportion mixes to provide concrete with the following properties:
1. Compressive Strength (28 Days): 3000 psi (20.7 MPa).
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump Limit: 4 inches (100 mm).
   a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches (200 mm) after adding admixture to plant- or site-verified, 2- to 3-inch (50- to 75-mm) slump.

D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements for concrete exposed to deicing chemicals.

E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:
1. Air Content: 5.5 percent for 1-1/2-inch (38-mm) maximum aggregate.
2. Air Content: 6.0 percent for 1-inch (25-mm) maximum aggregate.
3. Air Content: 6.0 percent for 3/4-inch (19-mm) maximum aggregate.

F. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd. (0.9 kg/cu. m).

2.9. CONCRETE MIXING

A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94 and ASTM C 1116.
   1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 2 - EXECUTION

2.10. PREPARATION

A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

B. Remove loose material from compacted subbase surface immediately before placing concrete.

2.11. EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

2.12. STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap to adjacent mats.

2.13. JOINTS

A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
   1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
   1. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
   2. Provide tie bars at sides of pavement strips where indicated.
   3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
   1. Expansion joints are types of isolation joints. Revise spacing to suit Project or delete if not required.
   2. Locate expansion joints at intervals of 50 feet (15.25 m), unless otherwise indicated.
   3. Extend joint fillers full width and depth of joint.
   4. Terminate joint filler less than 1/2 inch (12 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
   5. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   6. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   7. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
   1. Select type of joint-forming method required or retain both at Contractor's option. Add spacing of joints if not indicated on Drawings.
   2. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.

a. Radius: 1/4 inch (6 mm).

3. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
1. Radius: 1/4 inch (6 mm).

2.14. CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.

D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.

E. Delete paragraph below if adding water after batch mixing is permitted. Revise if conditional approval will be permitted. ACI 301 and ASTM C 94 permit water to be added to concrete mix onsite, up to amount allowed in design mix.

F. Do not add water to concrete during delivery, at Project site, or during placement.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.

J. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

K. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

L. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

M. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

N. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

2.15. CONCRETE FINISHING

A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.

Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
   1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

2.16. CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.

B. If evaporation rate in paragraph below is exceeded, ACI 305R states that plastic shrinkage cracking is probable. See manufacturers' literature or ACI 305R for estimated moisture-loss chart relating relative humidity, air and concrete temperature, and wind velocity to rate of evaporation.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
   1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
      a. Water.
      b. Continuous water-fog spray.
      c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
   2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
   3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

2.17. PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
   1. ACI 117 establishes few pavement tolerances. Below are based on ACI 330.1.
      a. Elevation: 1/4 inch (6 mm).
      b. Thickness: Plus 3/8 inch (9 mm), minus 1/4 inch (6 mm).
      c. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
      d. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch (25 mm).
      e. Vertical Alignment of Tie Bars and Dowels: 1/4 inch (6 mm).

f. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch (13 mm).
g. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
h. Joint Spacing: 3 inches (75 mm).
i. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
j. Joint Width: Plus 1/8 inch (3 mm), no minus.

2.18. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing shall be performed according to the following requirements:
1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each set of compressive-strength specimens.
5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
6. Revise number of test cylinders in subparagraph above and number of tests in subparagraph below to suit Project.
7. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m). One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
8. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
9. Usually delete subparagraph below. If retaining, revise number of compressive-strength tests above.
10. When total quantity of a given class of concrete is less than 50 cu. yd. (38 cu. m Contracting Officer may waive compressive-strength testing if adequate evidence of satisfactory strength is provided.

11. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
12. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi (3.4 MPa).

C. Test results shall be reported in writing to Contracting Officer, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

2.19. REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.

B. Drill test cores where directed by Contracting Officer when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 02528

misc99_3\mtdc02528

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02581 – PAVEMENT MARKINGS AND MARKERS (PREFORMED PLASTIC, PAINTS AND ENAMELS)

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 - GENERAL

Delete all references to Engineer establishing or laying out of control points for painting. Contractor shall be responsible for all control using the dimensions shown on the plans.

PART 4 – MEASUREMENT AND PAYMENT

Delete in its entirety.

END OF SECTION 02581

misc99_3\mtdc02581

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02610A – WATER MAIN MATERIALS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 2 - PRODUCTS

2.2 Delete last sentence and insert "Use DR 14 Class 200 pipe."

END OF SECTION 02610A

misc99_3\mtdc02610A

This page intentionally blank

SECTION 02610B – SANITARY SEWER MAIN MATERIALS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 2 – PRODUCTS

2.12 GRAVITY SEWER PIPE Delete in its entirety and add the following:

"A. 4" to 6" Diameter - ASTM D 1785 PVC Schedule 40 Pipe and Fittings:
1. Pipe shall conform to ASTM D 2665-81 and D 3311-71 standards in accordance with the UPC.
2. Fittings shall conform to ASTM D 2665-78 and D 33``-79a and shall be glue fitting only.
3. Solvent cement and primer shall conform to ASTM D 2564-86.

B. 8" Diameter - ASTM D 3034, Standard Specifications for Polyvinyl Chloride Sewer Pipe and Fittings, with an SDR of 35."

2.1.5 FITTINGS Delete in its entirety and insert "Sewer service connections shall be made by installing either standard tee fittings or tapping saddles. Tapping saddles shall be Predco Fast-Fit sewer saddle with epoxy kit and tapping donut, or equal."

2.2 Delete in its entirety.

2.3 Delete in its entirety.

END OF SECTION 02610B

misc99_3\mtdc02610B

This page intentionally blank

SECTION 02610C – STORM DRAIN MATERIALS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 - GENERAL

1.3 Delete in its entirety.

PART 2 - PRODUCTS

2.2 At the end of the first paragraph add the following:

"The pipe shall conform to ASTM F679, T-1 wall thickness, per "Standard Specifications for PVC Large Diameter Plastic Gravity Sewer Pipe and Fittings"(18"-27")."

2.7 Delete in its entirety and add the following:

"2.7 HIGH DENSITY POLYETHYLENE PIPE

A. Gravity Flow Watertight Pipe Systems. The gravity flow watertight pipe systems shall be Hi-Q Sure-Lok 10.8 bell-and-spigot as manufactured by Hancor, Inc. The bell and spigot joint shall meet ASTM D3212. The system shall consist of pipe, sleeves, gaskets, lubricant and where necessary, fittings. All components shall be supplied by the same manufacturer.

B. Pipe. The pipe shall be Hancor Hi-Q Sure-Lok 10.8 high density polyethylene smooth interior pipe meeting the requirements of AASHTO M294 Type S. The pipe shall have annular corrugations. Minimum conveyance factors shall be shown in Table 1.

C. Watertight Sleeves. The watertight sleeves shall be smooth polyethylene with an indention in the center to ensure proper positioning of the pipe. Sleeves shall be factory-installed on one end of the pipe.

D. Gaskets. Gaskets shall be a solid cross section ring and meet the requirements of ASTM F477. A protective removable stretch wrap material shall be placed on all exposed gaskets at the factory.

E. Lubricant. Gaskets and sleeves shall be lubricated prior to insertion with a compound supplied by the pipe manufacturer.

F. Fittings. Pipe fittings shall conform to the requirements of AASHTO M294. Fittings shall have annular corrugations.

Table 1
TiteLine Data

PIPE DIAMETER	CONVEYANCE FACTOR*	INSIDE DIAMETER	OUTSIDE DIAMETER**
12”	46.3	12”	15.4”
15”	83.9	15”	19.6”
18”	136.4	18”	23.9”
24”	293.9	24”	29.9”
30”	532.9	30”	37.8”

*Based on design Manning “n” value of 0.010.
**Indicates the outside diameter of the sleeve.”

2.8 SURGE BASIN

Furnish concrete surge basin as shown on the drawings.

END OF SECTION 02610C

misc99_3\mtdc02610C

SECTION 02711 - FOUNDATION DRAINAGE SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes foundation and underslab, subsoil drainage systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for the following:

1. Solid pipe for tight joints.
2. Perforated piping.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed foundation drainage systems similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.5 COORDINATION

A. Coordinate foundation drainage system installation with excavating, trenching, and backfilling.

B. Coordinate piping termination with storm drainage system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Thermadry Type 1750; Dow Chemical Co.
2. GEOTECH; GeoTech Systems Corp.

2.2 PIPES AND FITTINGS

A. General: Include pipes, fittings, couplings, and joint materials.

B. Polyethylene (PE) Drainage Tubing and Fittings: AASHTO M 252 Interim, Type S, corrugated, with smooth waterway, for coupled joints.

1. Couplings: AASHTO M 252, corrugated, band type, matching tubing and fittings.

C. Polyethylene (PE) Pipe and Fittings: AASHTO M 294 Interim, Type S, corrugated, with smooth waterway, for coupled joints.

1. Couplings: AASHTO M 294, corrugated, band type, matching tubing and fittings.

D. Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM D 3034, SDR 35, bell-and-spigot ends, for gasketed joints.

1. Gaskets: ASTM F 477, elastometric seal.

E. Perforated, Polyethylene (PE) Pipe and Fittings: ASTM F 405, corrugated, for coupled joints.

1. Couplings: Manufacturer's standard, band type.

F. Perforated, Polyvinyl Chloride (PVC) Sewer Pipe and Fittings: ASTM D 2729, bell-and-spigot ends, for loose joints.

2.3 SPECIAL PIPE COUPLINGS

A. Description: Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined. Include the following specific sleeve materials, where available:
1. Clay Pipe: ASTM C 425, rubber.
2. Plastic Pipe: ASTM F 477, elastomeric seal.

3. Dissimilar Pipes: Compatible with pipe materials being joined.
4. Bands: Stainless steel, at least 1 at each pipe insert.

2.4 SOIL MATERIALS

See Section 02300 – Earthwork

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and areas for suitable conditions where foundation drainage systems are to be installed. Do not proceed until unsatisfactory conditions have been corrected.

3.2 FOUNDATION DRAINAGE SYSTEM APPLICATIONS

A. Systems with 4-Inch (DN 100) Piping: As follows:

1. Perforated, polyethylene (PE) pipe and fittings, couplings, and coupled joints.
2. Perforated, polyvinyl chloride (PVC) sewer pipe and fittings for loose, bell-and-spigot joints.

3.3 PIPING INSTALLATION

A. Drawing plans and details indicate general location and arrangement of foundation drainage system piping.

B. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing, solidly in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.

1. Install piping pitched down in direction of flow as shown on the drawings.
2. Provide recesses in excavation bottom to receive bells of pipe bell ends. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
3. Apply and compact impervious fill material to raise low areas or where unsatisfactory bearing soil may occur.

C. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.

D. Maintain swab or drag in piping with tight joints and pull past each joint as it is completed.

E. Extend piping and connect to storm drainage system, of sizes and in locations indicated. Terminate piping as indicated.

3.4 PIPE JOINT CONSTRUCTION AND INSTALLATION

A. General: Join and install pipe and fittings as indicated and according to the following.

B. Polyethylene (PE) Pipe and Fittings: As follows:

1. Join pipe, tubing, and fittings with couplings for soiltight joints according to AASHTO "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4 "Joint Properties"; and manufacturer's written instructions.
2. Join perforated pipe and fittings with couplings for soiltight joints according to AASHTO "Standard Specifications for Highway Bridges," Division II, Section 26.4.2.4 "Joint Properties"; or ASTM D 2321; and manufacturer's written instructions.
3. Install according to ASTM D 2321 and manufacturer's written instructions.
4. Install perforated pipe with perforations down.

C. Polyvinyl Chloride (PVC) Pipe and Fittings: As follows:

1. Join ASTM D 3034 sewer pipe and fittings with elastomeric seal gaskets according to ASTM D 2321.
2. Join ASTM D 2729 perforated, sewer pipe and fittings with loose, bell-and-spigot joints.
3. Install according to ASTM D 2321.
4. Install perforated pipe with perforations down.

D. System Piping Joints: Make joints using system manufacturer's seals and couplings, except where otherwise specified.

E. Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and that fit both pipe materials and dimensions.

3.5 SOIL MATERIAL INSTALLATION

A. Filter Material: Place filter material over drainage fabric and drainage pipe as indicated on the drawings.

B. Fill to Grade: Place fill over filter material to plan elevations and slope away from building.

END OF SECTION 02711

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02713 – WATER MAINS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 – GENERAL

1.2 At the end of the first sentence add "and as shown on the drawings."

PART 3 – EXECUTION

3.2.5 Delete the first sentence.
Delete the 7th paragraph.

PART 4 – MEASUREMENT AND PAYMENT

Delete this section in its entirety.

END OF SECTION 02713

misc99_3\mtdc02713

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02718 – WATER VALVES AND FIRE HYDRANTS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 – GENERAL

1.2 Delete Standard Drawing No. 02718-2 and 02718-3.

PART 4 – MEASUREMENT AND PAYMENT

Delete this section in its entirety.

END OF SECTION 02718

misc99_3\mtdc02718

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02719 – WATER SERVICE CONNECTIONS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 - GENERAL

1.2 Delete in its entirety.

PART 4 - MEASUREMENT AND PAYMENT

Delete this section in its entirety.

END OF SECTION 02719

misc99_3\mtdc02719

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02721 – STORM DRAINS AND CULVERTS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 – GENERAL

1.2 Delete all Standard Drawings except 02722-5 –Typical Manhole Channel Details
See drawings for Standard Drawings.

PART 2 – PRODUCTS

2.2.1 Delete in its entirety and insert "Furnish manholes constructed of precast concrete sections with frames, covers and steps as shown on the drawings. Manholes shall have eccentric cones only."

2.2.4 Delete in its entirety and insert "Furnish frames and covers as shown on the Drawings."

PART 3 – EXECUTION

3.1.5 At the end of the last sentence add … "provided that any variation does not result in a lever of reverse sloping invert."

PART 4 – MEASUREMENT AND PAYMENT

Delete this section in its entirety.

END OF SECTION 02721

misc99_3\mtdc02721

This page intentionally blank

SECTION 02721A - OIL AND SAND INTERCEPTOR

1. An Oil and sand interceptor shall be installed to capture wastewater from the washdown area on the southwest side of the Cache Storage Building #2200. It's exact location shall be as directed by the Contracting Officer. The Missoula Department of Engineering Oil and Sand Interceptor Standard Detail (Std.-194) is attached at the end of this Section.

2. The oil and sand interceptor shall be in accordance with the Missoula Wastewater Treatment Plant, Approved Best Management Practices Policy, Sand and Oil Interceptors, dated January 23, 1997, as follows:

Industrial users subject to Missoula Municipal Code 13.06.110 shall have an interceptor of a size and construction approved by the City. Industrial users which do not have an approved interceptor or do not use Best Management Practices for their interceptor shall be subject to the pretreatment surcharge specified in MMC 13.06.230.

1) Inspection: The interceptor shall be inspected at least once per month.

Tools which may be viable:

a) Pry bar or "T" handle

b) Flashlight

c) Pole or "sludge judge" marked at tank liquid level and in increments such as inches.

2) Maintenance Logbook: A logbook shall be maintained. Each time the interceptor is inspected or any maintenance is performed, an entry shall be made in the log containing at a minimum:

a) The date the activity is performed

b) Name of person performing the activity

c) The condition of the absorbent pillow

d) The thickness of any settled matter

e) A description of the activity performed

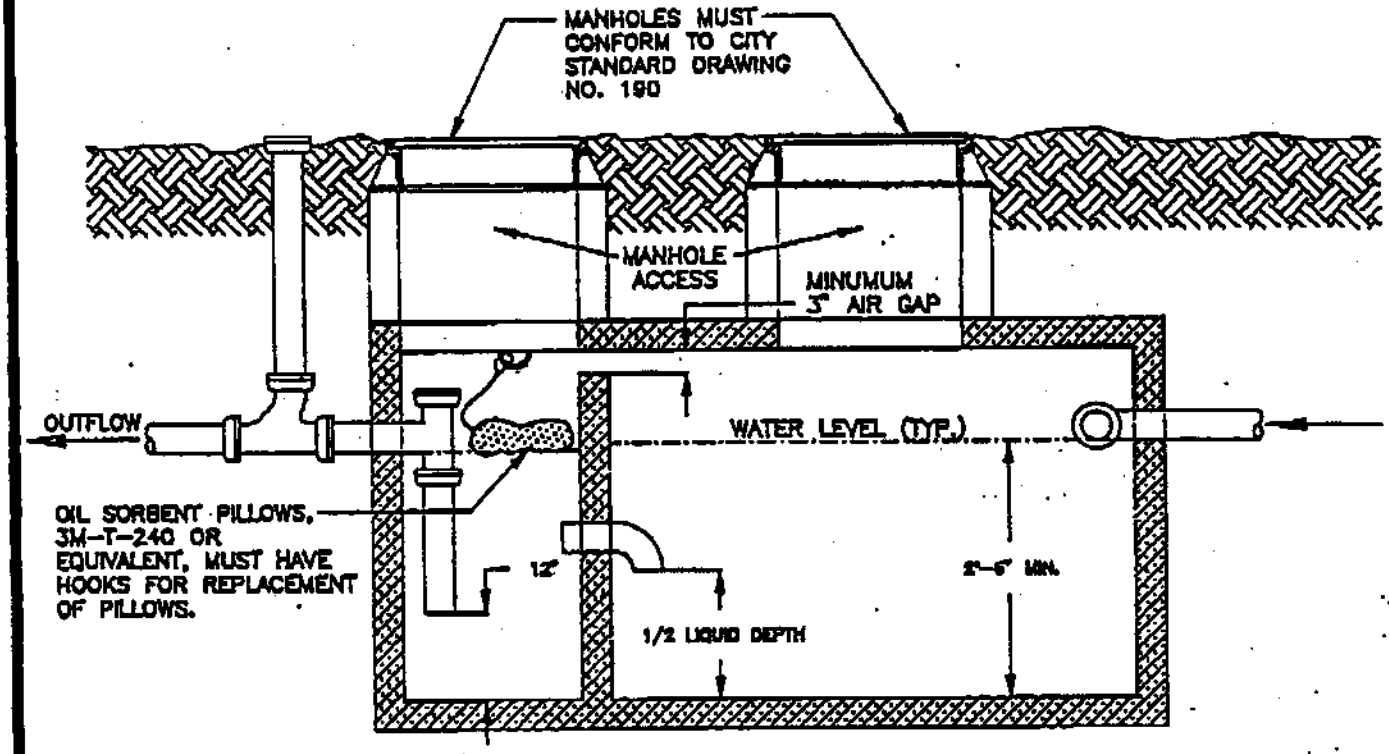
3) Oil Sorbent Pillows: A sorbent pillow shall be placed in each chamber of the interceptor. There shall be no accumulation of floating oil in any chamber. Maintain pillows as follows:

a) Replace pillows if they sink

b) Replace pillows when they are saturated with oil. Saturated pillows will drip oil when lifted out of the tank and squeezed gently.

c) Dispose of the pillows by drying completely (no water) and put in garbage collection container (BFI landfill)

*00003



INTERCEPTOR SHALL BE SIZED IN ACCORDANCE WITH THE UNIFORM PLUMBING CODES, SECTION 402. INLET COMPARTMENT LENGTH MUST NOT BE LESS THAN 2/3rds OF THE TOTAL LENGTH. (1,000 GALLONS MINIMUM CAPACITY)

APPROVED BY CITY ENGINEER Bruce J. Barker	SCALE NTS ADOPTED 02/1990 REVISED 10/03/90 SUPERSEDES	OIL & SAND INTERCEPTOR	
		DEPT. OF ENGINEERING MISSOULA, MONTANA	DWG. NO. STD-194

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02722 – SANITARY SEWER MAINS

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 – GENERAL

1.2 Delete all Standard Drawings except Drawings 02713-2, 02722-5, and 02722-8. See drawings for Standard Drawings.

PART 2 – PRODUCTS

2.2.1 Delete in its entirety and insert "Construct manholes from precast concrete sections having frames, covers and steps as shown on the drawings. Manholes shall have eccentric cones only."

2.2.4 Delete in its entirety and insert "Furnish frames and covers as shown on the drawings."

2.2.5 Change "Structural Concrete" to "Cast-In-Place Concrete"

PART 3 – EXECUTION

3.1.5 Delete in its entirety and insert "Variance from established line and grade shall not be greater than ¼ inch, provided that such variation does not result in a lever or reverse sloping invert."

3.3.5 Delete in its entirety.

3.3.6 Add "A 7 day deflection test will be required on all sanitary sewer mains."

PART 4 – MEASUREMENT AND PAYMENT

Delete this section in its entirety.

END OF SECTION 02722

misc99_3\mtdc02722

This page intentionally blank

SECTION 02724 – SANITARY SEWER AND STORM DRAIN SERVICES

This specification is incorporated by reference from the "Montana Public Works Standard Specifications, Fourth Edition, January, 1996." (All references to Section or Division numbers within the Montana Public Works Standard Specifications refer to that publication only).

The incorporated specification is modified as follows:

PART 1 - GENERAL

1.2 Delete in its entirety.

PART 2 – PRODUCTS

2.1 Add prior to the first paragraph "Furnish gravity sewer service pipe meeting the following requirements for service lines and cleanouts.
ASTM D 1785 (PVC) Schedule 40 Pipe and Fittings:
-Pipe shall conform to ASTM D2665-82 and D3311.71 standards in accordance with the UPC.
-fittings shall conform to ASTM D2665-78 and D3311-79a and shall be glued fittings only.
-Solvent cement and primer shall conform to ASTM D2564-86."

PART 3 – EXECUTION

3.1 Delete in its entirety and insert "Construct service lines as shown on the drawings."

PART 4 – MEASUREMENT AND PAYMENT

Delete this section in its entirety.

END OF SECTION 02724

misc99_3\mtdc02724

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02730 – SANITARY SEWER LIFT STATIONS

PART 1 – GENERAL

1.1 SUMMARY

1.1.1 WORK INCLUDED: Provide pipe, valves, fittings, pumps, wet wells, manholes, control systems, and all necessary appurtenances required for a complete lift station and force main installation. A Lift Station is a premanufactured low profile below grade station, requiring installation of the premanufactured pumping station on a contractor supplied and constructed wet well.

1.1.2 RELATED WORK:

A. Trenching is specified in Section 02221.
B. Cast in place concrete is specified in Section 03300.
C. Manholes are specified in Section 02722.

1.2 REFERENCES

1.2.1 RELATED DOCUMENTS: General Conditions, Supplementary Conditions, and applicable provisions of Division 1 Sections apply to this Section.

1.2.2 REFERENCE STANDARDS: Comply with the requirements of the reference standards noted herein, except where more stringent requirements are listed herein or otherwise required by the Contract Documents.

1.3 DEFINITIONS

1.4 SUBMITTALS

1.4.1 SUBMITTAL PROCEDURES: Refer to Division 1.

1.4.2 PRODUCT DATA: Submit manufacturer's published product specifications, recommendations, and installation instructions for materials and products specified herein for the lift stations and valve manholes.

1.4.3 SHOP DRAWINGS: Submit drawings indicating layout, dimensions, construction materials, valve boxes, fittings, pumps, pump lifting/guide rail system, vaults, service lines, accessories, and control schematics.

1.4.4 TEST REPORTS: Submit test reports for hydrostatic pressure and chlorination tests specified.

1.6 DELIVERY, STORAGE, AND HANDLING

1.6.1 PRODUCT HANDLING: Exercise care to prevent damage to materials during loading transportation, unloading, and handling at the site. Do not drop pipe or fittings.

1.6.2 DELIVERY: Deliver piping in bundles, securely strapped, with protective blocking as required. Label or tag each bundle with type, size, and quality of material. Deliver valves and hydrants in manufacturer's protective shipping crates or cartons.

1.6.3 STORAGE AND PROTECTION: Store piping, valves hydrants above ground on blocking or skids. Damaged materials and products will be subject to rejection.

1.7 JOBSITE CONDITIONS

1.7.1 EXISTING SITE CONDITIONS: Visit the site to confirm all existing conditions prior to submitting bids. The contractor shall be responsible for verifying the location of existing utilities prior to beginning construction.

PART 2 – PRODUCTS

2.1 MATERIALS

2.1.1 PIPE AND FITTINGS:

A. Ductile Iron Pipe: Comply with AWWA C151, working pressure of 150 psi, thickness class 52, with AWWA C104 cement mortar lining and bituminous outside coating 1 mil thick. Provide flanged joints, complying with AWWA C110. Polyethylene encasement shall comply with AWWA C105.

B. Polyvinyl Chloride Pipe: Two (2) inch pipe shall comply with ASTM D1785, Schedule 80, with flanged or solvent weld joints conforming to ASTM D 2467. Four (4) inch pipe shall comply with ASTM D 2241, SDR 26 with pressure rating of 160 and rubber gasketed push-on joints.

C. Ductile Iron Fittings: Comply with AWWA C153, Class 350, compact fittings, with mechanical joints for force main and flanged joints in valve manhole. Cement mortar lined fittings shall comply with AWWA C104 with bituminous outside coating one mil thick.

D. PVC Fittings: Comply with ASTM D2467 with solvent cement joints.

2.1.2 VALVES:

A. Resilient Wedge Valves: Complying with AWWA C509-80 with nonrising stems, flanged joint, open counterclockwise, resilient material permanently bonded to wedge, complying with ASTM 429-73, full epoxy coating on the inside of valve, and operate with a handwheel.

B. Check Valve: Shall be flap valve style complying with ASTM A126, Class B cast iron box and cover, domed access cover, only one moving part being the valve disc, disc shall be Buna-N

(NBR) complying with ASTM D2000-BG, surface seating at 45°, 35° disc stroke with opening through valve equal to nominal pipe diameter, valve interior with full epoxy coating, series 500 val-matic valve or approved equivalent.

2.1.3 PACKAGE LIFT STATIONS

A. Factory built 6' diameter x 5' in ground fiberglass pump station with duplex self-priming sewage pumps and electronic pressure switch level control by Gorman-Rupp or approved equivalent.

1. DESCRIPTION:

a. Scope

(1) The contractor shall furnish and install one factory built, in ground, fiberglass reinforced automatic pump station and one outdoor pump motor control center. The station shall be complete with all equipment specified herein. Two self-priming horizontal, centrifugal, v-belt motor driven sewage pumps, valves and internal piping shall be mounted inside the pump station. Heavy duty motor circuit breakers, magnetic motor starters, automatic liquid level control system, and internal wiring shall be mounted within the pump motor control center.

2. OPERATING CONDITIONS:

a. Pumps

(1) Each self-priming pump shall have the necessary characteristics and be selected to perform in accordance with, and subject to, the provisions of the paragraph hereafter titled pumps.

3. SYSTEM POWER CHARACTERISTICS:

a. Power

(1) Electrical power to be furnished to the pump station will be 3 phase, 60 hertz, 4 wire, 208 volts, maintained within plus or minus 10 percent. Control voltage shall not exceed 132 volts.

4. STATION ENCLOSURE:

a. Description

(1) The station enclosure shall contain and enclose pumps, motors, and piping, and shall be constructed to enhance serviceability by incorporating the following design characteristics:

(a) The enclosure shall consist of a pump chamber with integral base and covered entrance. The pump chamber shall be a vertical cylinder having a nominal inside diameter of 6 feet. The chamber shall contain a clear height inside of four feet eleven inches from floor to opening. The upper end of the pump chamber shall have a sealing flange a minimum of 3 inches in width.

(b) Chamber structure shall have adequate thickness and reinforcements for burial from grade to the concrete pad to which the chamber shall be secured. Pump station manufacturer shall supply stainless steel anchor bolts and clamps for installation of the pump chamber on the concrete pad.

(c) The pump chamber, internal equipment and piping shall be plumb. Pump chamber shall incorporate internal drainage methods as described in the paragraph entitled chamber base.

b. Materials

(1) The station enclosure shall be manufactured of molded reinforced isophthalic polyester resins with a minimum of 25% fiberglass and a maximum of 75% resin. Resin fillers or extenders shall not be used. Glass fibers shall have a minimum average length of 1 1/4 inches. Major design considerations shall be given to structural stability, corrosion resistance and water tight properties. The polyester laminates shall provide a balance of mechanical, chemical and electrical properties to insure long life. They must be impervious to micro-organisms, mildew, mold, fungus, corrosive liquids and gases which can reasonably be expected to be present in the environment surrounding the wet well.

(2) All interior surfaces of the housing shall be coated with a white polyester resin-rich finish for maximum light reflectivity. It shall be of suitable thickness and formulated to provide:

(a) Maintenance-free service.
(b) Abrasion resistance.
(c) Protection from sewage, greases, oils, gasoline and other common chemicals.
(d) Color fastness.
(e) Gloss retention.

c. Chamber Base

(1) The pump chamber shall be constructed of fiberglass reinforced with a steel plate. The steel plate shall be completely encapsulated by fiberglass. The base

shall incorporate a water drain incorporating a self sealing back flow prevention device. The base or pump chamber floor shall be designed to mount flush to the concrete pad and without creating misalignment or plumbing strain. The base shall incorporate a suitable flange for securing the pump chamber to the concrete pad to prevent flotation.

(2) The chamber base shall provide suitable openings for the pump suction and discharge lines to enter station chamber. The opening shall incorporate mounting collars of suitable height for the mounting of flexible pipe sealing couplings. Each coupling shall provide a water tight seal between pump suction and discharge lines and chamber base.

d. Station Cover

(1) The station cover shall be of a single piece design, molded of fiberglass reinforced polyester resin over a honeycomb core, offering maximum strength with minimum weight. A full drip lip shall be molded around the edge of the cover with a suitable gasket for sealing against chamber flange. A corrosion resistant hasp shall be provided to allow padlocking of cover in the closed position. Internal air passages shall be provided through the honeycomb core, to provide for station ventilation. The cover shall be eccentrically mounted for maximum access opening, to a support column attached to the chamber base. The outside of the cover shall be coated with a polyester resin-rich finish in a light color to provide minimum maintenance and to reduce heat absorption.

e. Cover Support Column

(1) The support column shall consist of a bearing housing and its support structure of heavy steel construction. The bearing housing shall contain a minimum of two non-lubricated bearings, in which a non-corrosive shaft shall be mounted in a manner that permits travel up or down. The shaft shall be free to travel a minimum of 12 inches, but shall be mounted in such a manner so that it may not rotate. A flange for attachment of station cover shall be mounted at the top of the shaft in frictionless bearings to allow the eccentrically attached station cover to rotate a full 360 degrees for maximum access to station interior. The mounting flange shall incorporate a locking mechanism to prevent the accidental rotation of station cover during normal station service procedures. This device shall automatically lock the station cover in 90 degree increments.

(2) The station cover shall be raised by means of an electric linear actuator, requiring 115 volts AC, 60 hertz, single phase current. The actuator shall be designed for smooth, reversible linear motion for loads up to 600 pounds and shall be equipped with adjustable limit switches to shut the motor off at the end of travel. The actuator shall be operated by a spring return key switch. The linear actuator shall be equipped with a manual override to allow access to

station interior in the event of a power outage. The manual override shall be accessible through the top of the station cover and require a standard ratchet and socket to operate.

f. Ventilating Blower

(1) An exhaust blower shall provide forced ventilation of the pump chamber. Blower shall be squirrel cage, high efficiency type of adequate capacity to change station air once every two minutes. Blower motor shall be protected by a thermal-magnetic air circuit breaker to provide overcurrent and overload protection and shall be controlled by a percentage timer having a range of zero to 100% of 10 minutes.

g. Station Heater

(1) Pump station shall be provided with a 1300/1500 watt, 115 volt electric heater with cord and grounding plug. Ungrounded heaters shall not be acceptable.

h. Receptacle

(1) A duplex ground fault indicating utility receptacle providing 115 vac, 60 hertz, single phase current shall be mounted on the side of the junction box. Receptacle circuit shall be protected by a 15 ampere thermal-magnetic circuit breaker.

5. PUMPS:

a. Description

(1) Pumps shall be horizontal, self-priming sewage pumps, specifically designed for pumping raw, unscreened, domestic sanitary sewage.

b. Size

(1) Pumps shall have 4 inch suction connection and 4 inch discharge connection.

c. Material

(1) All areas of the pump casing and volute which are exposed to sewage shall be constructed of cast iron of no lesser grade than class 30.

d. Internal Passages

(1) All openings, internal passages and internal recirculation ports shall be large enough to permit the passage of a sphere 3 inches in diameter and any trash or stringy material which may pass through the average house collection system.

Screens or any internal devices that create a maintenance nuisance or interfere with priming and performance of the pump shall not be permitted.

(2) Certified dimensional drawings indicating size and locations of the priming recirculation port or ports shall be submitted to the engineer for approval prior to shipment.

e. Pump Performance

(1) Each pump must have the necessary characteristics and be properly selected to perform under these operating conditions:

(a)	Capacity, in gpm,	120
(b)	Total dynamic head, in feet,	33
(c)	Total dynamic suction lift,	12
(d)	Maximum re-priming lift, in feet,	10
(e)	Maximum static suction lift, in feet,	11.8
(f)	Total discharge static head, in feet,	6.9

(2) Consideration shall be given to the sanitary sewage service anticipated, in which occasionally debris will lodge between the pump suction check valve and seat, resulting not only in loss of the suction leg, but also in the siphoning of liquid from the pump casing to the approximate center line of the impeller. Such occurrence shall be considered normal with proper installation of air release line to atmosphere.

(3) In consideration of such occurrence and of the unattended operation anticipated, each pump shall be so designed as to retain adequate liquid in the pump casing to insure unattended automatic re-priming while operating at its rated speed in completely open system without suction check valves and with a dry suction leg.

f. Reprime Performance

(1) Each pump must be capable of a reprime lift of 13 feet while operating at low speed and the selected impeller diameter. Reprime lift is defined as the static height of pump suction centerline above liquid that the pump will prime; and delivery within five minutes on liquid remaining in the pump casing after delivering pump is shut down with the suction check valve removed. Additional standards under which reprime test shall be run are:

(a) Piping shall incorporate a discharge check valve down stream from the pump. Check valve size shall be equal (or greater than) the pump discharge diameter.

(b) A ten foot length of one-inch pipe shall be installed between pump and discharge check valve. This line shall be open to atmosphere at all times to duplicate the air displacement rate of a typical pump station fitted with an air release valve.

(c) No restrictions shall be present in pump or suction piping which could serve to restrict the rate of siphon drop of the suction leg. Suction pipe configuration for reprime test shall incorporate a minimum horizontal run of 4.5 feet and one 90 degree elbow.

(d) Impeller shall be set at the clearances recommended by the manufacturer in the pump service manual.

(f) Liquid to be used for reprime test shall be water.

(2) Upon request from the Contracting Officer, certified reprime test data, prepared by the pump manufacturer and certified by a registered professional engineer, shall be submitted for approval.

g. Serviceability

(1) The pump manufacturer shall demonstrate to the Contracting Officer's satisfaction that due consideration has been given to reducing maintenance costs by incorporating the following features.

h. Special Tools

(1) No special tools shall be required for replacement of any components within the pump.

i. Cover Plate

(1) The pump must be equipped with a removable cover plate, allowing access for service and repairs without removing suction or discharge piping.

j. Wear Plate and Rotating Assembly

(1) The pump shall be fitted with a replaceable wear plate. Replacement of the wear plate, impeller, seal and suction check valve shall be accomplished through the removable cover plate. The entire rotating assembly, which includes bearings, shaft, seal and impeller, shall be removable as a unit without removing the pump volute or piping.

(2) Each pump shall incorporate a suction valve that can be removed or installed through the removable cover plate opening, without disturbing the suction piping. Sole function of the check valve shall be to eliminate re-priming with each cycle. Pumps requiring suction check valve to prime or reprime will not be acceptable.

k. Impeller Clearance Adjustment

(1) Means shall be provided for external adjustment of the clearance between the impeller and wear plate. The entire rotating assembly shall move as one unit to enable the clearances to be adjusted. Clearance adjustment by means of moving the shaft, thereby affecting the seal, shall not be acceptable.

6. CONSTRUCTION:

a. Impeller

(1) The impeller shall be two-vaned, semi-open, non-clog, cast in ductile iron with integral pump out vanes on the back shroud. Impeller shall thread onto the pump shaft and be secured with a lockscrew.

b. Seal

(1) The pump shaft shall be sealed against leakage by a mechanical seal. Both the stationary sealing member and mated rotating member shall be of tungsten titanium carbide alloy. Each of the mated surfaces shall be lapped to a flatness of one-half light band (5.8 millionths of an inch), as measured by an optical flat under monochromatic light. The stationary seal seat shall be double floating so that faces will not lose alignment during periods of shock loads that will cause deflection, vibration and axial movement of the pump shaft.

(2) The seal shall be lubricated with oil from a separate, oil-filled reservoir. The same oil shall not be used to lubricate both the shaft and the shaft bearings.

(3) The seal shall be warranted for a minimum of four years from date of shipment. Should the seal fail within the first year, the manufacturer shall be obligated, upon notification, to furnish a new seal, without charge to owner, F.O.B. Factory. The cost of replacement seals thereafter, will be on a pro-rated basis as follows: failure within two years, 25% of new seal price; failure within three years, 50% of new seal price; failure within four years, 75% of new seal price.

c. Shaft Bearings

(1) The pump shaft bearings shall be anti-friction ball or tapered roller bearings, of ample size and proper design to withstand all radial and thrust loads which can reasonably be expected during normal operation. Bearings shall be lubricated from a separate reservoir. Pump designs in which the same oil lubricates both the shaft bearings and the shaft seal shall not be acceptable.

d. Pump Suction Elbow

(1) Each pump shall be equipped with a one-piece, cast iron suction elbow. Each elbow shall have one 1/4 inch NPT tapped hole with pipe plug for mounting of gauges or other instrumentation.

e. Gauge Kit

(1) Each pump shall be equipped with a glycerin-filled compound gauge to monitor suction pressures and a glycerin-filled pressure gauge to monitor discharge pressures. Gauges shall be a minimum of 4 inches in diameter and shall be 1 percent of full scale reading. Compound gauges shall be graduated -30 feet to +30 feet water column minimum. Pressure gauges shall be graduated 0 to 60 feet water column minimum.

(2) Gauges shall be mounted on a resilient panel and frame assembly which shall be firmly secured to pumps or piping. Gauge installations shall be complete with all hoses and fittings and shall include a shutoff valve installed in each inlet at the point of connection to suction and discharge pipes.

f. Spare Parts Kit

(1) There shall be furnished with pump station the following minimum spare parts:

(a) One spare mechanical seal (complete) and with it, all gaskets, seals, sleeves, O-rings and packing required to be replaced during replacement of the seal.
(b) One set of impeller clearance adjustment shims.
(c) One quart of seal lubricant.
(d) One cover plate O-ring.

(e) One rotating assembly O-ring.

7. VALVES AND PIPING:

a. Check Valve

(1) Each pump shall be equipped with a full flow type check valve, capable of passing a 3" spherical solid, with flanged ends and be fitted with an external lever and spring. The valve seat shall be constructed of stainless steel and shall be replaceable. The valve body shall be cast iron and incorporate a 3" cleanout port. Valve clapper shall have a molded neoprene seating surface incorporating low pressure sealing rings. Valve hinge pin and internal hinge arm shall be stainless steel supported on each end in brass bushings, sealing bushing shall have double "O" rings. "O" rings shall be easily replaceable without requiring access to interior of valve body. Valve shall be rated at 175 psi water working

pressure, 350 psi hydrostatic test pressure. Valves other than full flow type or valves mounted in such a manner that prevents the passage of a 3" spherical solid shall not be acceptable.

b. Plug Valve

(1) The discharge header shall include a 3-way plug valve to permit either or both pumps to be isolated from the common discharge header. Valves shall have ports designed to pass spherical solids equal to the pumps capability. The plug valve shall be non-lubricated, tapered type. Valve body shall be semi-steel with flanged end connections drilled 125 pound standard. Valve shall be furnished with a drip-tight shutoff plug mounted in stainless steel bearings and shall have a resilient facing bonded to the sealing surface. Valve shall be operated with a single level actuator providing lift, turn and reset action. The lever shall be equipped with a locking device to hold the plug in the desired position.

c. Piping

(1) Flanged header pipe shall be centrifugally cast, ductile iron, complying with ANSI/AWWA a21.51/C115 and class 53 thickness.

(2) Flanges shall be cast iron 125 and comply with ANSI b16.1.

(3) Pipe and flanges shall be threaded and suitable thread sealant applied before assembling flange to pipe.

(4) Bolt holes shall be in angular alignment within 1/2 degree between flanges. Flanges shall be faced and a gasket finish applied that shall have concentric grooves a minimum of 0.01 inch deep by approximately 0.03 inch wide, with a minimum of three grooves on any given surface spaced maximum of 1/4 inch apart.

8. SUPPORTS AND THRUST BLOCKS:

a. Piping and Valves

(1) All pipes connected to the pump station shall be supported according to good commercial practice to prevent piping loads from being transmitted to the pumps. Pump station discharge force main piping shall be anchored with thrust blocks where shown on the contract drawings.

9. DRIVE UNIT:

a. Motors

(1) The pump motors shall be horizontal, open drip-proof, induction type, with normal starting torque and low starting current characteristics, suitable for 3 phase, 60 hertz, 208 volt, ac electrical current. The motors shall not be overloaded at the design condition or at any head in the operating range, as specified.

(2) Each motor shall be in current NEMA design cast iron frame with copper windings.

b. Drive Transmission

(1) Power shall be transmitted from motors to pumps by means of v-belt drive assemblies. The drive assemblies must be selected to establish proper pump speed to meet the specified operating conditions.

(2) Each drive assembly shall have a minimum of two v-belts. In no case will a single belt drive be acceptable. Each v-belt drive assembly shall be selected on the basis that adequate power will be transmitted from drive to pump.

(3) Drive systems with a safety factor of less than 1.5 to 1.0 shall not be considered sufficient for the service intended. Computation of safety factors shall be based on performance data published by the drive manufacturer.

c. Belt Guards

(1) Pump drive transmissions shall be enclosed on all sides in a guard constructed of any one or combination of materials consisting of expanded, perforated or solid sheet metal, except that maximum perforated or expanded openings shall not exceed 1/2 inch.

(2) Guards shall be manufactured to permit complete removal from the pump unit without interference with any unit component and shall be securely fastened to the unit base and rigidly braced to some fixed part.

(3) All metal shall be free of burrs and sharp edges. Structural joints shall be continuously welded. Panels may be riveted to frames with not more than five inch spacing. Tack welds shall not exceed four inch spacing.

(4) The guard shall be primed with a minimum of 1.5 mills of zinc-based synthetic primer. A finish acrylic enamel coating (minimum 1.5 mils) shall be applied in accordance with Section 3, color definitions of ANSI 253.1; 1967, safety color code for marking physical hazards.

10. FINISH:

The pumps, piping, and exposed steel framework shall have a prime coat of zinc based synthetic primer. The finish coat shall be an automotive grade white acrylic enamel.

11. ELECTRICAL CONTROL COMPONENTS:

    a. Pump Station Electrical Condition Connection

        (1) All electrical equipment mounted within the pump station shall be factory wired to a common terminal strip. The pump station shall be provided with a main conduit fitting for field connection to the pump motor control center. Field wiring connections in the pump motor control center shall be matched marked to field connections in the pump station.

    b. Panel Enclosure

        (1) The electrical control equipment shall be mounted within (NEMA 3r steel), dead front type control enclosure. Enclosure door shall be gasketed with neoprene, shall be hinged and shall be equipped with captive closing hardware. Control compartment shall include a removable steel back panel on which control components shall be mounted. Back panels shall be secured to enclosures with collar studs. Operator controls shall be mounted on a steel inner swing panel. The enclosure shall be suitable for post mounting.

        (2) All operating controls and instruments shall be securely mounted and shall be clearly labeled to indicate function.

        (3) Panel shall have 115 volt AC/100 watt, silicon rubber panel heater with adjustable thermostat.

12. MOTOR BRANCH COMPONENTS:

    a. Mounting

        (1) All motor branch components shall be of the highest industrial quality, securely fastened to a removable sub-plate with screws and lock washers. The sub-plate shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any components.

    b. Circuit Breakers and Operating Mechanisms

        (1) A properly sized heavy duty air circuit breaker shall be furnished for each pump motor and shall have a symmetrical RMS interrupting rating of 10K amperes at 240 volts. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.

        (2) A padlocking operating mechanism shall be installed on each motor circuit breaker. Operator handles for the mechanisms shall be located on the exterior

of the control compartment door, with interlocks which permit the door to be opened only when circuit breakers are in the "off" position.

c. Motor Starters

(1) An open frame, across-the-line, NEMA rated magnetic motor starter shall be furnished for each pump motor. Starters of NEMA size 1 and above shall be designed for addition of at lease two auxiliary contracts. Starter rates "0", "00" or fractional size shall not be acceptable. Power contacts shall be double-break and made of cadmium oxide silver. All motor starters shall be equipped to provide under-voltage release and overload protection on all three phases. Motor starter contacts shall be easily replaceable without removing the motor starter from its mounted position.

d. Overload Relays

(1) Overload relays shall be block-type, utilizing melting alloy type spindles and shall have visual trip indication with trip-fee operation. Pressing of the overload reset lever shall not actuate the control contact until such time as the overload spindle has reset. Resetting of the overload reset lever will cause a snap-action control contact to reset, thus re-establishing a control circuit. Overload relays shall be manual reset only and not convertible to automatic reset. Trip setting shall be determined by heater element only and not by adjustable settings.

(2) An overload reset push-button shall be mounted through the door of the control panel in such a manner as to permit resetting the overload relays without opening the control panel door.

13. OTHER CONTROL COMPONENTS:

a. Control Circuit

(1) The control circuit shall be protected by a thermal-magnetic air circuit breaker which shall be connected in such a manner as to allow control power to be disconnected from all control circuits.

b. Pump Mode Selection

(1) Pump mode selector switches shall be connected to permit manual start and manual stop of each pump individually and to select automatic operation of each pump under control of the level control system. Manual operation shall override all shutdown systems, but not the motor overload relays. Selector switch contacts shall be rated 15 amperes minimum at 120 volts non-inductive.

c. Alternator Relay

(1) Pump alternator relay shall be of electro-mechanical industrial design. Relay contacts shall be rated 10 amperes minimum at 120 volts non-inductive.

d. Pump Time Indicators

(1) Control panel shall be equipped with one pilot light for each pump motor. Light shall be wired in parallel with the related pump motor starter to indicated that the motor is or should be running.

e. Elapsed Time Indicators

(1) Six digit elapsed time indicators (non-reset type) shall be connected to each motor starter to indicate the total running time of each pump in "hours" and "tenths of hours."

f. Sequence Selector

(1) A switch shall be provided to permit the station operator to select automatic alternation of the pumps to select pump number 1 or 2 to be the lead pump for each pumping cycle.

g. High Pump Temperature Protection

(1) The control panel shall be equipped with circuitry to override the level control system and shut down the pump motor(s) when required to protect the pump from damage caused by excessive temperature.

(2) A thermostat shall be mounted on each pump to detect its temperature and a magnetic switch shall be supplied for each thermostat. If the pump temperature should rise to a level which could cause pump damage, the thermostat shall cause a magnetic switch to drop out the motor starter. An indicator, visible on the front of the control panel shall indicate that the pump motor has been stopped because of a high temperature condition. The pump shall remain locked out until the pump has cooled and the circuit has been manually reset. Automatic reset of such a circuit shall not be acceptable.

h. Voltage Loss Protection

(1) The control panel shall have a "Three Phase Voltage Monitor" which protects for low voltage/voltage unbalance and phase loss or reversal.

i. Surge Arrestor

(1) The control panel shall have a "Transient Voltage Surge Suppresser" for lightning or power surges.

j. Wiring

(1) The pump station as furnished by the manufacturer shall be completely wired except for the power feeder lines to the branch circuit breakers and final connections to remote alarm devices.

(2) All wiring, workmanship and schematic wiring diagrams shall be in compliance with applicable standards and specifications set forth by the national electric code (NEC).

(3) All user serviceable wiring shall be type MTW or THW, 600 volts and shall be color coded as follows:

(a)	Line and load circuits, AC or DC power	black
(b)	AC control circuit less than line voltage	red
(c)	DC control circuit	blue
(d)	Interlock control circuit, from external source	yellow
(e)	Equipment grounding conductor	green
(f)	Current carrying ground	white
(g)	Hot with circuit breaker open	orange

k. Wire Identification and Sizing

(1) Control circuit wiring inside the panel, with the exception of internal wiring of individual components, shall be 16 gauge minimum, type MTW or THW, 600 volts. Wiring in conduit shall be 14 gauge minimum. Motor branch wiring shall be 10 gauge minimum.

(2) Motor branch conductors and other power conductors shall not be loaded above 60 degree C temperature rating, on circuits of 100 amperes or less, nor above 75 degree C on circuits over 100 amperes. Wires shall be clearly numbered at each end in conformance with applicable standards. All wire connectors in the control panel shall be of the ring tongue type with nylon insulated shanks. All wires on the sub-plate shall be bundled and tied. All wires extending from components mounted on door shall be terminated on a terminal block mounted on the back panel. All wiring outside the panel shall be installed in conduit.

l. Wire Bundles

(1) Control conductors connecting components mounted on the enclosure door shall be bundled and tied in accordance with good commercial practice. Bundles shall be made flexible at the hinged side of the enclosure. Adequate length and flex shall be allowed so that the door can swing to its full open position without undue mechanical stress or abrasion on the conductors or insulation. Bundles shall be clamped and held in place with mechanical fastening devices on each side of the hinge.

14. CONDUIT:

a. Conduit Requirements are as follows:

(1) All conduit and fittings shall be UL listed.

(2) Liquid tight flexible conduit shall be constructed of a smooth, flexible, abrasion resistant, liquid tight, polyvinyl chloride.

(3) Conduit shall be supported in accordance with articles 346, 347 and 350 of the National Electric Code.

b. Grounding

(1) The pump station manufacturer shall ground all electrical equipment inside the pump station to the junction box back panel. The mounting surface of all ground connections shall have any paint removed before making final connections.

(2) The contractor shall provide an earth driven ground connection to the pump station at the main grounding lug in accordance with the National Electric Code (NEC) Equipment Marking.

(3) A permanent corrosion resistant name plate(s) shall be attached to the control and shall include the following information:

(a) Equipment serial number.
(b) Supply voltage, phase and frequency.
(c) Current rating of the minimum main conductor.
(d) Electrical wiring diagram number.
(e) Motor horsepower and full load current.
(f) Motor overload heater element.
(g) Motor circuit breaker trip current manufacturer.
(h) Name and location of equipment manufacturer.

(4) Control components shall be permanently marked using the same identification shown on the electrical diagram. Identification shall be mounted adjacent to the device.

(5) Switches, indicators and instruments shall be plainly marked to indicate function, position, etc. Marking shall be mounted adjacent to and above the device.

15. LEVEL CONTROL SYSTEM:

a. Functional Description

(1) The level control system shall start and stop the pump motors in response to changes in the wet well level, as set forth herein.

b. Type

(1) The level control system shall be the air bubbler type, containing air bubbler piping which extends into the wet well. A pressure sensor contained within the electronic pressure switch shall sense the air pressure in this piping to provide wet well level signals for the remainder of the level control system.

c. Sequence of Operation

(1) The level control system shall continuously monitor the wet well level, permitting the operator to read wet well level at any time. Upon operator selection of automatic operation, the electronic pressure switch shall start the motor for the one pump when the liquid level in the wet well rises to the "lead pump start level." When the liquid is lowered to the "lead pump stop level" the electronic pressure switch shall stop this pump. Those actions shall constitute one pumping cycle. Should the wet well level continue to rise, the electronic pressure switch shall start the second pump when the liquid reaches the "lag pump start level", so that both pumps are operating to pump down the well. Pumps shall stop at their respective "stop" levels. These levels shall be adjustable as described below.

d. Automatic Pump Alternation

(1) The level control system shall utilized the alternator relay to select first one pump, then the second pump, to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle.

e. Electronic Pressure Switch

(1) The electronic pressure switch shall include integral components to perform all pressure sensing signal conditioning, EMI and RFI suppression, DC power

supply and 120 volt outputs. Comparators shall be solid state and shall be integrated with other components to perform as described below.

(2) The electronic pressure switch shall be capable of operating on a supply voltage of 108 volts to 132 volts AC, 60 hertz, in an ambient temperature range of -18 degrees C (0 degrees F) through +55 degrees C (131 degrees F). Control range shall be 0 to 12.0 feet of water with an overall repeat accuracy of plus or minus 0.1 feet of water. The electronic pressure switch shall consist of the following integral components: pressure sensor, display, electronic comparators and output relays.

f. Pressure Sensor

(1) The pressure sensor shall be a strain gauge transducer and shall receive an input pressure from the air bubbler system. The transducer shall convert the input to a proportional electrical signal for distribution to the display and electronic comparators. The transducer output shall be filtered to prevent control response to level pulsations or filtered to prevent control response to level pulsations or surges. The transducer range shall be 0 to 15 psi, temperature compensated from -40 degrees C (-40 degrees F) through +85 degrees C (185 degrees F), with a repeat accuracy of plus or minus 0.25% full scale about a fixed temperature. Transducer over-pressure rating shall be 3 times full scale.

g. Display

(1) The electronic pressure switch shall incorporate a digital panel meter which, upon operator selection, shall display liquid level in the wet well and the preset start and stop levels for both the lead and lag pumps. The meter shall be a 3 1/2” digit display calibrated to read out directly in feet of water, accurate to within one-tenth foot (0.1 foot), with a full scale indication of not less than 33 feet.

h. Electronic Comparators

(1) Level adjustments shall be electronic comparator setpoints to control the levels at which the lead and lag pumps start and stop. Each of the level settings shall be adjustable and accessible to the operator without opening the control panel or any cover panel on the electronic pressure switch. Controls shall be provided to permit the operator to read the selected hard wiring, the use of electronic test equipment, artificial level simulation or introduction of pressure to the electronic pressure switch.

i. Output Relays

(1) Each output relay in the electronic pressure switch shall be solid state. Each relay input shall be optically isolated from its output and shall incorporate zero crossover switching to provide high immunity to electrical noise. The "on" state of each relay shall be indicated by illumination of a light emitting diode. The output of each relay shall be individually fused providing fused overload and short circuit protection. Each output relay shall have an inductive load rating equivalent to one NEMA size 4 contactor. A pilot relay shall be incorporated for loads greater than a size 4 contactor.

j. Serviceability

(1) The electronic pressure switch shall be equipped with replacement plug-in integrated circuits and output fuses. The main circuit board assembly shall be provided with keyed plug-in connections to "offboard" components permitting main board removal without de-soldering. All printed circuits shall have a conformal coating applied to both sides to protect against moisture or fungus.

k. Independent Lag Pump

(1) Circuit design in which the application of power to the lag pump motor starter is contingent upon completion of the lead pump circuit shall not be acceptable.

l. High Water Alarm with Alarm Silence

(1) The electronic pressure switch shall be equipped with an additional electronic comparator and solid state output relay to alert maintenance personnel to a high liquid level in the wet well. In the event that the wet well liquid reaches a preset high water alarm level, the high water alarm output relay shall energize a signal relay. The signal relay shall complete a 115 volt AC circuit for an external alarm device and alarm light. A mechanical indicator, visible on the front the control panel, shall indicate that a high wet well level exists. The signal relay shall maintain the alarm signal until the wet well level has been lowered and the circuit has been manually reset.

(2) An alarm silence switch and relay shall be provided to permit maintenance personnel to de-energize the external alarm device while corrective actions are underway. After silencing the alarm device, manual reset of the signal relay shall provide automatic reset of the alarm silence relay.

(a) Alarm light (external).

(1) The pump station shall be supplied with one 115 volt, AC alarm light in a vapor-tight fixture with red globe, guard, conduit box and mounting fixtures. Alarm light and mounting fixtures shall be designed to permit mounting in such a manner that rainwater

cannot stand or collect in the gasketed area of the fixture, between the base and globe.

(b) Alarm Signal

(1) The alarm shall be connected to a dial-up phone. The dial-up phone shall be capable of dialing at least two sets of numbers under an alarm condition. Any time the light comes on, the phone shall call the specified numbers.

16. AIR BUBBLER SYSTEM AND PIPING:

a. Air Flow Indicator

(1) An air flow indicator gauge shall be provided and connected to the air bubbler piping to provide a visual indication of rate of flow in standard cubic feet per hour.

b. Air Pumps

(1) Two (2) vibrating reed type air pumps shall be furnished to deliver free air at a rate of approximately 5 cubic feet per hour and a pressure not to exceed 7 psi. Liquid level control systems utilizing air compressors delivering greater quantities of air at higher pressures, requiring pressure reducing valve, rate of flow control valves, air storage reservoirs and other maintenance nuisance items will not be acceptable.

(2) A selector switch shall be furnished to provide manual alternation of the air pumps. The switch shall be connected in such a manner that either air pump may be selected to operate continuously.

c. Air Bell

(1) An air bell constructed of PVC 3 inches in diameter shall be provided for installation at the outlet end of the air bubbler line in the wet well. The bell shall have a 3/8 inch NPT tapped fitting for connection of the bubbler line.

17. MANUFACTURER'S RESPONSIBILITIES:

a. Operational Test

(1) The pumps, motors and controls shall be given an operation test in accordance with the standards of the hydraulic institute. Recordings of the test shall substantiate the correct performance of the equipment a the design head, capacity, suction lift, speed and horsepower as herein specified.

(2) Upon request from the engineer, the engineer or his representative shall be invited to witness the operational test at the manufacturer's facility or other location designated by the manufacturer.

b. Support Literature

(1) The manufacturer of the pump station shall be responsible for delivery to the engineer of 4 copies of the support literature required herein.

c. Installation Instructions

(1) Installation of the pump station and related appurtenances shall be performed in accordance with written instructions by the manufacturer.

d. Operation and Maintenance Instructions

(1) The pump station manufacturer shall be responsible for supplying written instruction, which shall be sufficiently comprehensive to enable the operator to operate and maintain the pump station and all equipment supplied by the station manufacturer. Said instructions shall assume that the operator is familiar with pumps, motors, piping and valves, but that he has not previously operated and/or maintained the exact equipment supplied.

(2) The instructions shall be prepared as a system manual applicable solely to the pump station and equipment supplied by the manufacturer to these specifications and shall include those devices and equipment supplied by him. However, items of equipment for which the station manufacturer has made mounting or other provisions, but which he has not supplied, may be excluded from these instructions. The instructions shall include, but not limited to, the following:

(a) Descriptions of, and operating instructions for, each major component of the pump station as supplied.

(b) Instructions for operation of the pump station in all intended modes of operation.

(c) Instructions for all adjustments which must be performed at initial start-up of the pump station, adjustments which must be performed after the replacement of the level control system components and adjustments which must be performed in the course of preventative maintenance as specified by the manufacturer.

(d) Service instructions for major components not manufactured by the pump station manufacturer, but which are supplied by him in accordance with

these specifications. The incorporation of literature produced by the actual component manufacturer shall be acceptable.

(e) Electrical schematic diagram of the pump station as supplied, prepared in accordance with NMTBA and JIC standards. Schematic shall show, to the extent of authorized repair, pump motor branch, control and alarm system circuits and interconnections among these circuits. Wire numbers shall be shown on the schematic. Schematic diagrams for individual components, the detail parts of which are not normally repairable by the station operator, need not be included and shall not be substituted for an overall schematic diagram. Partial schematic, block diagrams and simplified schematics shall not be provided in lieu of overall schematic diagram.

(f) Layout drawing of the pump station as supplied, prepared in accordance with good commercial practice, showing the locations of all pumps, motors, valves and piping.

(4) Operation and maintenance instructions which are limited to a collection of component manufacturer literature without overall pump station instructions shall not be acceptable.

(5) Operation and maintenance instructions shall be specific to the equipment supplied in accordance with these specifications. Instruction manuals applicable to many different configurations and pump stations and which require the operator to selectively read portions of the instructions shall not be acceptable.

e. Manufacturer's Warranty

(1) The manufacturer of the pump station shall warrant it to be of quality construction, free from defects in material and workmanship. This warranty shall include the complete station for the time specified in the General Conditions.

2.1.4 BEDDING: Bedding materials are specified in Section 02221.

2.1.5 CONCRETE MATERIALS AND MIXES

A. Comply with the applicable requirements of Section 03300.

2.1.6 PRECAST CONCRETE MANHOLES

A. Comply with the applicable requirements of Section 02722.

2.1.7 FRAMES, GRATES, COVERS, AND STEPS

A. Comply with the applicable requirements of Section 02722.

PART 3 – EXECUTION

3.1 EXAMINATION

3.1.1 VERIFICATION OF CONDITIONS: Examine areas and conditions under which the work of the Section is to be performed. Do not proceed with work until unsatisfactory conditions have been corrected. Commencement of work implies acceptance of all areas and conditions.

3.2 EXCAVATION AND BACKFILLING

3.2.1 TRENCHING, MANHOLE AND WET WELL: Excavation, bedding of pipe, subgrade preparation, backfilling, and compaction are specified in Section 02221.

3.3 INSTALLATION

3.3.1 PIPE INSTALLATION

A. Deliver, handle, store and install pipe in accordance with manufacturer's recommendations.

B. Carefully examine all pipe and fittings for cracks and other defects. Groove in bells of ductile iron pipe shall be full and continuous. Remove all foreign matter from interior and ends of pie and appurtenances before lowering into trench.

C. Carefully lower pipe, fittings, valves, and hydrants into trench piece by piece to prevent damage to pipe materials, protective coatings, and linings. Do not dump into trench.

D. If pipe cannot be lowered into trench and into place without getting earth into it, place heavy, tightly woven canvas bag over each end and leave in place until joints are made.

E. Keep trenches free from water during pipe laying and jointing.

F. When pipe laying is not in progress, close open ends of pipe by watertight plug, or other appropriate means.

3.3.2 DEFLECTION OF PIPE: Do not exceed deflection limits for each type of pipe as recommended by pipe manufacturer.

3.3 PIPE JOINTING

A. General: Cut pipe for inserting valves, fittings, or closure pieces in neat and workmanlike manner with no damage to pipe or lining. Leave smooth end at right angles to axis of pipe.

B. Mechanical Joints:

1. Thoroughly clean last eight (8) inches of spigot and inside bell to remove oil, grit, tar, and other foreign matter.

2. Coat spigot and gasket with solution furnished by pipe manufacturer. Slip cast iron gland on spigot end of pipe with lip extension of gland toward spigot end.

3. Coat gasket with joint lubricant and place on spigot end of pipe to be laid, with thick edge toward gland. Push entire section forward to seat spigot in bell of pipe in place.

4. Press gasket into place within bell, evenly, around entire joint. Move ductile iron gland along pipe into position for bolting nuts with suitable torque wrench.

5. Alternately tighten nuts 180 degrees apart to produce equal pressure on al parts of gland in accordance with the following table:

Pipe Size	Bolt Size	Torque Range
Inches	Inches	Ft.-lbs
3	5/8	45 – 60
4 – 25	3/4	75 – 90

C. Push on Joints: Thoroughly clean exterior four (4) inches of pipe spigot and inside of adjoining bell to remove oil, grit, tar, and other matter. Place gasket in bell with large round side of gasket pointing inside pipe bell. Apply thin film of joint lubricant over gasket's entire exposed surface. Wipe spigot end of pipe clean and insert into bell to contact gasket. Force pipe into bell to manufacturer's jointing mark.

D. Flanged Joints: Thoroughly clean faces of flanges of oil, grease, and other material. Thoroughly clean rubber gaskets and check for proper fit. Assure proper seating of flanged gasket. Tighten bolts so pressure on gasket is uniform. Use torque wrenches to ensure uniform bearing. If joints leak when hydrostatic test is applied, remove and replace gaskets and retighten bolts.

E. Solvent Weld Joints: Prepare and assemble joints in accordance with ASTM D2467 and manufacturers requirements.

F. Thrust Restraint: Install in accordance with Drawings for water main installation.

3.3.4 WATERMAIN CROSSING

A. Normal Conditions: Whenever possible lay force mains under water mains in a manner to provide vertical separation of at least 18" between invert of water main and crown of sewer.

3.4 FIELD QUALITY CONTROL

3.4.1 NOTIFICATION

A. Notify Contracting Officer at least 48 hours in advance of pipe being laid or any construction of lift stations and valve manholes. Do not backfill pipe trench or structures until observed by Contracting Officer.

B. Notify Contracting Officer at least 48 hours before pipe is to be tested. Tests shall be conducted in presence of Contracting Officer.

3.4.2 HYDROSTATIC TESTING

A. Make pressure and leakage tests on all newly laid pipe. Test force mains in one test segment per line.

B. Furnish the following equipment and materials for test, unless otherwise directed: Two (2) graduated containers, two (2) pressure gauges, and one (1) suitable hose and suction pipe as required.

C. Testing Procedure:

1. Test each force main line installed while trench is partially backfilled and joints are left exposed for examination for leaks. Do not conduct pressure test until 48 hours after placement of concrete thrust blocks.

2. After pipe has been partially backfilled, slowly let water into line. Vent to allow air in line to be released. Flush line as necessary for cleaning. Leave water in line for 24 hours prior to pressure test.

3. Test at one and one-half (1.5) times working pressure, calculated for low point of test section, or 150 psi, whichever is greater. Valve off pump and hold pressure in line for test. Test for two hours or as agreed to by Contracting Officer.

4. At end of test, operate pump until test pressure is again attained. Calibrate container of water for pump suction to determine amount of water to replace leakage.

D. Leakage Allowance: Leakage is the quantity of water necessary to refill the line at end of the test period. No installation will be accepted until leakage is less then the following:

Allowable leakage per 1000 ft. of Pipe, Gallons/Hour

Avg. Test	Nominal Pipe Diameter, Inches						
Pressure, Psi	2	4	6	8	10	12	18
150	0.2	0.3	0.55	0.74	0.92	1.10	1.66

For pipe with 18 ft nominal lengths. To obtain recommended allowable leakage for pipe with 20 ft nominal lengths, multiply leakage calculated from table by 0.9. Adjust allowable leakage for other lengths of pipe in same manner. If pipeline under test contains sections of various diameters, allowable leakage will be sum of computed leakage for each size. Reduce allowable leakage proportionately for sections less than 1000 ft.

3.5 ADJUSTING AND CLEANING

3.5.1 RESTORATION OF EXISTING FACILITIES: Remove all pavements, curbs, gutters, utilities, fences, irrigation ditches, yards, lawns, and other structures or surfaces demolished or damaged as a result of this work to conditions equal to or better than before work began.

3.5.2 DISPOSAL OF WASTE MATERIALS: Where disposal sites are not designated, remove and dispose of all waste materials off site.

END OF SECTION 02730

misc99_3\mtdc02730

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02810

IRRIGATION SYSTEMS

GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.

B. The following related items of work included under other sections:
   1. Division 2: Earthwork
   2. Landscape - Section 02900

1.02 SUMMARY

A. The work required under this Section consists of furnishing all labor materials, equipment, services and related items necessary to complete all irrigation system work, and all related work, complete as indicated on the drawings or specified herein.

B. The major items of work include, but are not limited to the following:
   1. Verify underground utility locations.
   2. Removal, protection and/or restoration of all existing improvements.
   3. Trenching and backfilling.
   4. Furnishing and installing a fully operational automatically controlled irrigation system, including all mains, laterals, fittings, quick coupling valves, gate valves, and drain valves, backflow preventer, etc.
   5. Testing of system and making it operative.

~~C. Owner provided, Contractor installed Solar Water Pump, Controller and Solar Array. Grundfos SunSub 400~~

1.03 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturing irrigation systems materials and products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than five (5) years.

B. Installer's Qualifications: Firms who have successfully completed execution of a minimum of five (5) contracts involving the installation of irrigation and piping work similar in size and scope to that required for this project. Such experience should be able to be demonstrated through references.

C. Codes and Standards:
   1. Comply with all applicable state and local ordinances and codes.
   2. All materials and work shall meet the requirements of the A.W.W.A., A.S.S.E. and the USC Foundation for Cross Connection Control.

1.04 SUBMITTALS

A. Shop Drawings

B. Product Data: Submit manufacturer's technical product data and installation instructions for irrigation system materials and products.

C. Record Drawings: At project closeout, submit record drawings of installed irrigation system piping and products, in accordance with requirements of Division 1.

D. Maintenance Data: Submit maintenance data and parts lists for irrigation system materials and products. Include these data, product data, shop drawings and record drawings in maintenance manual, in accordance with requirements of Division 1.

1.05 UTILITIES AND PROTECTION

A. Existing Utilities:
   1. Contractor shall acquaint himself/herself with all site conditions. Should utilities not shown on the plans be found during excavations, contractor shall promptly notify the Owner for instructions as to further action. Failure to do so will make Contractor liable for any and all damage thereto arising from his/her operations subsequent to discovery of such utilities not shown on plan.
   2. Contractor shall necessary adjustments in the Layout as may be required to connect the existing stubouts. Should such stubs not be located exactly as shown, Contractor may be required to work around existing conditions at no increase in cost to the Owner.

1.06 PERMITS AND FEES

1.07 DRAWINGS, SPECIFICATIONS AND DETAIL SHEETS

A. Scale and Dimensions:
   1. All measurements shall be verified at the site. Drawings may not be exactly to scale.

1.08 PIPING ARRANGEMENT

A. Suggestions for changes in location of piping, etc., advisable in the opinion of the Contractor, shall be submitted to the COR for approval before proceeding with the work, with written assurance that such changes will not cause any extra cost on their part or alteration of design requirements.

1.09 GUARANTEE

A. Guarantee all work done for one (1) year from date of acceptance against all defects in material, equipment and workmanship. Guarantee shall cover repair of damage to any part of the premises resulting from leaks, or other defects in material, equipment and workmanship to the satisfaction of the Owner. Repairs, if required, shall be done promptly, at no cost to the Owner.

B. Guarantee will include spring start-up and winterizing of system within the one (1) year time and development of approved water application schedule. Winter damage due to improper winterization is the responsibility of the Contractor.

C. All repairs and servicing required under the guarantee period shall be made under the observation of the maintenance crew to help train them in the proper operation and repair of the system.

PRODUCTS

2.01 MATERIALS

A. General:
   1. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings and capacities as indicated. Where not indicated, provide proper selection as determine by Installer to comply with installation requirements.
   2. All materials throughout the system shall be new and in perfect condition.

B. Piping: Provide pipes of one of the following materials of weight/class indicated. Provide pipe fittings and accessories of same material and weight/class as pipes, with joining method as indicated.
   1. Polyvinyl Chloride (PVC): Sized as shown on the drawings. All PVC pipe shall be continuously and permanently marked with manufacturer's name, material and schedule or type. Pipe shall conform to U.S. Department of Commerce Commercial Standard CS 256-63, or latest revision. All PVC pipe shall be SDR 21.
   2. Fittings: Schedule 40, polyvinyl chloride (PVC) weight as manufactured by Spears or approved equal. Solvent weld or insert fittings are acceptable. No saddle type clamping or fittings shall be used. Fittings to conform to ASTM D-2466.

C. Valves:
   1. Gate/Drain Valves: Shall be sized for mains. The valves shall be all bronze solid wedge, screw bonnet rated at 200 WOG.
   2. Quick Coupling Valves: Shall be as noted on drawings and shall be 1" brass with locking top, and located up stream of all remote control valves.
   3. Remote Control Valves: Electrically operated solenoid valves installed in valve boxes of appropriate size and type for valves specified with manual shut-off valve to match pipe size.

D. Dripperline and Integral Dripperline Components:
   1. The dripperline shall be Techline pressure compensating dripperline or Techlite 17mm, 12mm, or 8mm non-pressure compensated dripperline as manufactured by Netafim Irrigation, Inc. Dripper flow rate and spacing shall be as indicated on drawings.
   2. Techline/Techlite 17mm, 12mm or 8mm Fittings: All Techline/Techlite connections shall be made with approved Techline/Techlite insert fittings.
   3. Soil Staples (TLS6): All on-surface/under mulch Techline/Techlite installations shall be held in place with Techline Soil Staples spaced evenly every 3' to 5' on center, and with two staples on each change of location.
   4. Line Flushing Valves: All Techline/Techlite systems shall be installed with Netafim Automatic Line Flushing Valves as indicated on drawings.
   5. Air/Vacuum Relief Valves: Each independent subsurface irrigation zone shall be installed with an Air/Vacuum Relief Valve at the zone's highest point(s).
   6. Pressure Regulator: A pressure regulator shall be installed at each zone valve or on the main line to ensure operating pressures do not exceed system requirements. The pressure regulator shall be a Netafim Pressure Regulator. Model number as indicated on drawings.
   7. Disc Filter: A disc filter shall be installed at each zone valve or on the main line to ensure proper filtration. The filter shall be a Netafim Disc Filter. Model number and mesh as indicated on drawings.

E. Reduced Pressure Backflow Prevention Units: Reduced pressure backflow prevention units shall be provided as indicated on drawings and shall be in compliance with local codes. Febco 825Y or approved equal.

F. Solvent Cement: Compatible with PVC pipe and or proper consistence ASTM D-2564.

G. Control Wires: 24-Volt solid wire, UL approved for direct burial in ground. Minimum wire size shall be 18 gauge. All wire to be Paige wire or approved equal.

H. Expansion Curls: Expansion curls shall be provided within three (3') feet of each wire connection to solenoid and at least every three hundred (300') feet in length. (Expansion curls are formed by wrapping at least five (5) turns of wire around a rod or pipe 1" or more in diameter, then withdrawing the rod).

I. Sleeves for Control Wires: Under all walks and paving and where indicated on drawings, PVC 1220-160 PSI pipe or galvanized heavy wall steel conduit. Minimum size 1½" I.D.

J. Sleeves for Irrigation Pipe: Under all walks and paving and where indicated on drawings, Schedule 80 PVC pipe or as otherwise approved by the Project Consultant. To be two (2) times the O.D. of sleeved pipe.

K. Valve Boxes: Valve boxes shall be of appropriate size and type for valves specified, or as otherwise indicated on the drawings. All valve boxes in roadways or sidewalks shall be cast iron construction with locking lid. All valve boxes to have 6" pea gravel; with blocking, and wrapped with filter fabric.

L. Drains: Air hose connections of approved design shall be provided for winterizing at several locations so that the entire system can be drained by blowing it out with compressed air. The compressor shall be capable of varying pressures.

M. Rubber Hose: A quantity of two (2) approved heavy duty rubber hoses, 100 feet long, for use with quick coupling valves shall be furnished by the Contractor.

EXECUTION

3.01 INSPECTION

A. General: Examine areas and conditions under which irrigation system's materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 INSTALLATION OF IDENTIFICATION

A. General: Maintain all warning signs, shoring, barricades, flares and red lanterns as required by safety orders of the Division of Industrial safety and local ordinances.

3.03 INSTALLATION OF PIPING AND FITTINGS

A. Excavating and Trenching:
   1. The Contractor shall perform all excavations as required for the installation of the work included under this section, including shoring of earth banks to prevent cave-ins. The contractor shall trench, each day, only as much as required for that day's work.
   2. Trenches shall be made wide enough to allow minimum of two (2") inches between parallel pipe lines. Trenches for pipelines shall be made of sufficient depth to provide minimum cover from finish grade as follows:
      a. 15" minimum cover over main lines.
      b. 12" minimum cover over control lines from controller to valves.
      c. 4" - 6" cover over dripperline.

B. Pipe and Assembly:
   1. Install remote valves where shown and group together where practical. Place valves no closer than six (6") inches to walk edges, buildings and walls. Locate all valve boxes in planting beds unless otherwise directed or noted.
   2. No pipe shall be laid when, in the opinion of the Project Consultant, trench or weather conditions are unsuitable. When pipe laying is not in progress, the open ends of the installed pipe shall be closed by approved means to prevent entrance of trench water and other foreign material into the line(s). Enough backfill shall be placed in the center sections of the pipe to prevent floating. Any pipe that has floated shall be removed from the trench and re-laid.
   3. PVC pipe and fittings shall be solvent welded using solvents and methods as recommended by the manufacturer of the pipe, except where screwed connections are required. Pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before applying solvent with a non-synthetic bristle brush.
   4. Pipe may be assembled and welded on the surface. Snake pipe from side to side in the trench to allow for expansion and contraction.
   5. Make all connections between plastic pipe and metal valves or steel pipe with threaded fittings using plastic male adapters.

C. Dripperline Installation:
   1. Install all dripperline as indicated on drawings. Use only Teflon tape on all threaded connections.
   2. Clamp Techline/Techlite fittings with Oetiker clamps when operating pressure exceeds specific dripperline fitting requirements.
   3. When installing Techline/Techlite dripperline on-surface, install soil staples as listed below:
      a. Sand Soil - One staple every three (3') feet and two (2) staples on each change of direction (tee, elbow, or cross).
      b. Loam Soil - One staple every four (4') feet and two (2) staples on each change of direction (tee, elbow, or cross).
      c. Clay Soil - One staple every five (5') feet and two (2) staples on each change of direction (tee, elbow, or cross).
   4. Cap or plug all openings as soon as lines have been installed to prevent the entrance of materials that would obstruct the pipe. Leave in place until removal is necessary for completion of installation.
   5. Thoroughly flush all water lines before installing valves and other hydrants.
   6. Test in accordance with Paragraph on Hydrostatic Tests.

D. Automatic Controllers: Connect remote control valves to controller in a logical sequence to correspond with specification of the Owner or Project Consultant.

E. Automatic Control Wiring:
   1. Install control wires, sprinkler mains and laterals in common trenches whenever possible.
   2. Install control wires at least six (6") inches below finish grade and lay to the side and below main line. Provide expansion curls as described herein.
   3. Control wire splices will be allowed only in runs more than five hundred (500') feet. Connections of all underground wires shall by the use of wire nuts, covered with waterproof splice for each wire per installation instructions provided by the manufacturer, or as otherwise required by local ordinance.
   4. All wires passing under existing or future paving, construction, etc., shall be encased in plastic or galvanized steel conduit extending at least twelve (12") inches beyond edges of paving or constructions.

F. Backfilling and Compacting:
   1. After the system is operating, and required tests and inspections have been completed, backfill

excavations and trenches with clean soil free of rubbish.

2. Backfill for all trenches, regardless of type of pipe covered, shall be compacted to minimum ninety (90%) percent density.
3. Compact trenches in areas to be planted by thoroughly flooding the backfill.
4. Dress off all areas to finish grades.

3.04 FIELD QUALITY CONTROL

A. Hydrostatic Test:
   1. Request the presence of the Owner and/or Project Consultant at least forty-eight (48) hours in advance of testing.
   2. Testing to be accomplished at the expense of the Contractor, and in the presence of the Owner.
   3. Center load piping with small amount of backfill to prevent arching or slipping under pressure.
   4. Apply a continuous and static water pressure of sixty (60) PSI when welded plastic joints have cured at least twenty-four (24) hours and with the risers capped as follows:
      a. Main lines and sub mains to be tested for one (1) hour.
      b. Lateral lines to be tested for one (1) hour.
   5. Repair leaks resulting from tests.
   6. The lines shall then be retested until satisfactory.

3.05 INSTRUCTIONS

A. After completion and testing of the system, the Contractor will instruct the Owner's personnel in the proper operation and maintenance of the system.

3.06 PROTECTION

A. Contractor shall be responsible for work until finally inspected, tested and accepted. After delivery, and before and after installation, protect work against theft, injury or damage. Protect open ends of work with temporary covers or plugs during construction, to prevent entry of obstruction material.

END OF SECTION 02810

SECTION 02831 - CHAIN LINK FENCES AND GATES

PART 1 – GENERAL

1.1 SUMMARY

A. DESCRIPTION OF WORK

1. The work includes, but is not necessarily limited to, all labor, materials, equipment, and services required to complete chain link fencing and related work as shown on the Drawings and specified herein.

2. Work Specified Under Other Sections: Consult all other Sections, determine the extent and character of related work and properly coordinate work specified herein with that specified elsewhere to produce a complete, finished and workmanlike installation.

B. REFERENCES AND STANDARDS

The following references and standards are hereby made a part of this Section and Chain Link Fencing material and installation shall conform to the applicable requirements therein except as otherwise specified herein or shown on the Drawings.

1. Federal Specifications (FS).

2. Chain Link Fence Manufacturer's Institute's (CLFMI).

3. Steel China Link Galvanized Fence Fabric (CS 246).

4. Industrial Steel Specification for Fence-Posts, Gates and Accessories.

5. Standards for Chain Link Fence Installation.

1.2 SUBMITTALS

A. Manufacturer's literature describing products or materials.

B. Shop Drawings:

1. Include cross sectional dimensions of posts, braces, rails, fittings, accessories and gate frames; design of gates; and details of all gate hardware.

2. Include a layout drawing showing the spacing of posts and location of all gates; abrupt changes in grade; and all corner, gate, anchor, end and pull posts.

3. Do not proceed with the work until samples and shop drawings have been approved by the COR.

C. Quality Assurance

1. Provide chain link fences and gates as complete units produced by a single manufacturer including necessary erection accessories, fittings, and fastenings.

2. Installation of fencing shall be by the manufacturer or his authorized representative in accordance with CLFMI "Standards for Chain-link Fence Installation", the drawings, reviewed shop drawings, and the manufacturer's detailed installation drawings, instructions, and recommendations.

D. Product Delivery, Storage and Handling

1. Deliver and handle in manner to prevent damage.

2. Discharge materials carefully and store on raised platform pallets. Do not dump onto ground.

E. Field Measurements and Templates

Contractor shall secure all field measurements required for proper and adequate fabrication and installation of the work covered by this section. Exact measurements are the Contractor's responsibility. Furnish templates for exact location of items to be embedded in concrete and any setting instructions required for installation.

PART 2 – PRODUCTS

2.1 GENERAL

Fencing shall include fabric covering, framework, concrete footings, gates, hardware, and all appurtenances and accessories as required for a complete installation. All members shall conform with CLFMI standards, FS RR-F-191G/GEN, and as specified below.

2.2 FABRIC

A. Steel chain link fabric.

B. Base metal shall be 9 gauge carbon steel wire, tensile strength 90,000 p.s.i., helically wound and interwoven to form chain link fabric with a 2 inch diamond shaped mesh. Zinc coat the mesh after weaving with a minimum 0.30 ounces per square foot of uncoated wire surface. ASTM A 392 class I and FS RR-F-191-1A.

C. Fabric finish: Twisted and barbed selvage top and bottom.

D. Fabric height: As indicated on the drawings; provide one piece widths for fencing up to 12 feet high.

2.3 FENCE FRAMEWORK

A. All parts of pipe framework unless otherwise indicated shall be standard weight steel pipe. All parts shall be hot dipped galvanized after fabrications; minimum zinc coating 1.8 ounces per square foot of uncoated pipe; ASTM A 120 and FS RR-G-191/3A.

B. Schedule of Pipe Sizes – 6 foot fabric height.

Member	Outside Diameter Inches	Weight, Lbs. Per Lineal Foot
1. End, Corner and Pull Posts	2.875	5.79
2. Intermediate of Line Posts	2.375	3.65
3. Gate Posts, See Drawings		
4. Top Rail and Post Braces	1.660	2.27

2.4 FITTINGS AND APPURTENANCES

A. Tension Wire: 6 gauge galvanized steel wire.

B. Tie Wire: 9 gauge galvanized steel wire.

C. Stretcher Bar Bands: 1/8 x 1 inch galvanized steel.

D. Stretcher Bars: 1/4 x 3/4 inch flat galvanized steel bar.

E. Brace Rods: 3/8 inch round galvanized steel bars with turnbuckle adjustment.

F. Post Tops: Heavy duty malleable iron caps; galvanized; designed as a weather proof closure for pipe posts.

2.5 SWING GATES

A. Gates shall be single-leaf swing type as indicated on the drawings, furnished complete with al hardware and accessories as required, and conforming to FS RR-F-191/2A.

B. Gate Frames: Gate frames shall be fabricated from hot-dip galvanized steel pipe conforming to ASTM A120, with a minimum weight of zinc coating of 2.0 ounces per square foot. Minimum outside diameter of steel pipe shall be 1.90 inches, with a minimum weight of 2.72 pounds per lineal foot.

C. Gate Hardware: Provide the following hardware and accessories for each gate, as well as all necessary fittings and appurtenances required for the complete operation of the gate.

1. Hinges: Galvanized pressed steel or malleable iron to suit gate size, nonlift-off type, offset to permit 180 degree gate opening. Provide 1 pair of hinges for each leaf of each gate.

2. Latch Assembly for Single Gates: Forked type to permit operation from either side of gate, with padlock eye as integral part of latch.

3. Keeper: Provide keeper, which automatically engages the gate leaf and holds it in the open position until it is manually released, for all gate leaves.

2.6 CONCRETE

Provide concrete consisting of Portland cement, ASTM C150, aggregates, ASTM C33, and clean water. Mix materials to obtain concrete with a minimum 28-day comprehensive strength of 2500 psi using at least 4 sacks of cement per cu. yd., 1" maximum size aggregate, maximum 3" slump, and 2% to 4% entrained air.

PART 3 – EXECUTION

3.1 INSPECTION

Contracting Officer shall approve conditions of previous work for fence footings. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 FINISHED GRADES

A. Line posts shall be set a maximum of 10 feet on center. Verify location of all finished utilities and adjust post locations to verify consistency.

B. Drill or dig holes for post and other footings in firm, undisturbed or compacted soil. Footing holes and post embedment shall be in accordance with the drawings and fence manufacturer's standards, bur nor less than 12 inches in diameter and 36 inches deep.

C. Set all posts plumb and true to line and grade in concrete footings. Center and align posts in holes 3" above bottom of excavation. Slope top of footing away from posts. Posts not set plumb and true shall be removed an replaced; bending posts to make them plumb will not be permitted.

D. Provide couplings in top rail approximately every 20 feet. Couplings shall be outside sleeve type and at least 7 inches long, one coupling in every five shall contain a heavy spring to take up expansion and contraction of top rail. Top rail shall pass through base of

line post tops and from a continuous brace from end to end at each stretch of fence. Top rail shall be securely fastened to terminal posts by pressed steel connections.

E. Braces: All terminal posts on fence shall be braced with horizontal pipe bracing of the same material as the top rail, securely attached to the terminal and first post with malleable iron fittings. They shall be truss braced from the first line post to the bottom of the terminal post, with a 3/8 inch galvanized truss rod assembly. Corner posts shall be braced in both directions.

F. Fabric shall be fastened to line posts with galvanized fabric bands spaced approximately 14 inches apart and to top, bottom, and center rails with galvanized tie wires spaced 24 inches apart.

G. Fabric shall be fastened to end, corner and gate posts by means of stretcher bars threaded through the fabric. Stretcher bars shall be fastened to posts with stretcher bar bands every 14 inches.

H. Apply fabric on side of fence designated by Contracting Officer. Stretch fabric taut, securely fasten, cut and attach independently at terminal posts. Do not splice fabric.

I. Bolts shall not protrude more than 1/4 inch beyond nuts after tightening. File rough edges smooth. Wherever bolts are cut or minor breaks in film occur, consult Contracting Officer and, with his approval, renew galvanizing and coating with approved cold galvanizing preparation.

J. All posts shall be plumb and rigid after installation. Rails shall be straight and tight. Chain-link fabric shall be smoothed and uniformly stretched tight and straight.

3.3 GATES

A. Assemble gate frames by welding or with fittings and rivets for rigid connections. Use same fabric as for fence. Install fabric with tension bars at vertical edges, and tie wires at top and bottom edges. Attach tension bars to gate frame at not more than 15 inches on center. Attach hardware with rivets or by other means which will provide security against removal or breakage.

B. Provide additional horizontal and vertical members to ensure proper gate operation and for attachment of fabric, hardware, and accessories.

C. As many welds in the gate frame as possible shall be hot-dipped galvanized after fabrication. Where it is not possible to galvanize after fabrication, welds shall be coated with a cold galvanizing preparation approved by the Contracting Officer.

D. Gates shall be installed plumb, level, and secure for full opening without interferences. Install ground-set items in concrete for anchorage as recommended by the fence

manufacturer. Adjust hardware for smooth operation and lubricate. Gates shall operate smoothly and easily without noise or hinge bind.

END OF SECTION 02831

misc99_3\mtdc02831

SECTION 02900 - LANDSCAPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Trees.
2. Shrubs.
3. Lawns
4. Naturalized Grassland Areas
5. Topsoil and soil amendments.
6. Fertilizers and mulches.
7. Stakes and guys.
8. Landscape edgings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
2. Division 2 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.
3. Division 2 Section “Lawn Sprinkler Piping”

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.

1. Manufacturer's certified analysis for standard products.
2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
3. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.

C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

D. Samples of each of the following:

1. 5 lb. (2 kg.) of shredded bark mulch to verify composition.
2. Edging materials and accessories to verify color selected.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.

F. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.

1. Analysis of existing surface soil.
2. Analysis of imported topsoil.

G. Planting schedule indicating anticipated dates and locations for each type of planting.

H. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
1. Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
2. Installer must have:
   a. Knowledge of local plant communities, particularly prairie grasslands and their ecological requirements
   b. Ability to source native plant material appropriate for the selected site.
   c. Experience in restoration of indigenous environs relevant to the naturalized grassland areas of the project.
   d. Knowledge of plant and soil microbial interactions.
   e. Ability to produce seed source for identified plants, grown to desired size and installed by a crew experienced in restoration of disturbed lands.

3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.

B. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."

C. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious mate-

rial, pH, electroconductivity and mineral and plant-nutrient content of topsoil. Request from the soil testing agency a description of nutrient requirements for the native plants specified in the landscape plan, and recommended amendments to meet these requirements in the topsoil used in the project.

D. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

C. Sod: Harvest, deliver, store, and handle sod according to the requirements of the American Sod Producers Association's (ASPA) "Specifications for Turfgrass Sod Materials and Transplanting/Installing."

D. Trees and Shrubs: Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.

1. Immediately after digging bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.

E. Handle balled and burlapped stock by the root ball.

F. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots in water for 2 hours if dried out.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 PROJECT CONDITIONS

A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.7 COORDINATION AND SCHEDULING

A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Warrant the following living planting materials for the periods specified below, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.

1. Trees – Warrant for a period of one (1) year after date of Substantial Completion

2. Shrubs- Warrant for a period of one (1) year after date of Substantial Completion.
3. Lawns – Warrant for a period of one (1) year after date of Substantial Completion.
4. Naturalized Grassland Areas – Warrant for a period of two (2) years after date of Substantial Completion with minimum of 50% of soil area coverage provided by planted native grasses.

C. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.

D. Replace planting materials that are more than 25 percent dead or in an unhealthy condition at end of warranty period.

E. A limit of one replacement of each plant material will be required, except for losses or replacements due to failure to comply with requirements.

1.9 TREE AND SHRUB MAINTENANCE

A. Maintain trees and shrubs by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required

to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings. Maintain trees and shrubs for the following period:

1. Maintenance Period: 36 months following Substantial Completion.

2. Watering: Plants must receive two gallons of water every other day during the first two weeks after planting, and once every one to two weeks thereafter depending on weather conditions.

3. Landscaping subcontractor to notify General Contractor of any plant maintenance problems related to inadequate performance of irrigation systems.

1.10 LAWN MAINTENANCE

A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

1. Sodded Lawns: 30 days after date of Substantial Completion.

B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

C. Watering: Provide and maintain lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches (100 mm).

1. Water lawn at the minimum rate of 1 inch (25 mm) per week.

2. Landscaping subcontractor to notify General Contractor of any lawn maintenance problems related to inadequate performance of irrigation system.

D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.

E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of lawn area.

1.11 MAINTENANCE OF NATURALIZED GRASSLAND AREAS

A. Begin maintenance of areas seeded in native grasses immediately after each area is planted and continue until acceptable stand of grasses is established, but not for less than 36 months after date of Substantial Completion.

B. Establish and maintain naturalized grassland areas by watering, weeding, mowing, replanting and other operations. Roll, regrade and replant bare or eroded areas to produce a uniform stand of native grasses

C. Watering: Provide and maintain temporary piping, hoses or other watering equipment to convey water from sources and maintain uniformly moist soils to a depth of 4 inches.
   1. Water naturalized grassland areas at the minimum rate of 1 inch (25 mm) per week during grass seed germination and the first four weeks of new growth.

D. Weed control: Apply broadleaf herbicide during first two growing seasons to control weeds competing with native grasses.

E. Owner to be advised in writing to mow or burn naturalized grassland areas at end of third growing season.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Label each tree and shrub with securely attached, waterproof tag bearing legible designation of botanical and common name.

D. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

2.2 SHADE AND FLOWERING TREES

A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required.

   1. Branching Height: 1/3 to 1/2 of tree height.

B. Small Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, and stem form as follows:

1. Provide balled and burlapped trees

2.3 DECIDUOUS SHRUBS

A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.

B. Provide balled and burlapped, containerized or bareroot deciduous shrubs according to plant materials schedule on landscape plan.

2.4 CONIFEROUS EVERGREENS

A. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.

B. Form and Size: Specimen-quality, exceptionally heavy, tightly knit, symmetrically shaped coniferous evergreens.

C. Provide balled and burlapped coniferous evergreens.

1. Container-grown coniferous evergreens will be acceptable in lieu of balled and burlapped coniferous evergreens subject to meeting ANSI Z60.1 limitations for container stock.

2.5 GRASS MATERIALS

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.

1. Seed Mixture: Provide seed of grass species and varieties and proportions by weight, as indicated on the Plant Materials Schedule on the landscape plan.

2. Seed Sources (native grasses): or approved equal
   a. Wind River Seed
      Manderson, Wyoming
      307 / 568-3361

   b. Granite Seed
      Lehi, Utah
      800 / 992-5040

B. Sod: Certified turfgrass sod complying with ASPA specifications for machine-cut thickness, size, strength, moisture content, and mowed height, and free of weeds and undesirable native grasses. Provide viable sod of uniform density, color, and texture of the following turfgrass species, strongly rooted, and capable of vigorous growth and development when planted.

1. Species: Provide sod of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Plant Materials Schedule on landscape plan.

2. Sources:
   a. Bitterroot Turf Farm
      406 / 961-1184

      OR EQUAL

2.6 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch (25 mm) or larger in any dimension, and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

B. Topsoil Source: Import topsoil from off-site sources. Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep; do not obtain from bogs or marshes.

C. Owner to provide soil amendments to Contractor to meet plant nutrient requirements as indicated by soil tests.

D. Contractor coordinate and apply Owner-provided soil amendments.

E. Water: Potable water or rainwater collected on site.

2.7 FERTILIZER

A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.

B. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.

C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:

1. Composition: 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 5 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight.
2. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
3. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

E. Slow-Release Organic Fertilizer:
1. Agriform pellets.
2. Biosol.

OR EQUAL

2.8 MULCHES

A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1.
2. Type: Ground or shredded bark.

2.9 WEED-CONTROL BARRIERS

A. Nonwoven Fabric: Polypropylene or polyester fabric, 3 oz. per sq. yd. (100 g per sq. m) minimum.

1. Typar Heavy Grade Landscape Fabric, or equal.

2.10 STAKES AND GUYS

A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressure-preservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches (50 by 50 mm) by length indicated, pointed at one end.

B. Guy and Tie Wire: ASTM A 641 (ASTM A 641M), Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter.

C. Guy Cable: 5-strand, 3/16-inch (4.8-mm) diameter, galvanized-steel cable, with zinc-coated turn buckles, 3-inch- (75-mm-) long minimum, with two 3/8-inch- (10-mm-) galvanized eye-bolts.

D. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.

E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.11 LANDSCAPE EDGINGS

A. Polyethylene Edging: Manufacturer's standard-grooved, base-black polyethylene edging, 1/10 inch (2.5 mm) thick by 5 inches (125 mm) deep, unless otherwise indicated, extruded in standard lengths, with 9-inch- (225-mm-) steel angle stakes.

1. Top Profile: Rounded.
2. Accessories: Manufacturer's standard connecting clips or plugs.

2.12 MISCELLANEOUS MATERIALS

A. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4 inches (102 mm) wide minimum, with stretch factor of 33 percent.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure Architect's acceptance before the start of planting work. Make minor adjustments as may be required.

3.3 PLANTING SOIL PREPARATION

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

B. Mix fertilizers and Owner-provided soil amendments with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.

C. For tree pit or trench backfill, mix planting soil before backfilling and stockpile at site.

D. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.

1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid-tolerant plants.
2. Apply phosphoric acid fertilizer, other than that constituting a portion of complete fertilizers, directly to subgrade before applying planting soil and tilling.

3.4 LAWN PLANTING PREPARATION

A. Limit subgrade preparation to areas that will be planted in the immediate future.

B. Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.

C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.

1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
2. Allow for sod thickness in areas to be sodded.

D. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:

E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.

F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.5 3.5 NATURALIZED GRASSLAND PLANTING PREPARATION

A. Limit subgrade preparation to areas that will be planted in the immediate future.

B. Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.

C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.

1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
2. Allow for sod thickness in areas to be sodded.

D. Preparation of Unchanged Grades: Where native grasses are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:

E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.

F. Moisten prepared planting areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.6 EXCAVATION FOR TREES AND SHRUBS

A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.

1. Bare-Root Trees and Shrubs: Excavate at least 12 inches (300 mm) wider than root spread and deep enough to allow setting of roots on a layer of planting soil and with collar set at same grade as in nursery, but 1 inch (25 mm) below finish grade, unless otherwise indicated.

   a. Setting Layer: Allow 9 inches (225 mm) of planting soil.

2. Balled and Burlapped Trees and Shrubs: Excavate approximately 1-1/2 times as wide as ball diameter and equal to ball depth, plus the following setting layer depth:

   a. Setting Layer: Allow 9 inches (225 mm) of planting soil.

3. Container-Grown Trees and Shrubs: Excavate to container width and depth, plus the following setting-layer depth:

   a. Setting Layer: Allow 6 inches (150 mm) of planting soil.

B. Dispose of subsoil removed from landscape excavations. Do not mix with planting soil or use as backfill.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

3.7 PLANTING TREES AND SHRUBS

A. Set balled and burlapped stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.

1. Place stock on setting layer of compacted planting soil.
2. Remove burlap and wire baskets from tops of balls and partially from sides, but do not remove from under balls. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation, or there is evidence of root disease, rotting or spiraling.
3. For container stock, rough the sides and bottom of the root ball by hand to loosen the roots from the confines of the container shape.
4. Add ¼ cup of slow release organic fertilizer per gallon of root mass to the soil in the planting hole, avoiding direct contact with roots.
5. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

B. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.

1. Carefully remove containers so as not to damage root balls.
2. Place stock on setting layer of compacted planting soil.
3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

C. Dish and tamp top of backfill to form a 3-inch- (75-mm-) high mound around the rim of the pit. Do not cover top of root ball with backfill.

D. Wrap trees of 2-inch (50-mm) caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before wrapping.

3.8 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are size after pruning.

3.9 TREE AND SHRUB GUYING AND STAKING

A. Upright Staking and Tying: Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1800 mm) above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Guying and Staking: Guy and stake trees exceeding 14 feet (4.2 m) and more than 3-inch (75-mm) caliper unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches (760 mm) long, driven to grade. Attach flags to each guy wire, 30 inches (760 mm) above finish grade.

3.10 MULCHING

A. Mulch backfilled surfaces of pits, trenches, planted areas, and other areas indicated.

B. Weed-Control Barriers: Install the following weed-control barriers according to manufacturer's recommendations, before mulching. Completely cover area to be mulched, lapping edges a minimum of 6 inches (150 mm).

1. Material and Seam Treatment: Nonwoven fabric with seams pinned.

C. Organic Mulch: Apply the following average thickness of organic mulch and finish level with adjacent finish grades. Do not place mulch against trunks or stems.

1. Thickness: 3 inches (75 mm).

3.11 SEEDING NATURALIZED GRASSLAND AREAS

A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.

1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.

B. Sow seed at the rate of 30 lbs. per acre or 138 seeds per square foot.

C. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.

D. Protect seeded areas against hot, dry weather or drying winds by applying peat mulch within 24 hours after completion of seeding operations. Soak and scatter uniformly to a depth of 3/16 inch (4.8 mm) thick and roll to a smooth surface.

3.12 HYDROSEEDING NATURALIZED GRASSLAND AREAS

A. Hydroseeding: Hyroseed in all areas with slopes exceeding 1:6. Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

1. Mix slurry with nonasphaltic tackifier.
2. Apply slurry uniformly to all areas to be seeded in a 1-step process. Apply mulch at the minimum rate of 1500 lb per acre (16.5 kg per 100 sq. m) dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.13 SODDING NEW LAWNS

A. Lay sod within 24 hours of stripping. Do not lay sod if dormant or if ground is frozen.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across angle of slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within 2 hours of planting. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets and form a smooth surface. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below the sod.

3.14 INSTALLATION OF EDGINGS

A. Plastic Edging: Install plastic edging to surround all planting beds according to manufacturer's recommendations. Anchor with steel stakes spaced approximately 24 inches (600 mm) apart, driven through upper base grooves of edging.

3.15 CLEANUP AND PROTECTION

A. During landscaping, keep pavements clean and work area in an orderly condition.

B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.16 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

F

END OF SECTION 02900

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 02905

DRIP IRRIGATION SYSTEM

GENERAL

1.01 SUBMITTALS

A. Submit 5 copies of manufacturer's catalog cuts or current catalog of the following listed items:
   1. Manufacturer's Catalog Data
      a. Dripperline
      b. Barbed insert fittings
      c. Disc filter
      d. Pressure regulators
      e. PVC or Poly pipe
      f. Line flushing valves
      g. Air/Vacuum relief valves
      h. Stainless steel clamps
      i. Remote control valves
      j. PVC threaded and inserts fittings
      k. Metal ground stakes
      l. add or subtract to the following list as necessary)

1.02 SPARE PARTS

A. Upon completion of the installation, turn over the following spare parts and specialty tools to the owner's authorized representative. Include with the following quantities of items a list of each part with appropriate part number (for ordering replacement products) and local supply store of where these parts can be purchased.
   1. Plastic handled 5mm and/or 8mm punch depending on size of holes made
   2. (10') of dripperline for each dripper interval and discharge rate
   3. (10') of blank dripperline tubing if used
   4. (6) barbed couplings
   5. (6) barbed 90° elbow fittings
   6. (6) barbed tee fittings
   7. (6) 180° 2-way adapter tees
   8. (6) male adapters w/3/4" FPT
   9. (1) spare filter element of the mesh size indicated on the irrigation legend
   10. (1) line flushing valve
   11. (2) regulator springs of the color and regulating pressure indicated on the irrigation legend
   12. (6) dripper plug rings
   13. (6) dripper micro-tubing adapters

MATERIALS

2.01 PIPING MATERIALS

A. Dripperline with Pressure Compensating Emitters
   1. Dripperline shall be of nominal sized one-half (½") inch low density, ultra-violet-resistant, linear polyethylene tubing with internal pressure-compensating, continuous self-cleaning, integral

drippers at a specified interval. The tubing shall be brown in color and shall conform to an outside diameter (O.D.) of 0.66" and an inside diameter (I.D.) of 0.57". The dripperline shall be capable of a discharge rate of 0.4, 0.6 or 0.9 gallons per hour (GPH) between operating pressures of 7-70 PSI for each individual dripper.

2. The individual continuous self-cleaning, pressure compensating drippers shall be welded to the inside of the tubing wall. The drippers shall be constructed of three individual pieces:
   a. a black-colored dripper containing a filtration system on the inlet side, compensation cell, and recessed chamber with a water outlet,
   b. a hard plastic diaphragm retainer with color denoting discharge rate, with chamfered edges and a recessed groove in the center extending the full length of the diaphragm and,
   c. a flexible black elastomer diaphragm that allows pressure to build up within the chamber to purge sediment or other debris that may not have been captured by the disc filter.
   d. Dripper spacings shall be available in the following on-center intervals - 12", 18", and 24"

B. Dripperline with Non-Pressure Compensating Emitters
   1. Dripperline shall be low density, linear, ultra-violet-resistant, polyethylene tubing with internal non-pressure compensating integral drippers at a specified interval. The tubing shall be brown in color and shall conform to an outside diameter (O.D.) and an inside diameter (I.D.) as follows:
      a. 17mm dripperline - 0.67" O.D., 0.57" I.D.
      b. 12mm dripperline - 0.48" O.D., 0.42" I.D.
      c. 8mm dripperline - 0.26" O.D., 0.24" I.D.
   2. The dripperline shall be capable of individual dripper discharge rates in gallons per hour (GPH) as follows:
      a. 17mm - 0.5 or 1.0 GPH @ 15PSI
      b. 12mm - 0.6 or 0.9 GPH @ 25PSI
      c. 8mm - 0.3 GPH @ 10 PSI
   3. The individual drippers shall be welded to the inside of the tubing wall. Dripper spacings shall be available as follows:
      a. 17mm - 12" or 18"
      b. 12mm - 12" or 18"
      c. 8mm - 6" or 12"

C. Barbed Insert Fittings
   1. All barbed insert fittings shall be constructed of molded, ultra-violet-resistant, brown colored plastic (17mm) or black colored plastic (12mm and 8mm) having a nominal inside dimension (I.D.) as follows:
      a. 17mm - 0.57"
      b. 12mm - 0.42"
      c. 8mm - 0.24"
   2. Each fitting shall have a minimum of two ridges or barbs per outlet with a raised barb nearest the fitting outlet. All fittings shall be of one manufacturer and shall be available in one of the following end configurations:
      a. barbed insert fittings,
      b. male pipe threads (MPT) with barbed insert fittings, or
      c. female pipe threads (FPT) with barbed insert fittings.

D. Non-Pressure PVC Pipe
   1. Class 200 PVC
   2. Non-pressure (downstream of the remote control valve) PVC pipe shall be rigid, un-plasticized polyvinyl chloride PVC 1220, (Type 1, Grade 2), conforming to ASTM D 1785. Pipe shall have the following markings continuously along one side of the pipe:
      a. pipe O.D.
      b. type and grade

c. NSF rating
d. burst pressure rating
e. product standard ps-21-70 & ASTM number
f. date of manufacture

E. PVC Insert and Threaded Fittings
1. All PVC fittings shall be un-plasticized polyvinyl PVC I, or PVC II material for threaded or slip fitting tapered socket solvent weld fittings. The type of plastic material and schedule size shall be indicated on each fitting or coupling with raised or recessing markings. Fittings and couplings shall comply with the following specifications:
   a. Socket Fittings
      1) Schedule 40: ASTM D2466
      2) Schedule 40: ASTM D2464
   b. Threaded Fittings
      1) Schedule 80: ASTM D2467
      2) Schedule 80: ASTM D2464

2.02 LINE FLUSHING VALVE

A. The line flushing valve shall be constructed of brown molded plastic and shall be a normally open hydraulic valve which flushes based on volumetric quantities of water. Inlet and outlet configurations shall be of one of the following configurations:
1. ½" MPT, or
2. barbed insert fitting with collar

B. The line flushing valve shall be serviceable by removing a threaded cover from a base, exposing the internal components. The internal components of the line flushing valve shall consist of:
1. a molded diaphragm retainer,
2. a high density plastic flush regulator, and
3. a diaphragm 2" in diameter.

C. The line flushing valve shall be capable of automatically operating during initial system pressure build-up to discharge approximately one gallon of water. One line flushing valve shall be used for each 15 GPM of zone flow, and be able to operate at 57 PSI maximum, or 1.5 PSI minimum pressure at line ends.

2.03 PRESSURE REGULATOR VALVES

A. The pressure regulator valve(s) shall be a spring-operated piston type with an externally accessible regulation unit that can be serviced without removing the valve from the system. The valve shall be constructed from molded black plastic with six different colored tops with interchangeable springs denoting different pressure regulation and flow ranges. The regulator shall have a built-in indicator that shows when the proper outlet pressure is reached. Operating ranges for the valves shall be from 15-50 PSI in 5-PSI increments. Inlet and outlet ports of the valve shall be a combination of male/female threads.

2.04 DISC FILTER

A. The disc filter body shall be molded of black plastic with male pipe threads (MPT) for both the inlet and outlet ports. A threaded cap on one end of the body shall be capable of periodic servicing by unscrewing the cap or releasing the latched band from the main filter body. On one ¾" model, a manual shut-off valve shall be co-molded to the opposing end of the removable cap as part of the main body. This device shall be capable of closing off the inlet port so the disc element can be removed when the main line is still pressurized.
   1. The filter elements shall be disc-type. The disc-type filter rings shall be color-coded and available in one of four colors denoting filtration of 80, 120, 140, or 200 mesh.

2.05 AIR/VACUUM RELIEF VALVES

A. Air/vacuum relief valves shall be constructed of grey and/or black plastic with an internal sliding poppet valve that is capable of venting air or preventing vacuum. The main body shall have a 1/2" male pipe thread (MPT). Operating pressure range for the air/vacuum relief valve shall be 7 PSI minimum to 140 PSI maximum.

2.06 STAINLESS STEEL CLAMPS

A. Tubing clamps shall be constructed to 304 AISI stainless steel and shall be one "ear" type. This "ear" shall be capable of being pinched with a pinching tool to secure the tubing around the barbed insert fitting. Interior clamp wall shall be smooth to prevent crimping or pinching of tubing. Wall thickness of clamps shall be .0236" (0.6 mm) with an overall band width of ¼" (7 mm).

EXECUTION

3.01 STAKING

A. Lateral Dripperline Layout

B. Verify existing field dimensions of the area to be irrigated with the irrigation plans for accuracy. Begin dripperline layout 2" away from hard surfaces; i.e., concrete sidewalks, curbs, asphalt, and/or undefined edges; i.e., shovel-cut headers, and 4" away from softscape transitions. Mark tubing intervals on the ground with flags, paint, or some other method that can be maintained throughout the installation.

3.02 INSTALLATION

A. Piping Installation
   1. Methods of Installing Dripperline
      a. Dripperline can be installed in one of the four following methods:
         1) Over-excavation: Over-excavate the entire area to a depth of 4" - 6" below finish grade. Plant all specimen trees and shrubs 15 gallon size and larger, then place dripperline at the row spacing interval indicated on the plans.
         2) Pipe Pulling: Where ground disruption is to be minimized, pneumatic tire, pipe-pulling machinery shall be used. Potholes shall be used at the ends of each run for making connection to supply and exhaust headers of rigid PVC pipe or polyethylene pipe.
         3) Trenching: Hand or mechanically trench to the pipe depth indicated on the plans or in these specifications and backfill flush with finish grade. Avoid mechanically trenching within the dripline of existing trees. Hand-trench around existing tree roots when roots of 2" and larger are encountered. Remove all rock 1½" and larger when excavating and

remove from site. Do not backfill trenches with rock that will come in direct contact with tubing or rigid PVC piping.

4) On-Grade Installation: For on-surface or under mulch installation, place tubing at the lateral spacing indicated on the plans and place soil staples on 3'-5' intervals depending on terrain. Do not install tubing on surface without soil staples. Backfill with mulch or topdressing as noted in the Section 02900, "Landscaping".

2. Polyvinyl Chloride Pipe (PVC)
   a. Solvent-Welded Joints
      1) Shall conform to ASTM D2855
   b. Threaded Joints
      1) Full-cut with a maximum of three threads remaining exposed on pipe and nipples. Make threaded joints tight without recourse to wicks or filters, other than polytetrafluoroethylene (Teflon) tape. Avoid over-tightening of PVC-threaded connections.
   c. Placement of Rigid PVC Piping
      1) Install pipe in a serpentine (snaked) manner to allow for expansion and contraction in trench before backfilling. Install pipes at temperatures over 40° F. Pipe markings shall face upward out of the trench whenever possible.
   d. Dripperline
      1) Dripperline can be installed with the water outlets facing up, down, or sideways. In irregular areas, some water outlets could end up too close to fixed improvements and may have to be capped off with a dripper plug ring.

B. Cover
   1. Install underground piping horizontally and as evenly as possible to a maximum depth of 6", unless otherwise specified. (Typical pipe depth is 4" unless periodic aeration is anticipated, and then pipe depth should be lowered to 6".)

C. Barbed Insert Fittings
   1. Connect dripperline to barbed insert fittings by pushing the tubing on and over both barbs of the fitting until the tubing has seated against another piece of tubing or has butted against another portion of the barbed fitting. For water pressures in excess of the 45 PSI, or the maximum stated system pressure for the dripperline, whichever is less, use stainless steel clamps as noted in paragraph 3.2.4, "Pipe Clamping" on all barbed fittings.

D. Pipe Clamping
   1. When design operating pressure exceeds 45 PSI, or maximum stated system pressure for the dripperline, whichever is less, stainless steel pipe clamps shall be used. Slip clamps over tubing before slipping tubing over barbed insert fitting. Place clamp between the first and second ridge of the barbed fittings and crimp the "ear" of the clamp tightly. Crimp the "ear" twice to ensure proper seating.

E. Pressure Regulators
   1. Install a pressure regulator below grade, in-line with, and downstream of the remote control valve. Whenever possible, place the pressure regulator in the same valve box to allow for periodic inspection. Place the regulator with the arrow (molded into the side of the body) pointing in the direction of the flow of water. Provide straight piping on the outlet side of regulator for a dimension not less than three lengths of the overall body dimension.

F. Remote Control Valves
   1. Install remote control valves level and below grade with a minimum of 4" clearance to the top of the inside of the valve box cover. The arrow cast or molded into the side of the remote control valve should be pointing in the direction of the flow of water. Place a minimum of 1 cubic foot of

¾" gravel in the bottom of the valve box before backfilling with native soil around the exterior of the valve box. Support the four corners of the valve box with a common red brick (wood blocks tend to decay and allow valve boxes to settle over time) on each corner. At finish grade, the top of the valve box shall be 2" above surrounding grades in turf areas or in shrubs where a mulch layer is specified.

G. Disc Filter
   1. Install the disc filter, horizontally level, below grade, and either before or after the remote control valve as indicated in the installation details. The position of the disc filter in the valve box shall be off-center to allow for removal of the disc element for periodic servicing. Refer to the installation details for the size of the valve box. Include a minimum of 1 cu. ft. of ¾" gravel in the bottom of the valve box. Valve box support and placement shall conform to the installation methods described in paragraph 3.2.5, "Remote Control Valve".

H. Air/Vacuum Relief Valve
   1. Install the air/vacuum relief valve below grade and at the highest elevation(s) within each zone of subsurface dripperline. Depending on the site conditions and tubing layout, more than one air/vacuum relief valve may be required. Place the valve in a round valve box with a locking cover and a sump of 1 cubic foot of ¾" gravel as noted on the details. Additional Techline Blank Tubing may be necessary when placing Techline dripperline on mounds or berms with more than a 3' elevation difference. Techline, or Techline Blank Tubing shall be connected perpendicular to the dripperline with barbed tees and crosses from the lowest elevation of dripperline to the highest point of the mound berm where the air/vacuum relief valve is located. The air/vacuum relief lateral serves to collect and transport trapped air bubbles or relieve vacuum in lower elevation dripperline parallel to the dripperline located at the highest point in the system. Locate an air/vacuum relief lateral for each berm (high point) in the zone.

I. Flushing
   1. Prior to backfilling and before connection of the line flushing valves, flush the entire system to remove any dirt or sediment that may have entered the system during the installation.

J. Line Flushing Valve
   1. Install the line flushing valve(s) below grade at the hydraulic termination point(s) in each system, normally at the point farthest away from the source. Locate in a valve box with the top of the line flushing valve facing horizontally or vertically. Include a minimum of 1 cubic foot of ¾" gravel in the bottom of the valve box. Valve box support shall conform to the installation methods described in paragraph 3.2.5 "Remote Control Valve".

K. Testing
   1. Prior to backfilling, open the remote control valve and operate each circuit to check for leakage around both barbed and threaded PVC fittings. Make necessary corrections to stop leaks.

L. Retest
   1. Retest those systems where leaks were corrected before commencing backfilling operations.

END OF SECTION 02905

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mix design, placement procedures, and finishes.

B. Related Sections include the following:
   1. Division 2 Section "Earthwork" for drainage fill under slabs-on-grade.
   2. Division 2 Section "Cement Concrete Pavement" for concrete pavement and walks.

1.3 SUBMITTALS

A. Design Mixes: For each concrete mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

B. Steel Reinforcement Shop Drawings: Details of fabrication, bending, and placement, prepared according to ACI 315, "Details and Detailing of Concrete Reinforcement." Include material, grade, bar schedules, stirrup spacing, bent bar diagrams, arrangement, and supports of concrete reinforcement. Include special reinforcement required for openings through concrete structures.

C. Test Reports

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed concrete Work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

D. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

E. ACI Publications: Comply with the following, unless more stringent provisions are indicated:
1. ACI 301, "Specification for Structural Concrete."
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
a. Medium-density overlay, Class 1, or better, mill-release agent treated and edge sealed.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of the exposed concrete surface.
2. Furnish ties that, when removed, will leave holes not larger than 1 inch (25 mm) in diameter in concrete surface.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.

2.4 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I.

B. Normal-Weight Aggregate: Pea gravel passing 3/8" sieve – elevated floor slabs.

C. Normal-Weight Aggregate: ASTM C 33, uniformly graded – all others.

D. Water: Potable and complying with ASTM C 94.

2.5 ADMIXTURES

A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.

B. Air-Entraining Admixture: ASTM C 260.

C. Water-Reducing Admixture: ASTM C 494, Type A.

2.6 FIBER REINFORCEMENT

A. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in concrete, complying with ASTM C 1116, Type III, 1/2 to 1 inch (13 to 25 mm) long.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

C. Products: Subject to compliance with requirements, provide one of the following:
1. Fibrillated Fibers:
   a. Fibrasol F; Axim Concrete Technologies.
   b. Fibermesh; Fibermesh, Div. of Synthetic Industries.
   c. Forta CR; Forta Corporation.
   d. Grace Fibers; W. R. Grace & Co., Construction Products Div.

2.7 VAPOR RETARDERS

A. Vapor Retarder: ASTM E 1745, Class C, of one of the following materials; or polyethylene sheet, ASTM D 4397, not less than 10 mils (0.25 mm) thick:
   1. Three-ply, nylon- or polyester-cord-reinforced, laminated, high-density polyethylene sheet; 7.8 mils (0.18 mm) thick.

2.8 CURING MATERIALS

A. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

B. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
   1. Clear, Waterborne, Membrane-Forming Curing Compound:
      a. Kure-N-Seal W; Sonneborn, Div. of ChemRex, Inc.
      b. Cure & Seal 14 percent; Symons Corporation.

2.9 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.10 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
   4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Topping: Traffic-bearing, cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6 mm).
   1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5700 psi (39 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXES

A. Prepare design mixes for each type and strength of concrete determined by either laboratory trial mix or field test data bases, as follows:
   1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
   2. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the laboratory trial mix basis.

B. Foundation Walls: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 3000 psi (27.6 MPa).
   2. Maximum Slump: 4 inches (100 mm).

C. Slab-on-Grade and Footings: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 3000 psi (27.6 MPa).
   2. Maximum Slump: 3 inches (125 mm).

D. Elevated Floor Slabs: Proportion normal-weight concrete mix as follows:
   1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).
   2. Maximum Slump: 3 inches (125 mm).

E. Cementitious Materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements.

F. Air Content: Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus 1 or minus 1.5 percent, unless otherwise indicated:
   1. Air Content: 5.5 percent for 1-1/2-inch- (38-mm-) nominal maximum aggregate size.
   2. Air Content: 6 percent for 1-inch- (25-mm-) nominal maximum aggregate size.
   3. Air Content: 6 percent for 3/4-inch- (19-mm-) nominal maximum aggregate size.
   4. Air Content: 4.5 percent for 3/8-inch- (9-mm-) nominal maximum aggregate size.

G. Synthetic Fiber: Uniformly disperse in concrete mix at manufacturer's recommended rate, but not less than 1.5 lb/cu. yd. (0.90 kg/cu. m).

H. Admixtures: Use admixtures according to manufacturer's written instructions.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
   1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:
   1. Class A, (smooth-finish and exposed-to-view) 1/8 inch (3 mm).
   2. Class C, (rough-finish and concealed-from-view) 1/2 inch (13 mm).

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
   1. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   1. Install anchor bolts, accurately located, to elevations required.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E 1643 and manufacturer's written instructions.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
   1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
   1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
   2. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
   3. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness, as follows:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 3/4-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
   1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
   2. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Architect.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot

be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

D. Deposit concrete in forms in horizontal layers no deeper than 24 inches (600 mm) and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.
   1. Consolidate placed concrete with mechanical vibrating equipment. Use equipment and procedures for consolidating concrete recommended by ACI 309R.
   2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the vibrator. Place vibrators to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   2. Maintain reinforcement in position on chairs during concrete placement.
   3. Screed slab surfaces with a straightedge and strike off to correct elevations.
   4. Slope surfaces uniformly to drains where required.
   5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
   1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
   3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.

G. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:
   1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
   3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.8 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched. Remove fins and other projections exceeding ACI 347R limits for class of surface specified.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding 1/8 inch (3 mm) in height.
   1. Apply to concrete surfaces exposed to public view or to be covered with a coating or covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, or painting.
   2. Do not apply rubbed finish to smooth-formed finish.

C. Rubbed Finish: Apply the following to smooth-formed finished concrete:
   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.9 FINISHING FLOORS AND SLABS

A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.
   1. Apply float finish to surfaces indicated, to surfaces to receive trowel finish, and to floor and slab surfaces to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

C. Trowel Finish: After applying float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
   1. Apply a trowel finish to surfaces indicated and to floor and slab surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system
   2. Finish surfaces to the following tolerances, measured within 24 hours according to ASTM E 1155/E 1155M for a randomly trafficked floor surface:

a. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot- (3.05-m-) long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following:
1) 1/8 inch (3.2 mm).

D. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

C. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.11 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces, by one or a combination of the following methods:
1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

a. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer recommends for use with floor coverings.

2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.2-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension in solid concrete but not less than 1 inch (25 mm) in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's

written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mix placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mix, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; ASTM C 173, volumetric method, for structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.

    a. Cast and field cure one set of four standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39; test one laboratory-cured specimen at 7 days and two at 28 days. Reserve the fourth cylinder as a spare for defective cylinders.

C. Strength of each concrete mix will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

END OF SECTION 03300

SECTION 04720 - CAST STONE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Cast stone masonry veneer and accessories

B. Related Sections
   1. Division 4: Unit Masonry Assemblies for concrete block and masonry anchors and accessories
   2. Division 7: Joint Sealants for sealants and control joints.

1.3 DEFINITIONS

A. Cast Stone: Calcium silicate masonry building units intended to simulate natural cut stone.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units.

B. Samples: For each color and texture of cast stone required, 10 inches (250 mm) square in size.

C. Samples for Initial Selection: For colored mortar, showing the full range of colors available.

D. Full-Size Samples: For each type of cast stone unit required. Make available for C.O.R.'s review at Project site before installing cast stone.

   1. Approved Samples may be installed in the Work.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing cast stone units similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to manufacture required units.

This page intentionally blank

B. Source Limitations for Cast Stone: Obtain cast stone units through one source from a single manufacturer.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Pack, handle, and ship cast stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

B. Store installation materials on elevated platforms, under cover, and in a dry location.

C. Store mortar aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.7 COORDINATION

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Arriscraft International, Inc.

2.2 CAST STONE UNITS

A. Arriscaft “Renaissance” RS358 or approved equal product.
1. Tolerances:
a. unit length: ±1/16”
b. unit height: ±1/16”
c. Deviation from square, with the measurement taken using the longest edge as the base will be: ±1/16’
d. bed depth thickness: ± 1/8”
e. custom dimensions: ± 1/8”
2. Compressive Strength: minimum 5500 psi measured per ASTM C170
3. Absorption: 7.8-9.8% measured per ASTM C97
4. Density: miminum 126 lb/ft^3 measured by ASTM C97

5. Modulus of rupture: minimum 624 psi measured per ASTM C97

B. Special Units: as indicated on drawings.

C. Colors and Textures: Arrscraft “paprika”, bold face

2.3 MORTAR MATERIALS

A. Follow cast stone manufacturer’s written recommendation.
1. Typically Arriscraft International Inc. recommends the use of a Portland cement-lime based mortar mix, proportioned to a 1:1:6 ratio, where 1 part Portland cement is mixed with 1 part Type S hydrated mason’s lime and 6 parts masonry sand. This mixture, when properly mixed with the appropriate quantity of water, will result in a Type N mortar as specified in ASTM C270-95a; Standard Specification for Mortar for Unit Masonry.

B. Water: Potable.

2.4 ACCESSORIES

A. Anchors: Type and size indicated, fabricated from steel complying with ASTM A 36/A 36M, and hot-dip galvanized to comply with ASTM A 123.

B. Dowels: Round steel bars complying with ASTM A 36/A 36M or ASTM A 615/A 615M, 1/2-inch (12-mm) diameter, and hot-dip galvanized to comply with ASTM A 123.

C. Job-Mixed Detergent Solution: Solution of 1/2 cup (125 mL) of dry-measure tetrasodium poly-phosphate and 1/2 cup (125 mL) of dry-measure laundry detergent dissolved in 1 gal. (4 L) of water.

2.5 MORTAR MIXES

A. Setting Mortar: Per cast stone manufacturer’s written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of cast stone.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Set cast stone as indicated on Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

B. Drench units with clear water just before setting or per cast stone manufacturer's written recommendations.

C. Set units in full bed of mortar with full head joints, unless otherwise indicated. Build anchors and ties into mortar joints as units are set.

1. Fill dowel holes and anchor slots with mortar.
2. Fill collar joint solid as units are set.
3. Build concealed flashing into mortar joints as units are set.

D. Rake out joints for pointing with mortar to depths of not less than 3/4 inch (19 mm). Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

E. Point mortar joints by placing and compacting mortar in layers not greater than 3/8 inch (10 mm). Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.

F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

G. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.

1. Sealing joints is specified in Division 7 Section "Joint Sealants."
2. Keep joints free of mortar and other rigid materials.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m) or 1/4 inch in 20 feet (6 mm in 6 m) or more.

B. Variation from Level: Do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (9 mm) maximum.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches (3 mm in 900 mm) or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.4 ADJUSTING AND CLEANING

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by C.O.R..

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses. Remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
4. Clean cast stone by bucket and brush hand-cleaning method described in BIA Technical Notes No. 20 Revised II, using job-mixed detergent solution.
5. DO NOT USE WIRE BRUSHES.

END OF SECTION 04720

SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes unit masonry assemblies consisting of the following:
   1. Concrete masonry units.
   2. Mortar and grout.
   3. Ties and anchors.
   4. Miscellaneous masonry accessories.

B. Products installed, but not furnished, under this Section include the following:
   1. Cast-stone masonry, furnished under Division 4 Section "Cast Stone."
   2. Steel lintels and shelf angles for unit masonry, furnished under Division 5 Section "Metal Fabrications."
   3. Hollow-metal frames in unit masonry openings, furnished under Division 8 Section "Steel Doors and Frames."

1.3 SUBMITTALS

A. Product Data: For each different masonry unit, accessory, and other manufactured product specified.
   1. Mortar complying with property requirements of ASTM C 270.
   2. Grout mixes complying with compressive strength requirements of ASTM C 476. Include description of type and proportions of grout ingredients.

B. Cold-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1093 to conduct the testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.Select paragraph above or below. See Editing Instruction No. 3 in the Evaluations for information on preconstruction testing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
   1. Protect Type I concrete masonry units from moisture absorption so that, at the time of installation, the moisture content is not more than the maximum allowed at the time of delivery.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

   1. Protect sills, ledges, and projections from mortar droppings.
   2. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in **ACI 530.1/ASCE 6/TMS 602**.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

PART 2 - PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. General: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.

B. Concrete Masonry Units: [**ASTM C 90**] [**UBC Standard 21-4**] and as follows:

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of **2800 psi (19.3 MPa).**
2. Weight Classification: **Normal weight, unless otherwise indicated**].
3. Size (Width): Nominal, as indicated on drawings.
4. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.2 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: **ASTM C 207**, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C 150, Type I or Type III, and hydrated lime complying with ASTM C 207.

D. Mortar Cement: **ASTM C 1329**.

E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.

F. Aggregate for Grout: ASTM C 404.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494, Type C, and recommended by the manufacturer for use in masonry mortar of composition indicated.

H. Water: Potable.

2.3 REINFORCING STEEL

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60 (Grade 400).

2.4 MASONRY JOINT REINFORCEMENT

A. General: As indicated on drawings, per **ASTM A 951** and as follows:
   1. Hot-dip galvanized, carbon-steel wire for both interior and exterior walls.
   2. Wire Size for Side Rods: **W1.7 or 0.148-inch (3.8-mm)**
   3. Wire Size for Cross Rods: [**W1.7 or 0.148-inch (3.8-mm)**
   4. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

B. For single-wythe masonry, provide either ladder or truss type with single pair of side rods and cross rods spaced not more than 16 inches (407 mm) o.c.

2.5 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors, specified in subsequent articles, made from materials that comply with this Article, unless otherwise indicated.

B. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180), commercial-quality, steel sheet zinc coated by hot-dip process on continuous lines before fabrication.

2.6 MASONRY CLEANERS

A. Job-Mixed Detergent Solution: Solution of 1/2-cup (0.14-L) dry measure tetrasodium polyphosphate and 1/2-cup (0.14-L) dry measure laundry detergent dissolved in 1 gal. (4 L) of water.

2.7 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, to ensure that mortar color is consistent.

B. Mortar for Unit Masonry: Comply with **ASTM C 270**, Proportion Specification.
   1. Limit cementitious materials in mortar to portland cement, mortar cement, and lime.
   2. For reinforced masonry and where indicated, use Type **S**.

C. Grout for Unit Masonry: Comply with **ASTM C 476**.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with **Table 5 of ACI 530.1/ASCE 6/TMS 602** for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
   1. Verify that foundations are within tolerances specified.
   2. Verify that reinforcing dowels are properly placed.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction to verify actual locations of piping connections.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this Section and in other Sections of the Specifications.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to the opening.

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide a continuous pattern and to fit adjoining construction. Where possible, use full-size units without cutting. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

3.3 CONSTRUCTION TOLERANCES

A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

B. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

C. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.

D. For conspicuous horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch (12 mm) maximum.

E. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).

F. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

1. One-half running bond with vertical joint in each course centered on units in courses above and below.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: In each course, rack back one-half-unit length for one-half running bond or one-third-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.

F. Fill space between hollow-metal frames and masonry solidly with mortar, unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.

H. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. At fire-rated partitions, install firestopping in joint between top of partition and underside of structure above to comply with Division 7 Section "Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow masonry units as follows:

1. With full mortar coverage on horizontal and vertical face shells.
2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
3. For starting course on footings where cells are not grouted, spread out full mortar bed, including areas under cells.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Provide continuous masonry joint reinforcement as indicated. Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings.

a. Reinforcement above is in addition to continuous reinforcement.

B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1 inch (25 mm) in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar or other rigid materials.
2. Anchor masonry to structural members with flexible anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.8 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

1. Provide precast lintels made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by the same method used for concrete masonry units.
2. Provide prefabricated or built-in-place masonry lintels. Use specially formed bond beam units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.
3. Provide either of above at Contractor's option or provide precast or formed-in-place concrete lintels complying with requirements in Division 3 Section "Cast-in-Place Concrete."

C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.9 FIELD QUALITY CONTROL

A. Engage a qualified independent testing agency to perform field quality-control testing indicated below.

B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. (465 sq. m) of wall area or portion thereof.

C. Mortar properties will be tested per **ASTM C 780**.

D. Grout will be sampled and tested for compressive strength per **ASTM C 1019**.

E. Prism-Test Method: For each type of wall construction indicated, masonry prisms will be tested per **ASTM C 1314**:

1. Prepare 1 set of prisms for testing at 7 days and 1 set for testing at 28 days.

3.10 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
3. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

3.11 MASONRY WASTE DISPOSAL

A. Recycling: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 04810

This page intentionally blank

SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes structural steel.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 5 Section "Metal Fabrications" for loose steel bearing plates and miscellaneous steel framing.
2. Division 9 Section "Painting" for surface preparation and priming requirements.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

C. Shop Drawings detailing fabrication of structural steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
3. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed structural steel work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Fabricator Qualifications: Engage a firm experienced in fabricating structural steel similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to fabricate structural steel without delaying the Work.

C. Comply with applicable provisions of the following specifications and documents:
   1. AISC's "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design."
   2. AISC's "Specification for Allowable Stress Design of Single-Angle Members."
   3. ASTM A 6 (ASTM A 6M) "Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use."
   4. Research Council on Structural Connections' (RCSC) "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code Steel."
   1. Present evidence that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver structural steel to Project site in such quantities and at such times to ensure continuity of installation.

B. Store materials to permit easy access for inspection and identification. Keep steel members off ground by using pallets, platforms, or other supports. Protect steel members and packaged materials from erosion and deterioration.
   1. Store fasteners in a protected place. Clean and relubricate bolts and nuts that become dry or rusty before use.
   2. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

1.6 SEQUENCING

A. Supply anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, templates, instructions, and directions, as required, for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural Steel Shapes, Plates, and Bars: As follows:
   1. Carbon Steel: ASTM A 36 (ASTM A 36M).

B. Cold-Formed Structural Steel Tubing: ASTM A 500, Grade B.

C. Hot-Formed Structural Steel Tubing: ASTM A 501.

D. Steel Pipe: ASTM A 53, Type E or S, Grade B.
   1. Weight Class: Standard.
   2. Finish: Black, except where indicated to be galvanized.

E. Shear Connectors: ASTM A 108, Grade 1015 through 1020, headed-stud type, cold-finished carbon steel, AWS D1.1, Type B.

F. Anchor Rods, Bolts, Nuts, and Washers: As follows:

   1. Unheaded Rods: ASTM A 36 (ASTM A 36M).
   2. Headed Bolts: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; and carbon-steel nuts (unless noted otherwise).
   3. Headed Bolts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts where noted.
   4. Washers: ASTM A 36 (ASTM A 36M).

G. Nonhigh-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.

   1. Finish: Plain, uncoated.

H. Welding Electrodes: Comply with AWS requirements.

2.2 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and a 30-minute working time.

2.4 FABRICATION

A. Fabricate and assemble structural steel in shop to greatest extent possible. Fabricate structural steel according to AISC specifications referenced in this Section and in Shop Drawings.

   1. Camber structural steel members where indicated.
   2. Mark and match-mark materials for field assembly.
   3. Fabricate for delivery a sequence that will expedite erection and minimize field handling of structural steel.
   4. Complete structural steel assemblies, including welding of units, before starting shop-priming operations.

5. Comply with fabrication tolerance limits of AISC's "Code of Standard Practice for Steel Buildings and Bridges" for structural steel.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded.

C. Finishing: Accurately mill ends of columns and other members transmitting loads in bearing.

D. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's printed instructions.

E. Steel Wall Framing: Select true and straight members for fabricating steel wall framing to be attached to structural steel framing. Straighten as required to provide uniform, square, and true members in completed wall framing.

F. Holes: Provide holes required for securing other work to structural steel framing and for passage of other work through steel framing members, as shown on Shop Drawings.

1. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.5 SHOP PRIMING

A. Shop prime steel surfaces, except the following:
1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed-on fireproofing.
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust, loose mill scale, and spatter, slag, or flux deposits. Prepare surfaces according to SSPC specifications as follows:
1. SSPC-SP 2 "Hand Tool Cleaning."
2. SSPC-SP 3 "Power Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's instructions and at rate recommended by SSPC to provide a dry film thickness of not less than 1.5 mils (0.038 mm). Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before erection proceeds, and with the steel erector present, verify elevations of concrete and masonry bearing surfaces and locations of anchorages for compliance with requirements.

B. Do not proceed with erection until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place, unless otherwise indicated.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC specifications referenced in this Section.

B. Base and Bearing Plates: Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen surfaces prior to setting base and bearing plates. Clean bottom surface of base and bearing plates.

1. Set base and bearing plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.

    a. Comply with manufacturer's instructions for proprietary grout materials.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
1. Maintain erection tolerances of architecturally exposed structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members forming part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or by using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. Install and tighten nonhigh-strength bolts, except where high-strength bolts are indicated.

B. Install and tighten high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
2. Verify that weld sizes, fabrication sequence, and equipment used for architecturally exposed structural steel will limit distortions to allowable tolerances. Prevent surface bleeding of back-side welding on exposed steel surfaces. Grind smooth exposed fillet welds 1/2 inch (13 mm) and larger. Grind flush butt welds. Dress exposed welds.

3.5 FIELD QUALITY CONTROL

A. Owner will engage an independent testing and inspecting agency to perform field inspections and tests and to prepare test reports.

1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from requirements.

B. Correct deficiencies in or remove and replace structural steel that inspections and test reports indicate do not comply with specified requirements.

C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.

D. Field-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

E. Field-welded connections will be visually inspected according to AWS D1.1.

3.6 CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint. Apply paint to exposed areas using same material as used for shop painting.

1. Apply by brush or spray to provide a minimum dry film thickness of 1.5 mils (0.038 mm).

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on structural steel are included in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and apply galvanizing repair paint according to ASTM A 780.

END OF SECTION 05120

This page intentionally blank

SECTION 05400 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior load-bearing steel-stud walls.
   2. Interior load-bearing steel-stud walls.
   3. air-infiltration barriers.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 5 Section "Metal Fabrications" for masonry shelf angles and connections.
   2. Division 9 Section "Gypsum Board Assemblies" for gypsum board and nonload-bearing metal-stud framing and ceiling-suspension assemblies.

1.3 SUBMITTALS

A. Product data for each type of cold-formed metal framing, accessory, and product specified.

B. Shop drawings showing layout, spacings, sizes, thicknesses, and types of cold-formed metal framing, fabrication, fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachments to other units of Work.

C. Mill certificates signed by manufacturers of cold-formed metal framing certifying that their products comply with requirements, including uncoated steel thickness, yield strength, tensile strength, total elongation, and galvanized-coating thickness.

D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel" and AWS D1.3 "Structural Welding Code--Sheet Steel."
   1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

C. Fire-Test-Response Characteristics: Where fire-resistance-rated assemblies are indicated, provide cold-formed metal framing identical to that tested as part of an assembly for fire resistance per ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
   1. Fire-Resistance Ratings: As indicated by design designations listed in UL "Fire Resistance Directory," or by Warnock Hersey or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated in the Work include, but are not limited to, the following:
   1. Angeles Metal Systems.
   2. Dale//Incor Industries of Florida.
   3. Dale Industries, Inc.
   4. Incor Plant Dale Industries.
   5. Unimast, Inc.

2.2 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 446 (ASTM A 446M), zinc coated according to ASTM A 525 (ASTM A 525M), and as follows:
   1. Coating Designation: G 60 (Z 180).
   2. Grade: Grade A, 33,000 psi (230 MPa) minimum yield strength, 20 percent elongation.

3. Grade: Grade D, 50,000 psi (345 MPa) minimum yield strength, 12 percent elongation.

2.3 WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depths indicated, with lipped flanges, and complying with the following:
   1. Design Uncoated-Steel Thickness: 0.0474 inch (1.20 mm), 18 ga.
   2. Flange Width: 1-5/8 inches (41 mm).
   3. Web: Punched.

B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:
   1. Design Uncoated-Steel Thickness: Matching steel studs.
   2. Flange Width: Manufacturers standard deep flange where indicated, standard flange elsewhere.

2.4 HEADER FRAMING

A. Steel Header: Manufacturer's standard C-shaped steel headers, unpunched, of web depths indicated, with lipped flanges, and complying with the following:

   1. Design Uncoated-Steel Thickness: 0.0474 inch (1.20 mm), 18 ga.
   2. Design Uncoated-Steel Thickness: 0.0598 inch (1.52 mm), 16 ga.
   3. Design Uncoated-Steel Thickness: 0.0747 inch (1.90 mm), 14 ga.
   4. Flange Width: 1-5/8 inches (41 mm) minimum.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories of the same material and finish used for framing members, with a minimum yield strength of 33,000 psi (230 MPa).

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

   1. Supplementary framing.
   2. Bracing, bridging, and solid blocking.
   3. Web stiffeners.
   4. Gusset plates.
   5. Deflection track and vertical slide clips.
   6. Stud kickers and girts.
   7. Reinforcement plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36 (ASTM A 36M), zinc coated by the hot-dip process according to ASTM A 123.

B. Cast-in-Place Anchor Bolts and Studs: ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); carbon-steel hex-head bolts and studs; carbon-steel nuts; and flat, unhardened-steel washers. Zinc coated by the hot-dip process according to ASTM A 153.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws.
1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

E. Welding Electrodes: Comply with AWS standards.

2.7 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Thermal Insulation: ASTM C 665, Type I, unfaced mineral-fiber blankets produced by combining glass or slag fibers with thermosetting resins.

2.8 AIR-INFILTRATION BARRIER

A. Polyethylene sheet, 0.0061 inch (0.15 mm) thick, formed by spinning continuous strands of fine, high-density polyethylene interconnected fibers and bonding them together by heat and pressure; incorporating an additive to provide ultralight resistance for up to 120 days; with a water-vapor transmission rate equaling 669 g in 24 hours through 1 sq. m of surface per ASTM E 96 procedure B and flame-spread and smoke-developed ratings of 0 and 25, respectively, per ASTM E 84.

B. Available Products: Subject to compliance with requirements, air-infiltration barriers that may be incorporated in the Work include, but are not limited to, the following:

1. Tyvek Housewrap; DuPont Company, Fibers Department.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements, including installation tolerances and other conditions affecting performance of cold-formed metal framing. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed metal framing and accessories plumb, square, true to line, and with connections securely fastened, according to manufacturer's recommendations and the requirements of this Section.
   1. Cut framing members by sawing or shearing; do not torch cut.
   2. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

      a. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
      b. Locate mechanical fasteners and install according to cold-framed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.

C. Install framing members in one-piece lengths, unless splice connections are indicated for track or tension members.

D. Provide temporary bracing and leave in place until framing is permanently stabilized.

E. Install insulation in built-up exterior framing members, such as headers, sills, boxed joists, and double studs, inaccessible upon completion of framing work.

F. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

G. Erection Tolerances: Install cold-formed metal framing to a maximum allowable tolerance variation from plumb, level, and true to line of 1/8 inch in 10 feet (1:960) and as follows:

   1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings recommended by the manufacturer, but not greater than the following:

1. Spacing: 24 inches (610 mm) for nail or power-driven anchors.
2. Spacing: 48 inches (813 mm) for cast-in-place or expansion anchors.

B. Squarely seat studs against webs of top and bottom tracks. Fasten both flanges of studs to top and bottom track. Space studs as follows:

1. Stud Spacing: 16 inches (406 mm).
2. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Align studs vertically where wall-framing continuity is interrupted by floor framing. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

F. Install headers over wall openings wider than the stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated or required by manufacturer.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

G. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. Where type of supplementary support is not indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or load resulting from item supported.

H. Install horizontal bridging in stud system, spaced in rows not more than 48 inches (1219 mm) apart. Fasten at each stud intersection.
1. Bridging: Cold-rolled steel channel, clip angle fastened to webs of punched studs.
2. Bridging: Flat, steel-sheet straps of width and thickness indicated, fastened to stud flanges.
3. Bridging: Combination of flat, steel-sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

I. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 AIR-INFILTRATION BARRIER INSTALLATION

A. Cover sheathing with air-infiltration barrier as follows:
   1. Apply plastic sheet according to manufacturer's printed recommendations with a 4-inch (102-mm) overlap.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: A qualified independent testing agency employed and paid by Contractor will perform field quality-control testing.

B. Field and shop welds will be subject to inspection and testing.

C. Testing agency will report test results promptly and in writing to Contractor and C.O.R..

D. Remove and replace Work that does not comply with specified requirements.

E. Additional testing will be performed to determine compliance of corrected Work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanizing repair paint according to ASTM A 780 and the manufacturer's instructions.

B. Provide final protection and maintain conditions in a manner acceptable to manufacturer and Installer to ensure that cold-formed metal framing is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 05400

This page intentionally blank

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
1. Steel ship's ladders.
2. Loose bearing and leveling plates.
3. Loose steel lintels.
4. Support angles for elevator door sills.
5. Steel framing and supports for overhead doors.
6. Steel framing and supports for operable partitions.
7. Steel framing and supports for mechanical and electrical equipment.
8. Steel framing and supports for applications where framing and supports are not specified in other Sections.
9. Miscellaneous metal trim.
10. Pipe bollards.

B. Related Sections include the following:
1. Division 5 Section "Structural Steel" for structural-steel framing system components.
2. Division 5 Section "Pipe and Tube Railings" for metal pipe and tube handrails and railings.
3. Division 6 Section "Rough Carpentry" for metal framing anchors and other rough hardware.
4. Division 6 Section "Structural Glued-Laminated Timber" for timber connectors and other rough hardware.
5. Division 14 Section "Hydraulic Elevators" for elevator pit ladders.

1.3 SUBMITTALS

A. Product Data: For the following:
1. Paint products.
2. Grout.

B. Shop Drawings: Detail fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
1. Provide templates for anchors and bolts specified for installation under other Sections.

C. Welding Certificates: Copies of certificates for welding procedures and personnel.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Welding: Qualify procedures and personnel according to the following:
1. AWS D1.1, "Structural Welding Code--Steel."
2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

C. Steel Pipe: ASTM A 53, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

D. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A 153/A 153M.

E. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

A. Shop Primers: Provide primers that comply with Division 9 Section "Painting."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
   1. Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
   2. Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Allow for thermal movement resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening up of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

I. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

J. Remove sharp or rough areas on exposed traffic surfaces.

K. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

2.6 STEEL LADDERS

A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.
1. Comply with ANSI A14.3, unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.

B. Siderails: Continuous, 1/2-by-2-1/2-inch (12-by-64-mm) steel flat bars, with eased edges, spaced 18 inches (457 mm) apart.

C. Bar Rungs: 3/4-inch- (19-mm-) diameter steel bars, spaced 12 inches (300 mm) o.c.

D. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.

F. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung by a proprietary process.
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
a. Mebac; IKG Borden.
b. SLIP-NOT; W. S. Molnar Company.

2.7 STEEL SHIP'S LADDERS

A. Provide ship's ladders where indicated. Fabricate of open-type construction with structural-steel channel or steel plate stringers, steel pipe handrails, and steel bar grating treads, unless otherwise indicated. Provide brackets and fittings for installation.
1. Comply with applicable requirements in Division 5 Section "Pipe and Tube Railings" for steel pipe railings.

2.8 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

2.9 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.

2.10 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports that are not a part of structural-steel framework as necessary to complete the Work.

B. General: Provide steel framing and supports indicated and as necessary to complete the Work.

C. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
   1. Fabricate units from slotted channel framing where indicated.
   2. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors 1-1/4 inches (32 mm) wide by 1/4 inch (6 mm) thick by 8 inches (200 mm) long at 24 inches (600 mm) o.c., unless otherwise indicated.
   3. Furnish inserts if units must be installed after concrete is placed.

2.11 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

2.12 PIPE BOLLARDS

A. Fabricate pipe bollards from Schedule 80 steel pipe.

2.13 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.14 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed metal fabrications:
1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

2.15 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.16 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 607.1.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings, if any.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

D. Anchor wheel guards to concrete or masonry construction to comply with manufacturer's written instructions. Fill cores solidly with concrete.

3.4 INSTALLING PIPE BOLLARDS

A. Anchor bollards in place with concrete footings. Support and brace bollards in position in footing excavations until concrete has been placed and cured.

B. Fill bollards solidly with concrete, mounding top surface.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05500

This page intentionally blank

SECTION 05521 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Steel pipe and tube handrails and railings.

1.3 PERFORMANCE REQUIREMENTS

A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:
   1. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."

B. Structural Performance of Handrails and Railings: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stresses of materials for handrails, railings, anchors, and connections:

   1. Top Rail of Guards: Capable of withstanding the following loads applied as indicated:

      a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
      b. Uniform load of 50 lbf/ft. (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf/ft. (1460 N/m) applied vertically downward.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.

   2. Handrails Not Serving As Top Rails: Capable of withstanding the following loads applied as indicated:

      a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
      b. Uniform load of 50 lbf/ft. (730 N/m) applied in any direction.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.

   3. Infill Area of Guards: Capable of withstanding a horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area.

      a. Load above need not be assumed to act concurrently with loads on top rails in determining stress on guard.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For the following:
1. Grout, anchoring cement, and paint products.

B. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other Work.

1.5 STORAGE

A. Store handrails and railings in a dry, well-ventilated, weathertight place.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 COORDINATION

A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.8 SCHEDULING

A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

a. Black finish, unless otherwise indicated.

b. Type F, or Type S, Grade A, standard weight (Schedule 40), unless another grade and weight are required by structural loads.

2. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

3. Iron Castings: Malleable iron complying with ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.

1. For steel handrails, railings, and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

2.3 PAINT

A. Shop Primers: Provide primers to comply with applicable requirements in Division 9 Section "Painting."

B. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

2.4 FABRICATION

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form changes in direction of railing members as follows:

1. As detailed.

D. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

E. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

F. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

G. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

H. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

I. Close exposed ends of handrail and railing members with prefabricated end fittings.

J. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

K. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.6 STEEL FINISHES

A. For nongalvanized steel handrails and railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed handrails and railings:
   1. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush-off Blast Cleaning."

C. Apply shop primer to prepared surfaces of handrail and railing components, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

   1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
   3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
   1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.

   1. Weld flanges to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:
   1. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.7 CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section "Painting."

3.8 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05521

This page intentionally blank

SECTION 06100 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Framing with dimension lumber.
   2. Framing with engineered wood products.
   3. Rooftop equipment bases and support curbs.
   4. Wood furring, grounds, nailers, and blocking.
   5. Sheathing.
   6. Subflooring.
   7. Bundled log columns

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 6 Section “Wood Chord Metal Joists” for Trus-Joists.
   2. Division 6 Section "Finish Carpentry" for nonstructural carpentry items exposed to view and not specified in another Section.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for the following products:
   1. Engineered wood products.
   2. Metal framing anchors.
   3. Construction adhesives.

C. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that evidence the following products' compliance with building code in effect for Project.

1. Engineered wood products.
2. Metal framing anchors.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood product from one source and by a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Wood-Preservative-Treated Materials:
      a. Baxter: J. H. Baxter Co.
      b. Chemical Specialties, Inc.
      c. Continental Wood Preservers, Inc.
      d. Hickson Corp.
      e. Hoover Treated Wood Products, Inc.
      f. Osmose Wood Preserving, Inc.
   2. Laminated-Veneer Lumber:
      a. Boise Cascade Corp.
      b. Georgia-Pacific Corp.
      c. Louisiana-Pacific Corp.
      d. Trus Joist MacMillan.
   3. Prefabricated Wood I-Joists:
      a. Boise Cascade Corp.
      b. Georgia-Pacific Corp.
      c. Louisiana-Pacific Corp.
      d. Trus Joist MacMillan.
   4. Metal Framing Anchors:
      a. Cleveland Steel Specialty Co.
      b. Harlen Metal Products, Inc.
      c. Silver Metal Products, Inc.
      d. Simpson Strong-Tie Company, Inc.
      e. Southeastern Metals Manufacturing Co., Inc.

2.2 LUMBER, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
   1. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
   1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.
   2. Dressed sizes of green lumber are larger than dry lumber under DOC PS 20.
   3. Provide dressed lumber, S4S, unless otherwise indicated.
   4. Provide lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

A. General: Where lumber or plywood is indicated as preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.

B. Pressure treat above ground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
   3. Wood floor plates installed over concrete slabs directly in contact with earth.

C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.4 DIMENSION LUMBER

A. General: Provide dimension lumber of grades indicated according to the ALSC National Grading Rule (NGR) provisions of the inspection agency indicated.

B. Exterior and Load-Bearing Walls: Provide framing of the following grade and species:
   1. Grade: No. 2.
   2. Species: Douglas fir-larch ; WWPA.

C. Exposed Framing: Provide material hand-selected from lumber of species and grade indicated below for uniformity of appearance and freedom from characteristics that would impair finish appearance.
   1. Species and Grade: As required for structural capacity or as listed above.

2.5 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.

B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.

C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.

2.6 ENGINEERED WOOD PRODUCTS

A. General: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that evidence compliance with building code in effect for Project.
   1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Laminated-Veneer Lumber: Lumber manufactured by laminating wood veneers in a continuous press using an exterior-type adhesive complying with ASTM D 2559 to produce members with grain of veneers parallel to their lengths and complying with the following requirements:
   1. Extreme Fiber Stress in Bending: 2600 psi (17 MPa) for 12-inch nominal- (286-mm actual-) depth members.
   2. Modulus of Elasticity: 1800,000 psi (13 800 MPa).
   3. Tension Parallel to Grain: 1550 psi (13 MPa).

4. Compression Parallel to Grain: 2460 psi (19 MPa).
5. Compression Perpendicular to Grain: 400 psi (3 MPa) perpendicular to and 500 psi (3.5 MPa) and parallel to glue line.
6. Horizontal Shear: 285 psi (2 MPa) perpendicular to and 190 psi (1.3 MPa) parallel to glue line.

C. Prefabricated Wood I-Joists: Units manufactured by bonding stress-graded lumber flanges to wood-based structural-use panel webs with exterior-type adhesives complying with ASTM D 2559, to produce I-shaped joists complying with the following requirements:
1. Flange Material: Laminated-veneer lumber.
2. Web Material: Oriented-strand board (OSB) complying with DOC PS 2.
3. Web Material: Plywood complying with DOC PS 2.
4. Web Material: Either material indicated above, as standard with joist manufacturer.
5. Structural Capacities: Establish and monitor structural capacities according to ASTM D 5055.
6. Sizes: Depths and widths as indicated, with flanges not less than 1-1/2 inches (38 mm) in actual width.

2.7 WOOD-BASED STRUCTURAL-USE PANELS, GENERAL

A. Structural-Use Panel Standards: Provide either all-veneer, mat-formed, or composite panels complying with DOC PS 2, "Performance Standard for Wood-Based Structural-Use Panels," unless otherwise indicated. Provide plywood panels complying with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood," where plywood is indicated.

B. Trademark: Factory mark structural-use panels with APA trademark evidencing compliance with grade requirements.

2.8 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE PANELS

A. General: Where structural-use panels are indicated for the following concealed types of applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, exposure durability classification, and edge detail (where applicable).
1. Thickness: Provide panels meeting requirements specified but not less than thickness indicated.
2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial."

B. Subflooring: APA-rated sheathing. ¾" t&g Plywood
1. Exposure Durability Classification: Exterior.
2. Span Rating: 48/24

C. Wall Sheathing: APA-rated Structural I sheathing.
1. Exposure Durability Classification: Exterior.
2. Span Rating: 24/0 for stud spacing of 16 inches (610 mm) or less.

2.9 STRUCTURAL-USE PANELS FOR BACKING

A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch (11.9 mm) thick.

2.10 PARTICLEBOARD

A. General: Comply with and factory mark each panel according to ANSI A208.1. Provide thickness indicated.

2.11 BUNDLED LOG COLUMNS

A. Grade: Premium

B. Species: Engelman Spruce or Lodgepole Pine; WWPA

2.12 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.
   1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of Type 304 stainless steel.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.13 METAL FRAMING ANCHORS

A. General: Provide galvanized steel framing anchors of structural capacity, type, and size indicated and as follows:
   1. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for Project.

2. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

B. Galvanized Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653, G60 (ASTM A 653M, Z180) coating designation; structural, commercial, or lock-forming quality, as standard with manufacturer for type of anchor indicated.

C. Joist Hangers: U-shaped joist hangers with nailing flanges at least 85 percent of joist depth.
1. Width and Thickness: Per hanger manufacturer.
D. Top Flange Hangers: U-shaped joist hangers, full depth of joist, formed from metal strap with tabs bent to extend over and be fastened to supporting member.
1. Strap Width and Thickness: Per hanger manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.

C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.

D. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

E. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
1. Published requirements of metal framing anchor manufacturer.
2. "Table 23-I-Q--Nailing Schedule" of the Uniform Building Code.

F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; predrill as required.

G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.

H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.

3.3 WOOD FRAMING, GENERAL

A. Framing Standard: Comply with AFPA's "Manual for Wood Frame Construction," unless otherwise indicated.

B. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

C. Install framing members of size and at spacing indicated.

D. Do not splice structural members between supports.

E. Firestop concealed spaces of wood-framed walls and partitions at each floor level and at ceiling line of top story. Where firestopping is not inherent in framing system used, provide closely fitted wood blocks of 2-inch nominal- (38-mm actual-) thickness lumber of same width as framing members.

3.4 INSTALLATION OF STRUCTURAL-USE PANELS

A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
   1. Comply with "Code Plus" provisions of above-referenced guide.

B. Fastening Methods: Fasten panels as indicated below:
   1. Subflooring: Glue and nail to framing throughout.
   2. Sheathing: Screw to framing.
   3. Plywood Backing Panels: Nail or screw to supports.

END OF SECTION 06100

SECTION 06155 – STRESSED SKIN PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Stressed skin roof panels

B. Related Sections
1. Division 9 Section for painting of Firefinish

1.2 DESCRIPTION

A. Stressed skin panels shall be 8 ¼ inch thick pressure laminated composites of approved oriented strand board (OSB)and expanded polystyrene (EPS) insulation. A layer of "Firefinish" will be laminated to the underside of all panels in areas where the panel forms the finished ceiling. All required splines, fasteners, adhesive shall be supplied by the manufacturer or per the written instructions of the manufacturer.

1.3 PERFORMANCE REQUIREMENTS

A. Panel sizes
1. Panels shall be manufactured in sizes large enough to prevent handling and erection damage while minimizing the number and length of joints.

B. Dimensional tolerance
1. Panels shall be fabricated and supplied to within 1/16" of the approved shop drawing dimensions.
2. Panels shall be manufactured to create a 1/8" gap between sheathing edges to allow for movement and placement of caulk

C. Thermal Characteristics
1. Mininum R-value of 8 1/4" thick panel: 29.0 at 75° and 31.5 at 40°.

1.4 SUBMITTALS

A. Product Data: For stressed skin panels. Include installation instructions and data on fabrication.

B. Provide certification of compliance with code requirements as an alternate method of construction. Panels shall be stamped with a certified ICBO number.

C. Each panel type shall be accompanied with verified structural calculations by a Montana registered engineer.

D. Certification from manufacturer that panels have been tested in accordance with ASTM E 72, ASTM E 119, ASTM E 84 and other applicable tests.

E. Shop drawings for panel layout, panel-to-panel details, panel to supporting structure details, and all associated accessory details.

F. Provide documentation of third party inspection and labeling of all insulation used in manufacture of panels.

G. Provide certification of insect treatment. Treatment must be EPA registered, with treatment efficacy substantiated by independent research and ongoing in-plant testing.

H. Warranty documents covering lamination and R-value.

I. Samples: 1' x 1' square.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed stressed skin panel installation similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Both flame and physical characteristics will be covered by the manufacturer's quality control and listing programs.

C. Each panel shall be labeled indicating the maintenance of in-plant quality control/third party inspection service in compliance with ASTM and ICBO code requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of stressed skin panels to avoid extended on-site storage and to avoid delaying the Work.

B. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings.

C. After installation, all panels shall be covered to prevent contact with water on all exposed panel edges.

PART 2 - PRODUCTS

2.1 STRESSED SKIN PANELS, GENERAL

A. Manufacturer
   1. Panels shall be R-Control Panel Building Systems as manufactured by AFM Corporation, or an approved equal product.

B. Description of Materials
   1. Stressed skin panels
      a. Expanded polystyrene core (EPS) – minimum of .95 pcf complying with ASTM C 578.
      b. Oriented strand board (OSB) shall be identified on the panel with an APA performance rating mark, with an Exposure 1 durability rating: minimum physical properties shall be tested and described in APA PRP-108.
      c. "Firefinish": As provided by AFM or approved equal. Approximately 0.10 inches thick and laminated in one piece to the lower panel surface in areas where the panel provides the finish ceiling as indicated on drawings. Provide with smooth surface.
      d. Adhesives shall be an approved laminating adhesive having an in-use temperature range of –40 to 250 degrees Fahrenheit.
   2. Splines
      a. Splines for use in joining panels shall be supplied by the panel manufacturer or per the manufacturer's written recommendations.
   3. Fasteners
      a. Fasteners shall be supplies by the panel manufacturer or per the manufacturer's written recommendations.
   4. Caulk
      a. Caulking shall be compatible with all components of the panel and adjacent materials. Caulking shall be supplies by the panel manufacturer or per the manufacturer's written recommendations.
   5. Construction Adhesive
      a. Adhesives for installing accessories and dimensional lumber shall be supplies by the panel manufacturer or per the manufacturer's written recommendations.
   6. Foam Sealant
      a. All sealants shall be compatible with all components of the panel and adjacent surfaces.
   7. Miscellaneous
      a. Dimensional lumber accessory to stressed skin panels shall be DF/L #2 or better or pre-engineered equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall inspect conditions of substrate, grade and other conditions, which may affect the proper installation of panels. Any adverse conditions are to be reported in writing to the Architect and corrected before panel installation may proceed.

B. Installation shall be in strict accordance with the contract documents and with the manufacturer's written instructions. Any conflicts therein shall be brought to the attention of the Architect in writing.

C. Lower surface of the Firefinish panels will be painted as drywall.

3.2 PROTECTION

A. When storing panels, do not allow them to come into ground contact. Stored panels must remain dry. Do not allow panels to be stored in an unsupported manner. Improper storage may cause tolerance problems in installation.

B. Panels with Firefinish lower surfaces must be protected from all damage to the Fire Form during shipping, storage, installation and construction.

C. Roof panels must be fully protected from the weather at the end of each day or when rain or snow is imminent.

D. Remove and replace insulated roof panels, which have become wet or damaged before proceeding with installation of additional panels or other work.

END OF SECTION 06150

SECTION 06171- WOOD CHORD METAL JOISTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Wood chord metal floor and roof joists as manufactured by Trus-Joist MacMillan or approved equal.

B. Related Sections: The following Sections contain requirements that relate to this Section:

   1. Division 6 Section "Rough Carpentry" for roof and floor sheathing of structural-use panels and dimension lumber for supplementary framing and permanent bracing.
   2. Division 6 Section 'Stress Skin Panels" for roof sheathing of stress skin panels for permanent bracing.

1.3 DEFINITIONS

A. Wood chord metal joists include planar structural units consisting of members fabricated from dimension lumber or laminated lumber and steel tubing, cut and assembled before delivery to Project site.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Engineer, fabricate, and erect wood chord metal joists to withstand design loads within limits and under conditions required.
   1. Design joists to withstand design loads without deflections greater than the following:
      a. Roof Joists: Vertical deflection of 1/240 of span due to total load.
      b. Floor Trusses: Vertical deflection of 1/480 of span due to live load.
      c. Floor Trusses: Vertical deflection of 1/360 of span due to dead load.

B. Engineering Responsibility: Fabrcator shall use a qualified professional engineer registered in the State of Montana to prepare calculations, Shop Drawings, and other structural data for wood chord metal joists.

1.5 SUBMITTALS

A. Product Data for joists and connectors.

B. Shop Drawings detailing location, pitch, span, camber, configuration, and spacing for each type of joist required; species, sizes, and stress grades of lumber to be used; splice details; and bearing details.
   1. To the extent truss design considerations are indicated as fabricator's responsibility, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   2. Include joist Shop Drawings signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed wood chord metal joists installation similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store joists with care and comply with manufacturer's written instructions and TPI recommendations to avoid damage and lateral bending.

B. Inspect joists showing discoloration, corrosion, or other evidence of deterioration. Discard and replace joists that are damaged or defective.

1.8 SEQUENCING AND SCHEDULING

A. Time delivery and erection of joists to avoid extended on-site storage and to avoid delaying progress of other trades whose work must follow erection of joists.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following, or a pre-approved equal:
   1. Wood Chord Metal Joists
      a. Trust-Joist, MacMillan

2.2 DIMENSION LUMBER

A. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.

1. Grade stamps and other markings on exposed joists shall be turned away from normal view.

B. Grade and Species: Provide dimension lumber of any species for joist chord members, graded visually or mechanically, and capable of supporting required loads without exceeding allowable design values.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified below for material and manufacture.

1. Where truss members are exposed to weather or to high relative humidities, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of stainless steel, Type 304 or 316.

B. Wood Screws: ASME B18.6.1.

C. Lag Bolts and Screws: ASME B18.2.1 (ASME B18.2.3.8M).

D. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.4 METAL FRAMING ANCHORS

A. General: Provide metal framing anchors of structural capacity, type, size, metal, and finish indicated that comply with Trus-Joist requirements, or approved equal.

B. Research or Evaluation Reports: Provide products for which model code research or evaluation reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with building code in effect for this Project.

1. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis, and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035, with dry film containing a minimum of 94 percent zinc dust by weight.

2.6 FABRICATION

A. Cut joist members to accurate lengths, angles, and sizes to produce close-fitting joints.

PART 3 - XECUTION

3.1 INSTALLATION

A. Do not install wood chord metal joists until supporting construction is in place and is braced and secured.

B. Before installing, splice joists delivered to Project site in more than one piece.

C. Hoist joists in place by lifting equipment suited to sizes and types of joists required, exercising care not to damage joist members or joints by out-of-plane bending or other causes.

D. Install and brace joists according to manufacturerer's recommendations.

E. Install joists plumb, square, and true to line and securely fasten to supporting construction.

F. Space, adjust, and align joists in location before permanently fastening:

G. Anchor joists securely at all bearing points using metal framing anchors. Install fasteners through each fastener hole in metal framing anchor according to manufacturer's fastening schedules and written instructions.

H. Install and fasten permanent bracing per truss manufacturer's instructions, during joist erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

I. Do not cut or remove truss members.

J. Return wood chord metal joists that are damaged or do not meet requirements to fabricator and replace with joists that do meet requirements.

1. Do not alter joists in the field without written direction from Manufacturer.

3.2 REPAIRS AND PROTECTION

A. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 06192

SECTION 06185 - STRUCTURAL GLUED-LAMINATED TIMBER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Beams, girders, and purlins.
   2. Columns.

1.3 DEFINITIONS

A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives with the grain of the laminations approximately parallel longitudinally.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance of Structural Glulam Timber: Engineer, fabricate, and install structural glulam timber to withstand structural loads shown on Drawings without exceeding the allowable design working stresses according to AITC 117--DESIGN.

1.5 SUBMITTALS

A. Product Data: For glulam timber and accessories. Include installation instructions and data on lumber, adhesives, fabrication, treatment, and protection.

B. Shop Drawings: Show layout of structural glulam timber system and full dimensions of each member. Indicate species and laminating combination, adhesive type, and other variables in required Work.
   1. Include large-scale details of connections.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed structural glulam timber construction similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Manufacturer Qualifications: Provide factory-glued structural units produced by an AITC-licensed firm.

1. Factory mark each piece of structural glulam timber with AITC Quality Mark. **Place mark on surfaces that will not be exposed in completed Work.**

C. Quality Standard: Comply with AITC A190.1, "Structural Glued Laminated Timber."

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions of AITC 111, "Recommended Practice for Protection of Structural Glued Laminated Timber during Transit, Storage, and Erection."

B. Individually wrap members with plastic-coated paper covering, with water-resistant seams, before shipping or exposing to outdoor conditions.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLULAM TIMBER FRAMING

A. Species and Grades for Structural Glulam Timber: Provide glulam members that comply with "Performance Requirements" Article and are made from the following species:
1. Species: Douglas fir.

B. Species and Grades for Beams, Purlins, and Arches: Provide glulam members of the following species that comply with AITC 117--MANUFACTURING for the following combination symbol:

1. Species and Combination Symbol: Douglas fir, 24FV4 – Simple Span Members.
2. Species and Combination Symbol: Douglas fir, 24FV8 – Continuous or Cantilevered Members.

C. Species and Grades for Columns: Provide glulam members of the following species that comply with AITC 117--MANUFACTURING for the following combination symbol:

1. Species and Combination Symbol: Douglas fir, 3.

D. Appearance Grade: At members exposed to view provide architectural appearance grade members complying with AITC 110.

E. Adhesive: Wet-use type complying with ASTM D 2559.

F. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

G. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

H. Connectors, Anchors, and Accessories: Fabricate from structural-steel shapes, plates, and bars complying with ASTM A 36 (ASTM A 36M); steel bars complying with ASTM A 575, Grade M 1020; and hot-rolled steel sheet complying with ASTM A 570 (ASTM A 570M), Grade 33.

2.2 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

B. Camber: Fabricate horizontal and inclined members, units of less than 1:1 slope, with either circular or parabolic camber equal to 1/500 of span.

C. End-Cut Sealing: Immediately after end-cutting each member to final length and after wood treatment (if any), apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood-coated for not less than 10 minutes.

D. Seal Coat: After fabricating and sanding each unit, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit, except for treated wood where treatment included a water repellent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Erect structural glulam timber framing true and plumb, with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Use padded slings and protect corners with wood blocking.

B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

C. Install steel connectors, anchors, and accessories as indicated.

3.2 ADJUSTING AND CLEANING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glulam timber if repairs are not approved by C.O.R..

3.3 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work specified in Division 9. Retain wrapping where it can serve as a painting shield.

END OF SECTION 06185

SECTION 06200 - FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Exterior standing and running trim.
   2. Interior standing and running trim.
   3. Railings.
   4. Composite paneling.
   5. Wood ceiling

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 6 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
   2. Division 9 Section "Painting" for finish and back-priming of finish carpentry.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of factory-fabricated product and process specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.

C. Samples of finished composite paneling (12” x 12”)

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.

B. Do not deliver interior finish carpentry until environmental conditions meet requirements specified for installation areas. If finish carpentry must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry until building is enclosed and weatherproof, wet-work in space is completed and nominally dry, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels through the remainder of construction period.

B. Weather Limitations: Proceed with installing exterior finish carpentry only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements and at least one coat of specified finish to be applied without exposure to rain, snow, or dampness.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Composite Paneling:
a. Phenix Biocomposites, Inc., Environ Biocomposite, “Biofiber” Series.
1) Biofiber: Wheat
2) Biofiber: Burl

2.2 MATERIALS, GENERAL

A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.

B. Inspection Agencies: Inspection agencies, and the abbreviations used to reference them, include the following:
1. WWPA - Western Wood Products Association.

C. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps entirely and provide certificates of grade compliance issued by inspection agency.

D. Softwood Plywood: Comply with DOC PS 1, "U.S. Product Standard for Construction and Industrial Plywood."

E. Particleboard: ANSI A208.1, Grade M-2.

2.3 EXTERIOR STANDING AND RUNNING TRIM

A. Lumber Trim: Provide finished lumber and moldings complying with the following requirements including those of the grading agency listed with species:
   1. Species: Southern yellow pine; SPIB.
      a. Grade: B & B.
   2. Texture: Surfaced (smooth).
   3. Lumber for Transparent Finish (Stained or Clear): Solid lumber stock.

2.4 INTERIOR STANDING AND RUNNING TRIM

A. Hardwood Trim: Provide finished hardwood lumber and moldings complying with the following requirements:
   1. Species and Cut: Straight sawn, clear, kiln-dried birch selected for compatible grain and color.
   2. Texture: Surfaced (smooth).
   3. Lumber for Transparent Finish (Stained or Clear): Solid lumber stock.

B. Lumber for Painted Finish: Glued-up lumber or solid lumber stock.

2.5 RAILINGS

A. Interior Railings: Clear, kiln-dried railing stock of pattern indicated, either solid or laminated.

   1. Species: Birch
   2. Finish: Clear, stain color per Architect's selection.

B. Composite Paneling: unfinished.

   1. Thickness: As indicated
   2. Finish:
      a. Transaction (top horizontal) surfaces
         1) Chemcraft Sadolin per Environ Biocomposite product update publication, "Finish Recommendation for Environ Biocomposite and Dakota Burl Composite Horizontal Applications." See Division 9, Painting
      b. Other surfaces
         1) Urethane, Satin sheen, clear. See Division 9, Painting.
   3. Flame Spread: Class 2, ASTM E84-91
   4. Patterns:
      a. Biofiber: Burl
      b. Biofiber: Wheat

2.6 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails of the following materials, in sufficient length to penetrate minimum of 1-1/2 inches (38 mm) into substrate, unless otherwise recommended by manufacturer.
   1. Hot-dip galvanized steel.

B. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

2.7 FABRICATION

A. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry on relative humidity conditions existing during time of fabrication and in installation areas.

B. Fabricate finish carpentry to dimensions, profiles, and details indicated.

1. Back out or kerf backs of the following members, except members with ends exposed in finished work:
2. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius.
3. Ease edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

C. Prime and backprime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Division 9 Section "Painting."

3.3 INSTALLATION, GENERAL

A. Do not use finish carpentry materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
1. Do not use manufactured units with defective surfaces, sizes, or patterns.

B. Install finish carpentry plumb, level, true, and aligned with adjacent materials. Use concealed shims where required for alignment.

1. Scribe and cut finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level. Install adjoining finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
4. Coordinate finish carpentry with materials and systems in or adjacent to standing and running trim and rails. Provide cutouts for mechanical and electrical items that penetrate exposed surfaces of trim and rails.

C. Finish according to specified requirements.

D. Refer to Division 9 Sections for final finishing of finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints, if required.

1. Match color and grain pattern across joints.
2. Install trim after gypsum board joint finishing operations are completed.
3. Drill pilot holes in hardwood before fastening to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

A. Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

3.6 CLEANING

A. Clean finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.7 PROTECTION

A. Provide final protection and maintain conditions that ensure finish carpentry is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 06200

SECTION 06402 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Wood cabinets (casework).
2. Plastic-laminate countertops.
3. Stairwork and rails.
4. Engineered (laminated) wood flooring applied to ceilings.
5. Shop finishing of woodwork.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 6 Section "Rough Carpentry" for exposed framing and for furring, blocking, shims, and hanging strips for installing interior woodwork.
2. Division 6 Section "Rough Carpentry" for exposed framing and for furring, blocking, and other carpentry work concealed in the wall.
3. Division 6 Section "Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.
4. Division 8 Section "Flush Wood Doors" for doors specified by reference to architectural woodwork standards.
5. Division 9 Section "Painting" for field finishing of installed interior architectural woodwork.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.
   1. Shop-applied transparent finishes.
   2. Plastic laminates.
   3. Thermoset decorative overlays.

D. Samples for verification of the following:
   1. Lumber with or for transparent finish, 50 sq. in. (300 sq. cm), for each species and cut, finished on one side and one edge.
   2. Wood-veneer-faced panel products, with or for transparent finish, 8 by 10 inches (200 by 250 mm), for each species and cut. Include at least one face-veneer seam and finish one-half of face as specified.
      a. Step finish materials on sample to show and clearly define each coat.
   3. Exposed cabinet hardware, one unit for each type and finish.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.

B. Single-Source Responsibility: Arrange for production of interior architectural woodwork with sequence-matched wood veneers by a single firm.

C. Quality Standard: Except as otherwise indicated, comply with the following standard:
   1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

B. Hardware Coordination: Distribute copies of approved schedule for cabinet hardware specified in Division 8 Section "Door Hardware" to fabricator of architectural woodwork; coordinate cabinet shop drawings and fabrication with hardware requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:
   1. Hardboard: AHA A135.4.
   2. Medium-Density Fiberboard: ANSI A208.2.
   3. Particleboard: ANSI A208.1, Grade M-2.
   4. Softwood Plywood: PS 1.
   5. Engineered (laminated) veneer paneling/flooring applied to ceilings.

B. Formaldehyde Emission Level for Medium-Density Fiberboard: Comply with requirements of NPA 9.

C. Particleboard: ANSI A208.1, Grade M-2 made with phenol-formaldehyde resins.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
   1. Countertops except laboratory cabinets as indicated on drawings.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated in the Work include, but are not limited to, the following:
   a. Formica Corporation.
   b. Nevamar Corp.
   c. Ralph Wilson Plastics Co.

E. Chemical-Resistant, High-Pressure Decorative Laminate: NEMA LD 3, Grade PF-42, and as follows:
1. Laminate has the following ratings when tested with indicated reagents according to NEMA LD 3 test procedure 3.9.5:
   a. Nitric acid (30 percent): moderate effect.
   b. Sulfuric acid (77 percent): moderate effect.
   c. Hydrochloric acid (37 percent): moderate effect.
   d. Phosphoric acid (75 percent): no effect.
   e. Acetic acid (98 percent): no effect.
   f. Carbon tetrachloride: no effect.
   g. Formaldehyde: no effect.
   h. Ethyl acetate: no effect.
   i. Ethyl ether: no effect.
   j. Phenol (85 percent): moderate effect.
   k. Benzene: no effect.
   l. Xylene: no effect.
   m. Butyl alcohol: no effect.
   n. Furfural: no effect.
   o. Methyl ethyl ketone: no effect.
   p. Sodium hydroxide (25 percent): no effect.
   q. Sodium sulfide (15 percent): no effect.
   r. Ammonium hydroxide (28 percent): no effect.
   s. Zinc chloride: no effect.
   t. Gentian violet: no effect.
   u. Methyl red: no effect.
2. Laboratory casework as indicated on drawings.
3. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   a. Lab Grade 840 Black; Formica Corporation.
   b. Chemsurf; Ralph Wilson Plastics Co.

F. Adhesive for Bonding Plastic Laminate: Contact cement.

G. Thermoset Decorative Overlay: Decorative surface of thermally fused polyester or melamine-impregnated web, bonded to specified substrate and complying with ALA 1992.
1. Substrate: Medium-density particleboard.

H. Engineered (laminated) wood flooring/paneling applied to ceiling.
1. Thickness: 3/8”
2. Width: 4-6”
3. Species: Straight grain fir or pine.
4. Configuration: t&g, random length, v-grooved edges and ends.

5. Texture: smooth
6. Finish: unfinished, apply stain and transparent finish.
7. Color: match architect's sample.
8. Fire Resistive Classification: Class B; Flame spread less than 75; Smoke development less than 450. Approved treatment may be job-applied to gain required rating.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.

2.3 CABINET HARDWARE AND ACCESSORY MATERIALS

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 8 Section "Door Hardware."

B. Cabinet Hardware Schedule: Refer to schedule at end of this Section for cabinet hardware required for architectural cabinets.

C. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

D. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA code number indicated.
1. Stainless Steel, Stainless-Steel Base: BHMA 630.

E. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

2.4 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
   1. Grade: Custom.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
   1. Corners of cabinets and edges of solid-wood (lumber) members and rails: 1/16 inch (1.5 mm).

D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cut-outs and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

2.6 WOOD CABINETS (CASEWORK) FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 400 requirements for wood cabinets.
   1. Grade: Custom.

B. AWI Type of Cabinet Construction: Flush overlay.

C. Wood Species for Exposed Surfaces: White birch, plain cut.

D. Semiexposed Surfaces: Provide surface materials indicated below:
   1. Surfaces Other than Drawer Bodies: Match species and cut indicated for exposed surfaces.
   2. Drawer Sides and Backs: Thermoset decorative overlay.
   3. Drawer Bottoms: Thermoset decorative overlay.

E. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers except where located directly under tops.

2.7 COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for countertops.
   1. Grade: Custom.

B. Type of Top: High-pressure decorative laminate complying with the following:
   1. Grade: GP-50, 0.050-inch (1.270-mm) nominal thickness.
   2. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
      a. Provide Architect's selections from manufacturer's full range of colors and finishes in the following categories:
         1) Solid colors.
         2) Patterns.
   3. Edge Treatment: As indicated.
   4. Core Material: Medium-density particleboard.

2.8 STAIRWORK AND RAILS

A. Quality Standard: Comply with AWI Section 800.

B. Wood Species for Transparent Finish: White Birch, plain sawn.
   1. Handrails: Transparent.
   2. Other Moldings: Transparent.

2.9 SHOP FINISHING OF INTERIOR ARCHITECTURAL WOODWORK

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.
   1. Grade: Provide finishes of same grades as items to be finished.

B. General: The entire finish of interior architectural woodwork is specified in this Section, regardless of whether shop applied or applied after installation.
   1. Shop Finishing: To the greatest extent possible, finish architectural woodwork at the fabrication shop. Defer only final touch up, cleaning, and polishing until after installation.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.
   1. Backpriming: Apply one coat of sealer or primer compatible with finish coats to concealed surfaces of woodwork, including backs of trim, cabinets, paneling, and ornamental work and the underside of countertops. Apply 2 coats to back of paneling. Concealed surfaces of plastic laminate-clad woodwork do not require backpriming when surfaced with plastic laminate or thermoset decorative overlay.

D. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523.
   1. Grade: Custom.
   2. AWI Finish System TR-6: Catalyzed polyurethane.
   3. Staining: Match Architect's sample.

4. Sheen: Satin 30-50 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm) for plumb and level (including tops).

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.

F. Tops: Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with specified sealant.
   1. Install countertops with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
   2. Secure backsplashes to tops with concealed metal brackets at 16 inches (400 mm) o.c.

G. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.

H. Refer to Division 9 Sections for final finishing of installed architectural woodwork.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

3.5 CABINET HARDWARE AND ACCESSORY SCHEDULE

A. Sliding doors
1. Track: Stanley Heavy Duty Sliding Door Hardware with track stopper.
2. Floor guide
3. Flush Pulls (side to glass): Hager Flush Cup Pull 17N, Finish US26D
4. Pulls (side to room): Hager Offset Pull 12G, finish US26D.

B. Cabinets
1. Pulls: Lamp (Sugatsune America, Inc.) MB Series. Half-round, 3", satin nickel
2. Catches: matnetic type.
3. Hinges: Grass Slide-on 165 degree opening (European Style) #1203 series
4. Drawer Slides: Accuride Heavy Duty Full Extension Model #4034.

END OF SECTION 06402

SECTION 07132 - ELASTOMERIC SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. EPDM rubber sheet waterproofing.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 7 Section "Joint Sealants" for joint-sealant materials and installation.

1.3 PERFORMANCE REQUIREMENTS

A. Provide waterproofing that prevents the passage of water.

1.4 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Samples: For the following products:
   1. Delete Samples in subparagraphs below not required. Add number or revise size of Samples if applicable.

   2. 12-by-12-inch (300-by-300-mm) square of waterproofing.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who is authorized, approved, or licensed by waterproofing manufacturer to install manufacturer's products; and who is eligible to receive waterproofing warranty specified.

B. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Store rolls according to manufacturer's written instructions.

E. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Special Manufacturer's Warranty: Written warranty, signed by waterproofing manufacturer agreeing to replace waterproofing material that does not comply with requirements or that does not remain watertight within specified warranty period.

1. Warranty Period: [**10**] years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
1. EPDM Rubber Sheet:

a. Carlisle Corporation, Carlisle Coatings & Waterproofing Div.; Sure-Seal EPDM.

2.2 SHEET WATERPROOFING

A. EPDM Rubber Sheet: ASTM D 6134, Type I, 60-mil- (1.5-mm-) thick flexible sheet, unreinforced, formed from EPDM.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.

1. Notify C.O.R. in writing of anticipated problems using waterproofing over substrate.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Prepare, fill, prime, and treat joints and cracks in substrate. Remove dust and dirt from joints and cracks according to ASTM D 4258.

D. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions.

3.3 FULLY ADHERED SHEET INSTALLATION

A. Install fully adhered sheets over entire area to receive waterproofing according to manufacturer's written instructions and recommendations in ASTM D 5843.

B. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required. Stagger end laps.

C. Apply bonding adhesive to substrates at required rate and allow to partially dry.

D. Apply bonding adhesive to sheets and firmly adhere sheets to substrates. Do not apply bonding adhesive to splice area of sheet.

E. Install fully adhered sheets and auxiliary materials to tie into existing waterproofing.

F. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending beyond repaired areas in all directions.

G. Horizontal Application: Apply sheets with side laps shingled with slope of deck where possible.

1. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal sheet waterproofing in place with clamping ring.

3.4 SEAM INSTALLATION

A. Cement Splice: Clean splice areas, apply splicing cement and in-seam sealant, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to produce a splice not less than 6 inches (150 mm) wide and to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet terminations.

B. Cement and Tape Splice: Clean splice areas, apply splicing cement and butyl gum tape, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet terminations.

3.5 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07132

SECTION 07160 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Cold-applied, cut-back asphalt dampproofing.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified, including data substantiating that materials comply with requirements for each dampproofing material specified. Include recommended method of application, recommended primer, number of coats, coverage or thickness, and recommended protection course.
   1. Certification by dampproofing manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

1.4 PROJECT CONDITIONS

A. Substrate: Proceed with dampproofing only after substrate construction and penetrating work have been completed.

B. Weather Limitations: Proceed with dampproofing only when existing and forecasted weather conditions will permit work to be performed according to manufacturer's recommendations and warranty requirements.

C. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Cold-Applied, Cut-Back Asphalt Dampproofing:
      a. ChemRex, Inc.; Sonneborn Building Products Div.

2.2 BITUMINOUS DAMPPROOFING

A. General: Provide products recommended by manufacturer for designated application.

B. Scope: Apply to the exterior surface of **all** exterior concrete walls below grade. Apply from no less than 4 inches below grade to 4 inches onto horizontal footing surface. Apply protection course board to vertical surface before backfilling.

C. Cold-Applied, Cut-Back Asphalt Dampproofing: Asphalt and solvent compound mixed to a smooth, uniform consistency to provide a firm, moisture-resistant, vapor-resistant, elastic coating recommended by the manufacturer for dampproofing use when applied according to the manufacturer's instructions.
   1. Semimastic Grade: Asphalt roof coating, consisting of an asphalt base with petroleum solvents and mineral stabilizers, complying with ASTM D 4479, Type I.

2.3 MISCELLANEOUS MATERIALS

A. Primer: Asphalt primer complying with ASTM D 41, for asphalt-based dampproofing.

B. Protection Course, Board Type: Premolded, 1/8-inch- (3-mm-) thick, multi-ply, semirigid board, consisting of a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt, and faced on one side with polyethylene film.

   1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
      a. Retain above for nonproprietary or below for semiproprietary Specification. Refer to Division 1 Section "Materials and Equipment."
   b. Protection Course II; ChemRex, Inc.; Sonneborn Building Products Div.
      c. Bituthene Asphaltic Hardboard; Grace: W.R. Grace & Co.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrate of projections and substances detrimental to work; comply with recommendations of prime materials manufacturer.

B. Install separate flashings and corner protection stripping, as recommended by prime materials manufacturer, where indicated to precede application of dampproofing. Comply with details

shown and with manufacturer's recommendations. Pay particular attention to requirements at building expansion joints, if any.

C. Prime substrate as recommended by prime materials manufacturer.

D. Protection of Other Work: Do not allow liquid and mastic compounds to enter and clog drains and conductors. Prevent spillage and migration onto other surfaces of work by masking or otherwise protecting adjoining work.

3.2 INSTALLATION, GENERAL

A. Comply with manufacturer's recommendations except where more stringent requirements are indicated and where Project conditions require extra precautions to ensure satisfactory performance of work.

B. Application: Apply dampproofing to the following surfaces.

1. Exterior, below-grade surfaces of exterior concrete or masonry walls in contact with earth or other backfill and where space is enclosed on opposite side.
2. And where indicated on the Drawings.

C. Apply vertical dampproofing down walls from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when the Project is completed.

3.3 COLD-APPLIED, CUT-BACK ASPHALT DAMPPROOFING

A. Semimastic Grade: Brush or spray apply a coat of dampproofing at a rate of 5 gal./100 sq. ft. (2 L/sq. m), to produce a uniform, dry-film thickness of not less than 30 mils (0.8 mm).

3.4 PROTECTION AND CLEANING

A. Protect exterior, below-grade dampproofing membrane from damage until backfill is completed. Remove overspray and spilled materials from surfaces not intended to receive dampproofing.

3.5 INSTALLATION OF PROTECTION COURSE

A. General: Where indicated, install protection course of type indicated over completed-and-cured dampproofing treatment. Comply with dampproofing materials manufacturer's recommendations for method of support or attaching of protection materials. Support with spot application of trowel-grade mastic where not otherwise indicated.

END OF SECTION 07160

This page intentionally blank

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Insulation under slabs-on-grade.
   2. Foundation wall insulation
   3. Concealed building insulation.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of insulation product specified.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering insulation products that may be incorporated in the work include, but are not limited to, the following:
   1. Extruded-Polystyrene Board Insulation:
      a. Amoco Foam Products Company.
      b. Dow Chemical Co.
      c. UC Industries, Inc.; Owens-Corning Co.

2. Glass-Fiber Insulation:
   a. CertainTeed Corporation.
   b. Owens-Corning Fiberglas Corporation.

2.2 INSULATING MATERIALS

A. General: Provide insulating materials that comply with requirements and with referenced standards.
   1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.

B. Extruded-Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation formed from polystyrene base resin by an extrusion process using hydrochlorofluorocarbons as blowing agent to comply with ASTM C 578 for type and with other requirements indicated below:
   1. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 75 and 450, respectively.

C. Unfaced Mineral-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type I (blankets without membrane facing).
   1. Mineral-Fiber Type: Fibers manufactured from glass.
   2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.

C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Apply single layer of insulation to produce thickness indicated.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

B. Protect below-grade insulation on vertical surfaces from damage during backfilling by applying protection board. Set in adhesive according to written instructions of insulation manufacturer.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
   1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
   2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

3.6 PROTECTION

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

This page intentionally blank

SECTION 07311 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes asphalt shingles for steep roofs (steeper than 4 in 12).

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 6 Section "Rough Carpentry" for wood sheathing and framing.
2. Division 7 Section "Flashing and Sheet Metal" for metal valley flashing, step flashing, drip edges, and other sheet metal work.
3. Division 7 Section "Roof Accessories" for ridge vents, hatches, and roof penetrations.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product specified, including details of construction relative to materials, dimensions of individual components, profiles, textures, and colors.

C. Samples for initial selection in the form of manufacturer's sample finishes showing the full range of colors and profiles available for each type of asphalt shingle indicated.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Classification: Where products with a fire-test-response classification are specified, provide asphalt shingles identical to those tested according to ASTM E 108 or UL 790 and listed by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify each bundle of asphalt shingles with appropriate markings indicating fire-test-response classification of applicable testing and inspecting agency.

B. Wind-Resistance-Test Characteristics: Where wind-resistant asphalt shingles are indicated, provide products identical to those tested according to ASTM D 3161 or UL 997 and passed. Identify each bundle of asphalt shingles with appropriate markings of applicable testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's unopened bundles or containers with labels intact.

B. Handle and store materials at Project site to prevent water damage, staining, or other physical damage. Store roll goods on end. Comply with manufacturer's recommendations for job-site storage, handling, and protection.

1.6 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installing asphalt shingles only when existing and forecasted weather conditions will permit work to be performed according to manufacturers' recommendations and warranty requirements, and when substrate is completely dry.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty signed by manufacturer agreeing to repair or replace asphalt shingles that fail in materials or workmanship within the specified warranty period. Failures include, but are not limited to, deformation or deterioration of asphalt shingles beyond normal weathering.
   1. Warranty Period: Manufacturer's standard but not less than 40 years after date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
   1. Furnish 1 square (9.29 sq. m) coverage of asphalt shingles, identical to those to be installed, in unbroken bundles.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering asphalt shingles that may be incorporated in the Work include, but are not limited to, the following:
   1. GAF Building Materials Corporation, Timberline Ultra.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   1. Waterproof Underlayment
      a. Bituthene Ice and Water Shield; Grace: W.R. Grace & Co.

2.2 ASPHALT SHINGLES

A. Colors, Blends, and Patterns: Where manufacturer's standard products are indicated, provide asphalt shingles with the following requirements:
   1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for asphalt shingles of type indicated.

B. Three-Dimensional, Fiberglass, Laminated Strip Shingles: Mineral-surfaced, self-sealing, laminated, multi-ply overlay construction, fiberglass-based, strip asphalt shingles, complying with both ASTM D 3018, Type I, and ASTM D 3462. Provide shingles with a Class A fire-test-response classification that pass the wind-resistance-test requirements of ASTM D 3161.

C. Hip and Ridge Shingles: Manufacturer's standard, factory-precut units to match asphalt shingles.

2.3 ACCESSORIES

A. Felt Underlayment: Type I, 36-inch- (914-mm-) wide, asphalt-saturated organic felt, complying with ASTM D 226 (No. 15) or ASTM D 4869.

B. Asphalt Plastic Cement: Nonasbestos fibrated asphalt cement, complying with ASTM D 4586.

C. Nails: Aluminum or hot-dip galvanized steel, 0.120-inch- (3-mm-) diameter barbed shank, sharp-pointed, conventional roofing nails with a minimum 3/8-inch- (9.5-mm-) diameter head and of sufficient length to penetrate 3/4 inch (19 mm) into solid decking or at least 1/8 inch (3 mm) through plywood sheathing.
   1. Where nails are in contact with flashing, prevent galvanic action by providing nails made from the same metal as that of the flashing.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of asphalt shingles. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with noncorrosive roofing nails.

B. Coordinate installation with flashings and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and are securely fastened against movement.

3.3 INSTALLATION

A. General: Comply with manufacturer's instructions and recommendations but not less than those recommended by ARMA's "Residential Asphalt Roofing Manual" or "The NRCA Steep Roofing Manual."
   1. Fasten asphalt shingles to roof sheathing with nails.

B. Felt Underlayment: Apply 1 layer of felt underlayment horizontally over entire surface to receive asphalt shingles, lapping succeeding courses a minimum of 2 inches (50 mm), end laps a minimum of 4 inches (100 mm), and hips and valleys a minimum of 6 inches (150 mm). Fasten felt with sufficient number of roofing nails or noncorrosive staples to hold underlayment in place until asphalt shingle installation.

C. Waterproof Underlayment: Apply waterproof underlayment at eaves. Cover deck from eaves to at least 60 inches inside exterior wall line.
   1. In addition to eaves, apply waterproof underlayment in place of felt underlayment at valleys.

D. Metal Open Valleys: Comply with ARMA and NRCA recommendations. Install a second felt underlayment shingle lapped at least 12 inches (300 mm) and sealed with plastic asphalt cement. Install a metal valley shingle lapped at least 9 inches (225 mm) and sealed with plastic asphalt cement.

E. Flashing: Install metal flashing and trim as indicated and according to details and recommendations of the "Asphalt Roofing" section of "The NRCA Steep Roofing Manual" and ARMA's "Residential Asphalt Roofing Manual."

F. Install asphalt shingles, beginning at roof's lower edge, with a starter strip of roll roofing or inverted asphalt shingles with tabs removed. Fasten asphalt shingles in the desired weather exposure pattern; use number of fasteners per shingle as recommended by manufacturer. Use vertical and horizontal chalk lines to ensure straight coursing.
   1. Cut and fit asphalt shingles at valleys, ridges, and edges to provide maximum weather protection. Provide same weather exposure at ridges as specified for roof. Lap asphalt shingles at ridges to shed water away from direction of prevailing wind.
   2. Use fasteners at ridges of sufficient length to penetrate sheathing as specified.
   3. Pattern: Random spacing offset at succeeding courses.

3.4 ADJUSTING

A. Replace any damaged materials installed under this Section with new materials that meet specified requirements.

END OF SECTION 07311

SECTION 07412 - MANUFACTURED WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Metal wall panels with exposed fasteners.

B. Related Sections include the following:
   1. Division 5 Section "Cold-Formed Metal Framing" for metal studs, bracing, anchorage, and framing accessories.
   2. Division 7 Section "Sheet Metal Flashing and Trim" for metal flashing and trim not part of this Work.
   3. Division 7 Section "Joint Sealants" for field-applied sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide manufactured wall panel assemblies complying with performance requirements indicated and capable of withstanding structural movement, thermally induced movement, and exposure to weather without failure or infiltration of water into the building interior.

B. Air Infiltration: Provide manufactured wall panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. (0.45 L/s/sq. m) of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 4.0 lbf/sq. ft. (192 Pa).

C. Water Penetration: Provide manufactured wall panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward acting, wind-load design pressure of not less than 6.24 lb/sq. ft. (300 Pa) and not more than 12.0 lb/sq. ft. (575 Pa).

1.4 SUBMITTALS

A. Product Data: Include manufacturer's product specifications, standard details, certified product test results, and general recommendations, as applicable to materials and finishes for each component and for total panel assemblies.

B. Shop Drawings: Show layouts of panels, details of corner conditions, joints, panel profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work.

C. Samples for Initial Selection: Manufacturer's color charts or chips showing the full range of colors, textures, and patterns available for wall panels with factory-applied finishes.

D. Samples for Verification: Provide sample panels 12 inches (300 mm) long by actual panel width, in the profile, style, color, and texture indicated. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed metal wall panel projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver panels and other components so they will not be damaged or deformed. Package panels for protection against damage during transportation or handling.

B. Handling: Exercise care in unloading, storing, and erecting wall panels to prevent bending, warping, twisting, and surface damage.

C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify location of structural members and openings in substrates by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal wall panels within the specified warranty period and agreeing to repair finish or replace wall panels that show evidence of finish deterioration.

C. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

D. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal panels that may be incorporated into the Work include, but are not limited to, the following:
   1. Steel Wall Panels:
      a. Reynolds Metal Company
         1) Panel Type 1: Reynolds 4" Rib Roofing and Siding
         2) Panel Type 2: Reynolds 8" Rib Roofing and Siding

2.2 METALS AND FINISHES

A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755 (ASTM A 755M) and the following requirements:
   1. Galvanized Steel Sheet: ASTM A 653, G90 (ASTM A 653M, Z275); structural quality. 20 ga.
   2. Surface: Smooth, flat, mill finish.
   3. Exposed Finish for Exterior Panels: Apply the following coating in thickness indicated. Furnish appropriate air-drying spray finish in matching color for touchup.
      a. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight with a total minimum dry film thickness of 0.9 mil (0.023 mm) and 30 percent reflective gloss when tested according to ASTM D 523.
         1) Durability: Provide coating field tested under normal range of weather conditions for a minimum of 20 years without significant peel, blister, flake, chip, crack, or check in finish; without chalking in excess of a chalk rating of 8 according to ASTM D 4214; and without fading in excess of 5 Hunter units.
         2) Color: Custom color to match Valspar Industrial Coatings #392F254, Quaker Gray.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Use stainless-steel fasteners for exterior applications and galvanized steel fasteners for interior applications.
2. Provide exposed fasteners with heads matching color of panel by means of plastic caps or factory-applied coating.
3. Provide metal-backed neoprene washers under heads of exposed fasteners located on weather side of panels.

B. Accessories: Unless otherwise specified, provide components required for a complete wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, seam covers, flashings, louvers, sealants, gaskets, fillers, closure strips, and similar items. Match materials and finishes of panels.
1. Closure Strips: Closed-cell, self-extinguishing, expanded, cellular, rubber or cross-linked, polyolefin-foam flexible closure strips. Cut or premold to match configuration of panels. Provide closure strips where indicated or necessary to ensure weathertight construction.
2. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
3. Joint Sealant: One-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant as recommended by panel manufacturer.

C. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat, unless otherwise indicated. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 FABRICATION

A. General: Fabricate and finish panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Apply bituminous coating or other permanent separation materials on concealed panel surfaces where panels would otherwise be in direct contact with substrate materials that are noncompatible or could result in corrosion or deterioration of either materials or finishes.

C. Fabricate panel joints with captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will minimize noise from movements within panel assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements indicated for conditions affecting performance of metal panel walls.

1. Do not proceed with wall panel installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate metal wall panels with rain drainage work; flashing; trim; and construction of soffits, roofing, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

B. Promptly remove protective film, if any, from exposed surfaces of metal panels. Strip with care to avoid damage to finish.

3.3 PANEL INSTALLATION

A. General: Comply with panel manufacturer's written instructions and recommendations for installation, as applicable to project conditions and supporting substrates. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
   1. Apply 30 lb. asphalt felt to sheathing before installing panels.
   2. Field cutting exterior panels by torch is not permitted.
   3. Install panels with exposed exterior and interior fasteners, prefinished to match panel finishes.
   4. Locate and space exposed fasteners in true vertical and horizontal alignment. Use proper tools to obtain controlled, uniform compression for positive seal without rupture of neoprene washer.

B. Accessories: Install components required for a complete wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, seam covers, flashings, louvers, sealants, gaskets, fillers, closure strips, and similar items.
   1. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

C. Wall Panels: Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing. Handle and apply sealant and back-up according to sealant manufacturer's written instructions.
   1. Align bottom of wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
   2. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
   3. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

D. Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating or by other permanent separation as recommended by manufacturers of dissimilar metals.

E. Coat back side of metal panels with bituminous coating where it will contact wood, ferrous metal, or cementitious construction.

F. Installation Tolerances: Shim and align panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.4 CLEANING AND PROTECTING

A. Damaged Units: Replace panels and other components of the Work that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

B. Cleaning: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction.

END OF SECTION 07412

This page intentionally blank

SECTION 07531 - EPDM SINGLE-PLY MEMBRANE ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Mechanically fastened sheet roofing.
   2. Roof insulation/protection board.

B. Related Sections include the following:

   1. Division 6 Section "Rough Carpentry" for wood nailers, curbs, and blocking; and wood-based, structural-use roof deck panels.
   2. Division 7 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
   3. Division 7 Section "Joint Sealants."

1.3 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D 1079 for definition of terms related to roofing work not otherwise defined in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: Install sheet membrane roofing and base flashing that are watertight; will not permit the passage of liquid water; and will withstand wind loads, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.

C. FM Listing: Provide sheet membrane, base flashings, and component materials that meet requirements of FM 4450 and FM 4470 as part of a roofing system and that are listed in FM's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM markings.

1. Roofing system shall comply with the following:

    a. Fire/Windstorm Classification: Class 1A-90.

1.5 SUBMITTALS

A. Product Data: For each type of roofing product specified. Include data substantiating that materials comply with requirements.

B. Shop Drawings: Include plans, sections, and details of the following:

1. Base flashings and membrane terminations.

C. Samples for Verification: Of the following products:

1. 12-by-12-inch (300-by-300-mm) square of sheet roofing, of color specified, including T-shaped side and end lap seam.
2. 12-by-12-inch (300-by-300-mm) square of roof insulation/protection board.
3. 12-inch (300-mm) length of metal termination bars.
4. 6 insulation fasteners of each type, length, and finish.
5. 6 roof cover fasteners of each type, length, and finish.

D. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install specified roofing system.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that the roofing system complies with requirements specified in the "Performance Requirements" Article. Upon request, submit evidence of meeting requirements.

F. Maintenance Data: For roofing system to include in the maintenance manuals specified in Division 1.

G. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing roofing similar to that required for this Project and who is approved, authorized, or licensed by the roofing system manufacturer to install manufacturer's product.

B. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method indicated below by UL, FM, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and slopes indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit roofing to be installed according to manufacturers' written instructions and warranty requirements.

1.9 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Standard Roofing Manufacturer's Warranty: Submit a written warranty, without monetary limitation, signed by roofing system manufacturer agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:

1. Warranty Period: 15 years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. EPDM Sheet:

    a. Stevens Roofing Systems: Hi-Tuff EP
2. Perlite Board Insulation/protection board:
    a. GAF Materials Corp.
    b. Schuller Roofing Systems.
3. Roof walkway pads:
    a. Hi-Tred Walkway Pad by J.P. Stevens
    b. Adhered to surface with Hi-Tuff Bonding Adhesive

2.2 EPDM SHEET

A. EPDM Sheet: Uniform, flexible sheet formed from a terpolymer of ethylene-propylene-diene, complying with ASTM D 4637, Type 1, of the following grade, class, thickness, backing, and exposed face color:
    1. Grade and Class: Grade 1 or 2 and Class SR, scrim or fabric internal reinforced.
    2. Thickness: 60 mils (1.5 mm), nominal.
    3. Backing: Nonwoven polyester fabric.
    4. Exposed Face Color: Manufacturer's full color selection range (minimum 6 colors).

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system manufacturer for intended use and compatible with EPDM membrane roofing.
    1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.

B. Sheet Flashing: 60-mil- (1.5-mm-) thick EPDM, uncured or cured, according to application.

C. Bonding Adhesive: Manufacturer's standard bonding adhesive.

D. Splice Adhesive and Cleaner: Single-component butyl splicing adhesive and solvent-based splice cleaner.

E. Splice Primer and Tape: Manufacturer's standard synthetic rubber polymer primer and 3-inch- (75-mm-) wide minimum, butyl splice tape with release film.

F. Lap Sealant: Manufacturer's standard single-component sealant.

G. Water Cutoff Mastic: Manufacturer's standard butyl mastic sealant.

H. Metal Termination Bars: Manufacturer's standard aluminum bars, approximately 1 inch (25 mm) wide, roll formed and prepunched.

I. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening sheet to substrate, and acceptable to roofing system manufacturer.

J. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, in-seam sealants, termination reglets, and other accessories recommended by roofing system manufacturer for intended use.

2.4 THERMAL BARRIER/PROTECTION BOARD

A. Thermal Barrier/Protection Board: Perlite board, ASTM C 728, ½" inch thick or minimum thickness recommended by roofing manufacturer.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions of FM 4470, designed for fastening thermal barrier to substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which roofing will be applied, with Installer present, for compliance with requirements.

B. Verify that roof openings and penetrations are in place and set and braced and that roof drains are properly clamped into position.

C. Verify that wood nailers are in place and secured and match thicknesses of insulation required.

D. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of the roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 THERMAL BARRIER/PROTECTION BOARD

A. Install thermal barrier/protection board in accordance with roofing manufacturer's written instructions.

3.4 MECHANICALLY FASTENED SHEET INSTALLATION

A. Install EPDM sheet over area to receive roofing according to roofing system manufacturer's written instructions. Unroll sheet and allow to relax for a minimum of 30 minutes.

B. Start installation of sheet in presence of roofing system manufacturer's technical personnel.

C. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Mechanically or adhesively fasten sheet securely at terminations and perimeter of roofing.

E. Apply roofing sheet with side laps shingled with slope of roof deck where possible.

F. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing sheet in place with clamping ring.

3.5 FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of flashing sheet at required rate and allow to partially dry. Do not apply bonding adhesive to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing as recommended by manufacturer.

D. Clean splice areas, apply splicing cement, and firmly roll side and end laps of overlapping sheets according to manufacturer's written instructions to ensure a watertight seam installation. Apply lap sealant and seal exposed edges of sheet flashing terminations.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel (not sales personnel) to inspect roofing installation on completion and submit report to C.O.R..

1. Notify C.O.R. 72 hours in advance of the date and time of inspection.

3.7 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to C.O.R..

B. Correct deficiencies in or remove roofing that does not comply with requirements, repair substrates, reinstall roofing, and repair sheet flashings to a condition free of damage and deterioration at the time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07531

This page intentionally blank

SECTION 07620 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes sheet metal flashing and trim in the following categories:
   1. Exposed trim, gravel stops, and fasciae.
   2. Copings.
   3. Metal flashing.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 4 Sections for through-wall flashing and other integral masonry flashings specified as part of masonry work.
   2. Division 7 Section "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
   3. Division 7 Section "Joint Sealants" for elastomeric sealants.
   4. Division 7 Roofing Sections for flashing and roofing accessories installed integral with roofing membrane as part of roofing-system work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing.

B. Fabricate and install flashings at roof edges to comply with recommendations of FM Loss Prevention Data Sheet 1-49 for the following wind zone:
   1. Wind Zone 2: Wind pressures of 31 to 45 psf (1.48 to 2.15 kPa).

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.

C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.

D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
   1. 8-inch- (200-mm-) square Samples of specified sheet materials to be exposed as finished surfaces.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

1.6 PROJECT CONDITIONS

A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

PART 2 - PRODUCTS

2.1 METALS

A. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G90 (ASTM A 755M, Z275) coating designation, coil coated with high-performance fluoropolymer coating as specified in "Coil-Coated Galvanized Steel Sheet Finish" Article; not less than 0.0336 inch (0.85 mm) thick, unless otherwise indicated.

2.2 CONCEALED THROUGH-WALL SHEET METAL FLASHING

A. Material: Fabricate from the following metal:
   1. Copper: 10 oz. (0.34 mm thick) for fully concealed flashing; 16 oz. (0.55 mm thick) elsewhere.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   1. Cheney Flashing (Sawtooth); Cheney Flashing Company, Inc.
   2. Keystone Three-Way Interlocking Thruwall Flashing; Keystone Flashing Co.

2.3 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Solder: ASTM B 32, Grade Sn50, used with rosin flux.

B. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.

C. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coat.

D. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."

E. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.

F. Paper Slip Sheet: 5-lb/square (0.244 kg/sq. m) red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.

G. Polyethylene Underlayment: ASTM D 4397, minimum 6-mil- (0.15-mm-) thick black polyethylene film, resistant to decay when tested according to ASTM E 154.

H. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

I. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.

2.4 FABRICATION, GENERAL

A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of the item indicated.

B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.

D. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

E. Expansion Provisions: Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

F. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.

G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.

H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.

I. Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
   1. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

2.5 SHEET METAL FABRICATIONS

A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.

B. Scuppers: Fabricate from the following material:
   1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.

C. Exposed Trim, Gravel Stops, and Fasciae: Fabricate from the following material:
   1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.

D. Copings: Fabricate from the following material:
   1. Coil-Coated Galvanized Steel: 0.0396 inch (1.0 mm) thick.

E. Base Flashing: Fabricate from the following material:
   1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.

F. Counterflashing: Fabricate from the following material:
   1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.

G. Valley Flashing: Fabricate from the following material:
   1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.

H. Drip Edges: Fabricate from the following material:
   1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.

I. Eave Flashing: Fabricate from the following material:
   1. Coil-Coated Galvanized Steel: 0.0217 inch (0.55 mm) thick.

J. Equipment Support Flashing: Fabricate from the following material:
   1. Coil-Coated Galvanized Steel: 0.0276 inch (0.7 mm) thick.

2.6 COIL-COATED GALVANIZED STEEL SHEET FINISH

A. High-Performance Organic Coating Finish: Apply the following system by coil-coating process on galvanized steel sheet as recommended by coating manufacturers and applicator.
   1. Fluoropolymer 2-Coat Coating System: Manufacturer's standard 2-coat, thermocured system composed of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 605.2.
      a. Retain one color requirement from below. To ensure obtaining exact finish desired, insert product and manufacturers' names of coating system or systems.
         1) Color and Gloss: Color 1: Match metal siding color, Valspar Industrial Coatings color #392F254, Quaker Gray or other siding color if approved. Match for gloss.
         2) Color 2: As selected by Architect from coating manufacturer's full range of choices for color and gloss.
      b. Resin Manufacturers: Subject to compliance with requirements, provide fluoropolymer coating systems containing resins produced by one of the following manufacturers:
         1) Elf Atochem North America, Inc. (Kynar 500)
         2) Ausimont USA, Inc. (Hylar 5000)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install Work with laps, joints, and seams that will be permanently watertight and weatherproof.

B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

C. Roof-Edge Flashings: Secure metal flashings at roof edges according to FM Loss Prevention Data Sheet 1-49 for specified wind zone.

D. Expansion Provisions: Provide for thermal expansion of exposed sheet metal Work. Space movement joints at maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions in Work cannot be used or would not be sufficiently weatherproof and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

E. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards. Fill joint with sealant and form metal to completely conceal sealant.
1. Use joint adhesive for nonmoving joints specified not to be soldered.

F. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams. Tin edges to be seamed, form seams, and solder.

G. Seams: Fabricate nonmoving seams in aluminum with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.

H. Separations: Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
1. Underlayment: Where installing stainless steel or aluminum directly on cementitious or wood substrates, install a slip sheet of red-rosin paper and a course of polyethylene underlayment.
2. Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.

I. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of 2 inches (50 mm) and bed with sealant.

J. Equipment Support Flashing: Coordinate equipment support flashing installation with roofing and equipment installation. Weld or seal flashing to equipment support member.

3.3 CLEANING AND PROTECTION

A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

B. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Completion.

END OF SECTION 07620

SECTION 07720 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Roof curbs.
   2. Equipment supports.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for ladders and miscellaneous metal framing and supports.
   2. Division 6 Section "Rough Carpentry" for roof sheathing, wood cants, and wood nailers.
   3. Division 7 Section "Sheet Metal Flashing and Trim" for shop- and field-fabricated metal flashing and counterflashing, scuppers, gutters and downspouts, fasciae, roof expansion-joint covers, valleys, and miscellaneous sheet metal trim and accessories.
   4. Division 7 Sections for roofing accessories included as part of roofing Work.
   5. Division 9 Section "Painting" for shop primers and field painting.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, materials, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details. Indicate dimensions, weights, loadings, required clearances, method of field assembly, and components. Include plans, elevations, sections, details, and attachments to other Work.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for roof accessories with factory-applied color finishes.

1.4 QUALITY ASSURANCE

A. Standards: Comply with the following:
   1. SMACNA's "Architectural Sheet Metal Manual" details for fabrication of units, including flanges and cap flashing to coordinate with type of roofing indicated.
   2. NRCA's "Roofing and Waterproofing Manual" details for installing units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Roof Curbs and Equipment Supports:
      a. Custom Curb, Inc.
      b. Pate Co.(The).
      c. Roof Products & Systems Corp.
      d. ThyCurb, Inc.

2.2 MATERIALS, GENERAL

A. Galvanized Steel Sheet: ASTM A 653/A 653M with G90 (Z275) coating designation; commercial quality, unless otherwise indicated.

B. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for above-ground use, complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

C. Fasteners: Same metal as metals being fastened, or nonmagnetic stainless steel or other noncorrosive metal as recommended by manufacturer. Match finish of exposed fasteners with finish of material being fastened.

D. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, or PVC; or flat design of foam rubber, sponge neoprene, or cork.

E. Bituminous Coating: SSPC-Paint 12, solvent-type bituminous mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil (0.4-mm) dry film thickness per coating.

F. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

G. Elastomeric Sealant: Generic type recommended by unit manufacturer that is compatible with joint surfaces; ASTM C 920, Type S, Grade NS, Class 25, and Uses NT, G, A, and, as applicable to joint substrates indicated, O.

H. Roofing Cement: ASTM D 4586, nonasbestos, fibrated asphalt cement designed for trowel application or other adhesive compatible with roofing system.

2.3 ROOF CURBS

A. General: Provide roof curbs capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported on roof curbs. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.0747-inch- (1.9-mm-) thick, structural-quality, hot-dip galvanized or aluminum-zinc alloy-coated steel sheet; factory primed and prepared for painting with welded or sealed mechanical corner joints.
   1. Provide manufacturer's standard rigid or semirigid insulation where indicated.
   2. Fabricate units to minimum height of 8 inches (200 mm), unless otherwise indicated.
   3. Sloping Roofs: Where slope of roof deck exceeds 1/4 inch per foot (1:48), fabricate curb units with water diverter or cricket and with height tapered to match slope to level tops of units.

2.4 EQUIPMENT SUPPORTS

A. General: Provide equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction to be supported. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

B. Fabrication: Unless otherwise indicated or required for strength, fabricate units from minimum 0.0747-inch- (1.9-mm-) thick, structural-quality, hot-dip galvanized or aluminum-zinc alloy-coated steel sheet; factory primed and prepared for painting with welded or sealed mechanical corner joints.
   1. Fabricate units to minimum height of 8 inches (200 mm), unless otherwise indicated.
   2. Sloping Roofs: Where slope of roof deck exceeds 1/4 inch per foot (1:48), fabricate support units with height tapered to match slope to level tops of units.

2.5 GALVANIZED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
   1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

B. High-Performance Organic Finish: Cleaned and primed with inhibitive primer and organic coating as specified below. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   1. Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 621 for coil-coated sheets.
      a. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written instructions. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction involving roof accessories to ensure that each element of the Work performs properly and that combined elements are waterproof and weathertight. Anchor roof accessories securely to supporting structural substrates so they are capable of withstanding lateral and thermal stresses, and inward and outward loading pressures.

B. Install roof accessory items according to construction details of NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated,

C. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.

D. Flange Seals: Unless otherwise indicated, set flanges of accessory units in a thick bed of roofing cement to form a seal.

E. Cap Flashing: Where required as component of accessory, install cap flashing to provide waterproof overlap with roofing or roof flashing (as counterflashing). Seal overlap with thick bead of mastic sealant.

3.2 CLEANING AND PROTECTION

A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 07720

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 07840

FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping materials.

B. Firestopping of all penetrations and interruptions to fire rated assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED SECTIONS

A. Section 01700 - Execution Requirements: Cutting and patching.

B. Section 09260 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCES

A. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

C. FM P7825 - Approval Guide; Factory Mutual Research Corporation.

D. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics.

C. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs which provide the specified fire ratings when tested in accordance with methods indicated.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 FIRESTOPPING ASSEMBLIES

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use any system listed by UL or tested in accordance with ASTM E 814 that has F Rating equal to fire rating of penetrated assembly and T Rating Equal to F Rating and that meets all other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.

B. Remove incompatible materials which may affect bond.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authority having jurisdiction.

3.04 CLEANING AND PROTECTION

A. Clean adjacent surfaces of firestopping materials.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sealants for the following applications, including those specified by reference to this Section:
   1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:
      a. Control and expansion joints in cast-in-place concrete.
      b. Control and expansion joints in unit masonry and cast stone.
      c. Joints between metal panels.
      d. Joints between different materials listed above.
      e. Perimeter joints between materials listed above and frames of doors and windows.
      f. Control and expansion joints in ceiling and overhead surfaces.
      g. Other joints as indicated.

   2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:
      a. Perimeter joints of exterior openings where indicated.
      b. Tile control and expansion joints.
      c. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
      d. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      e. Other joints as indicated.

B. Related Sections include the following:
   1. Division 8 Section "Glazing" for glazing sealants.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer.
2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Manufacturer's Warranty: Written warranty, signed by elastomeric sealant manufacturer agreeing to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

C. Special warranties specified in this Article exclude deterioration or failure of elastomeric joint sealants from the following:
   1. Movement of the structure resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression caused by structural settlement or errors attributable to design or construction.
   2. Disintegration of joint substrates from natural causes exceeding design specifications.
   3. Mechanical damage caused by individuals, tools, or other outside agents.
   4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified in the sealant schedules at the end of Part 3.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range for this characteristic.

2.3 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant in the Elastomeric Joint-Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

B. Stain-Test-Response Characteristics: Where elastomeric sealants are specified in the Elastomeric Joint-Sealant Schedule to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

2.4 LATEX JOINT SEALANTS

A. Latex Sealant Standard: Comply with ASTM C 834 for each product of this description indicated in the Latex Joint-Sealant Schedule at the end of Part 3.

2.5 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
1. Type C: Closed-cell material with a surface skin.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include the following:
   a. Concrete.
   b. Concrete Masonry
   c. Cast Stone Masonry. (See manufacturer's special instructions for cleaning)
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   a. Metal.
   b. Glass.
   c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended in writing by joint sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.

E. Install sealants by proven techniques to comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses provided for each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealants from surfaces adjacent to joint.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from the original work.

3.6 ELASTOMERIC JOINT-SEALANT SCHEDULE

A. Low-Modulus Nonacid-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
   1. Products: Available products include the following:
      a. 790; Dow Corning.
      b. Silpruf; GE Silicones.
      c. UltraPruf SCS2300; GE Silicones.
   2. Type and Grade: S (single component) and NS (nonsag).
   3. Class: 25.
   4. Use Related to Exposure: NT (nontraffic).
   5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
      a. Use O Joint Substrates: anodic aluminum, metal coated with a high-performance coating, galvanized steel, cast stone, ceramic tile, and wood.

6. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
7. Applications: Joints in exterior joints except expansion joints and control joints in cast stone. Non-painted interior joints.

B. Medium-Modulus Neutral-Curing Silicone Sealant: Where joint sealants of this type are indicated, provide products complying with the following:
1. Products: Available products include the following:
   a. 791; Dow Corning.
2. Type and Grade: S (single component) and NS (nonsag).
3. Class: 25.
4. Use Related to Exposure: NT (nontraffic).
5. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated, O.
6. Below are examples of Use O substrates. Retain only those that apply or insert others.
   a. Use O Joint Substrates: anodic aluminum, metal coated with a high-performance coating, galvanized steel, cast stone, ceramic tile, and wood.]
7. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
8. Applications: Exterior expansion joints and control joints in cast stone.

3.7 LATEX JOINT-SEALANT SCHEDULE

A. Latex Sealant: Where joint sealants of this type are indicated, provide products complying with the following:

1. Products: Available products include the following:

   a. AC-20; Pecora Corporation.
   b. Tremflex 834; Tremco.

2. Applications: Interior painted joints.

END OF SECTION 07920

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes steel doors, door frames and window frames.

B. Related Sections: The following Sections contain requirements that relate to this Section:
1. Division 8 Section "Flush Wood Doors" for hollow-core and solid-core wood doors installed in steel frames.
2. Division 8 Section "Door Hardware" for door hardware and weatherstripping.
3. Division 8 Section "Glazing" for glass in steel doors, windows and sidelights.
4. Division 9 Section "Gypsum Board Assemblies" for spot grouting frames in gypsum board partitions.
5. Division 9 Section "Painting" for field painting primed doors and frames.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, and finishes.

C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.4 QUALITY ASSURANCE

A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.

B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to C.O.R.; otherwise, remove and replace damaged items as directed.

C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm) high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Steel Doors and Frames:
      a. Amweld Building Products, Inc.
      b. Ceco Door Products.
      c. Curries Co.
      d. Kewanee Corp.
      e. Steelcraft.

2.2 MATERIALS

A. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.

B. Galvanized Steel Sheets: Zinc-coated carbon steel complying with ASTM A 526 (ASTM A 526M), commercial quality, or ASTM A 642 (ASTM A 642M), drawing quality, hot-dip galvanized according to ASTM A 525, with A 60 or G 60 (ASTM A 525M, with Z 180 or ZF 180) coating designation, mill phosphatized.

C. Supports and Anchors: Fabricated from not less than 0.0478-inch- (1.2-mm-) thick steel sheet; 0.0516-inch- (1.3-mm-) thick galvanized steel where used with galvanized steel frames.

D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.DOORS

2.3 DOORS

A. Steel Doors: Provide 1-3/4-inch- (44-mm-) thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:
   1. Interior Doors: Grade II, heavy-duty, Model 1, full flush design, minimum 0.0478-inch- (1.2-mm-) thick cold-rolled steel sheet faces.
   2. Exterior Doors: Grade II, heavy-duty, Model 1, full flush design, minimum 0.0516-inch- (1.3-mm-) thick galvanized steel sheet faces.

2.4 FRAMES

A. Provide metal frames for doors, windows, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 0.067-inch- (1.7-mm-) thick cold-rolled steel sheet.
   1. Fabricate frames with mitered or coped and continuously welded corners.
   2. Form exterior frames from 0.067-inch- (1.7-mm-) thick galvanized steel sheet.

B. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

C. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

2.5 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.

   1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
      a. Rigid mineral fiber with internal sound deadener on inside of face sheets.

   2. Clearances: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between non-fire-rated pairs of doors. Not more than 3/4 inch (19 mm) at bottom.

a. Fire Doors: Provide clearances according to NFPA 80.

B. Fabricate exposed faces of doors and panels, including stiles and rails of nonflush units, from only cold-rolled steel sheet.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

E. Galvanized Steel Doors, Panels, and Frames: For the following locations, fabricate doors, panels, and frames from galvanized steel sheet according to SDI 112. Close top and bottom edges of doors flush as an integral part of door construction or by addition of minimum 0.0635-inch- (1.6-mm-) thick galvanized steel channels, with channel webs placed even with top and bottom edges. Seal joints in top edges of doors against water penetration.
1. At exterior locations and where indicated.

F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.

G. Thermal-Rated (Insulating) Assemblies: At exterior locations and elsewhere as shown or scheduled, provide doors fabricated as thermal-insulating door and frame assemblies and tested according to ASTM C 236 or ASTM C 976 on fully operable door assemblies.
1. Unless otherwise indicated, provide thermal-rated assemblies with U-value rating of 0.41 Btu/sq. ft. x h x deg F (2.33 W/sq. m x K) or better.

H. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.

I. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

J. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

K. Glazing Stops: Minimum 0.0359-inch- (0.9-mm-) thick steel or 0.040-inch- (1-mm-) thick aluminum.
1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Apply primers and organic finishes to doors and frames after fabrication.

2.7 GALVANIZED STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces with nonpetroleum solvent so that surfaces are free of oil or other contaminants. After cleaning, apply a conversion coating of the type suited to the organic coating applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.
   1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
   1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
   1. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
   2. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
   3. Install fire-rated frames according to NFPA 80.

C. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.
   1. Fire-Rated Doors: Install with clearances specified in NFPA 80.
   2. Smoke-Control Doors: Comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION 08110

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 08120

ALUMINUM DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum door frames.

1.02 RELATED SECTIONS

A. Section 06100 - Rough Carpentry (hardware installation).

B. Section 07900 - Joint Sealers.

C. Section 08710 - Door Hardware.

D. Section 08800 - Glazing.

1.03 REFERENCES

A. AA DAF-45 - Designation System for Aluminum Finishes; The Aluminum Association, Inc..

B. AAMA 609 - Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum; American Architectural Manufacturers Association.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association.

D. AAMA 701/702 - Voluntary Specifications for Pile Weatherstripping and Replaceable Fenestration Weatherseals; American Architectural Manufacturers Association.

E. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

1.04 SUBMITTALS

A. See Division 1 - for submittal procedures.

B. Product Data: Manufacturer's descriptive literature for each type door and frame; include the following information:
   1. Fabrication methods.
   2. Finishing.
   3. Hardware preparation.
   4. Accessories.

C. Shop Drawings: Indicate the following:
   1. Elevations and details of each door and frame type.
   2. Schedule of doors and frames.
   3. Conditions at openings with various wall thicknesses and materials.

4. Location and installation requirements for hardware.
5. Thicknesses of materials, joints.
6. Connections and trim.

D. Samples: Two sets of color chips representing specified colors and finishes.

E. Verification Samples:
1. Submit samples of each type, consisting of aluminum door corner construction, minimum 6 inch by 6 inch legs.
2. Where color or texture variations are anticipated, such as anodized finishes, include 2 or more units in each set of samples indicating extreme limits of variations.

F. Hardware Templates: For use in correctly aligning and adequately reinforcing door hardware.

G. Manufacturer's Installation Instructions: Printed installation instructions for each product, including product storage requirements.

H. Operations and Maintenance Data: Printed instructions for each product.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing aluminum door and frame systems of the type required for this project, with minimum five continuous years documented experience.

B. Installer's Qualifications: Workmen skilled in handling aluminum door and frame systems of the type required for this project.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated. Individually wrap doors in resilient packaging of corrugated cardboard, nylon banded.

B. Inspect delivered doors and frames for damage; unload and store with minimum handling. Repair minor damage if refinished items are equal in all respects to new work; otherwise, remove damaged items and replace with new.

C. Store products of this section under cover in manufacturer's unopened packaging until installation.
1. Place units on minimum 4 inch wood blocking.
2. Avoid non-vented plastic or canvas covers.
3. Remove packaging immediately if packaging becomes wet.
4. Provide 1/4 inch air spaces between stacked doors.

1.07 PROJECT CONDITIONS

A. Field Measurements: Take field measurements of areas to receive aluminum frames; note discrepancies on submitted shop drawings.

1.08 SCHEDULING

A. Ensure that templates required for reinforcement for door hardware specified in Section 08710, and/or actual hardware requested by manufacturer, are available in time for fabrication without affecting construction progress schedule.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A.

2.02 COMPONENTS

A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish.

B. Aluminum Frames:
1. Frame Components: Extruded channel (tubular) 6063-T5 aluminum alloy, minimum wall thickness 0.125 inch; cut corners square and fasten together with extruded corner brackets and stainless steel screws.
2. Hinge and Strike Mounting Plates: Extruded aluminum alloy bar stock, 0.1875 inch thick.
3. Replaceable Weatherstripping: AAMA 701, woolpile with nylon fabric, polypropylene backing, at head and jambs.
4. Profile: Open Back with Fin (OBF) 1-3/4 inches by 5 inches.
5. Profile: Open Back with Applied Stop (OBS) 1-3/4 inches by 5 inches.
6. Profile: Open Back with Applied Stop (OBS) 1-3/4 inches by 6 inches.
7. Profile: ____.

2.03 FINISHES

A. Finish: Clear anodic coating; AA-M12C22A31 Class II mechanical finish, non-specular, with chemical medium-matte etch, minimum thickness 0.4 mil.

2.04 FABRICATION

A. General: Receive hardware if required by manufacturer.

B. Aluminum Frames: Of shapes and contours indicated.
1. Mill joints to hairline fit.
2. Reinforce and secure mechanically.
3. Exposed Fasteners: Countersunk stainless steel Phillips head screws.

2.05 ACCESSORIES

A. Fasteners: Aluminum, non-magnetic stainless steel, or other material warranted by manufacturer as non-corrosive and compatible with aluminum components.
1. Do not use exposed fasteners except where unavoidable.

B. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible, otherwise, non-magnetic stainless steel or hot-dip galvanized steel complying with ASTM A 123/A 123M.

C. Bituminous Coating: Cold-applied asphaltic mastic, compounded for 30-mil thickness per coat.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces and openings are ready to receive frames and are within tolerances specified in manufacturer's instructions.

B. Verify that frames installed by other trades for installation of doors of this section are in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.

3.02 PREPARATION

A. Perform cutting, fitting, forming, drilling, and grinding of frames as required for project conditions; do not damage sight-exposed finishes.

B. Separate dissimilar metals to prevent electrolytic action between metals.

3.03 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings; set frames plumb, square, level, and aligned to receive doors.

B. Anchor frames to adjacent construction in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.
1. Seal metal-to-metal joints between framing members using good quality elastomeric sealant.

C. Where aluminum surfaces contact metals other than stainless steel, zinc, or small areas of white bronze, protect from direct contact by one or more of the following methods:
1. Paint dissimilar metal with one coat of heavy-bodied bituminous paint.
2. Apply good quality elastomeric sealant between aluminum and dissimilar metal.

3.04 CLEANING

A. Upon completion of installation, thoroughly clean frame surfaces in accordance with AAMA 609.

B. Do not use abrasive, caustic, or acid cleaning agents.

3.05 PROTECTION

A. Protect products of this section from damage caused by subsequent construction until substantial completion.

B. Repair damaged or defective products to original specified condition in accordance with manufacturer's recommendations.

C. Replace damaged or defective products which cannot be repaired to Architect's acceptance.

END OF SECTION

This page intentionally blank

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Solid-core doors with wood-veneer faces.
   2. Factory finishing flush wood doors.

B. Related Sections include the following:
   1. Division 8 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction, trim for openings, and louvers.
   1. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
   1. Indicate fire ratings for fire doors.

C. Samples for Initial Selection: Color charts consisting of actual materials in small sections for the following:
   1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.

D. Samples for Verification: As follows:
   1. Corner sections of doors approximately 8 by 10 inches (200 by 250 mm) with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with the following standard:
   1. AWI Quality Standard: AWI's "Architectural Woodwork Quality Standards" for grade of door, core, construction, finish, and other requirements.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's written instructions.
   1. Individually package doors in cardboard cartons and wrap bundles of doors in plastic sheeting.

B. Mark each door with individual opening numbers used on Shop Drawings. Use removable tags or concealed markings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form, signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch (6.35 mm) in a 42-by-84-inch (1067-by-2134-mm) section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 75-mm) span, or do not comply with tolerances in referenced quality standard.
   1. Warranty shall be in effect during the following period of time after the date of Substantial Completion:
      a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Flush Wood Doors:
      a. Weyerhaeuser Co.

2.2 DOOR CONSTRUCTION, GENERAL

A. Doors for Transparent Finish: Comply with the following requirements:
   1. Grade: Custom (Grade A faces).
   2. Faces: Natural Birch, plain sliced
   3. Match between Veneer Leaves: Random match.
   4. Match within Door Faces: Running match.
   5. Stiles: Same species as face or a compatible species.

2.3 SOLID-CORE DOORS

A. Interior Veneer-Faced Doors: Comply with the following requirements:
   1. Core: Glued-block core.
   2. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

B. Fire-Rated Doors: Comply with the following requirements:

   1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as required to provide fire rating indicated.
   2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated and as follows:
      a. 5-inch (125-mm) top-rail blocking.
      b. 5-inch (125-mm) bottom-rail blocking, at doors indicated to have kick, mop, or armor plates.
      c. 4-1/2-by-10-inch (114-by-250-mm) lock blocks.
      d. 5-inch (125-mm) midrail blocking, at doors indicated to have exit devices.
   3. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

C. Wood Frames for Light Openings: As follows:
   1. Wood Species: Same species as door faces.
   2. Profile: Flush rectangular beads.
   3. Frames for Openings in Fire Doors: Wood frames and metal glazing clips approved for use in 20-minute fire-rated wood-core doors.

2.4 FABRICATION

A. Fabricate flush wood doors in sizes indicated for Project site fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:
   1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
   1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

D. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
   1. Light Openings: Trim openings with moldings of material and profile indicated.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard's requirements for factory finishing.

B. Finish wood doors at factory.

C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
   1. Grade: Custom.
   2. Finish: Manufacturer's standard finish with performance requirements comparable to AWI System TR-6 catalyzed polyurethane.
   3. Staining: Preliminary selection, Weyerhauser color “Cinnamon”. Architect to make initial selection from manufacturer’s entire color range on veneer species.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installed door frames before hanging doors.
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 8 Section "Door Hardware."

B. Manufacturer's Written Instructions: Install wood doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
   1. Clearances: Provide 1/8 inch (3.2 mm) at heads, jambs, and between pairs of doors. Provide 1/8 inch (3.2 mm) from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch (6.4 mm) from bottom of door to top of threshold.
      a. Comply with NFPA 80 for fire-rated doors.
   2. Bevel non-fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) at lock and hinge edges.
   3. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at Project site.

3.3 ADJUSTING AND PROTECTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08211

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 08310

ACCESS DOORS AND PANELS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access door and frame units, non-fire-rated, in floor locations.

1.02 RELATED SECTIONS

A. Section 03300-Poured-In-Place Concrete: Openings in concrete.

B. Section 08654-Linoleum Floor Coverings: Floor covering installed on access door and frame unit.

1.03 DESIGN REQUIREMENTS

A. Fabricate floor access assemblies to support live load of 100 lb/sq ft with deflection not to exceed 1/180 of span.

1.04 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

C. Shop Drawings: Indicate exact position of all access door units.

D. Manufacturer's Installation Instructions: Indicate installation requirements.

1.05 PROJECT CONDITIONS

A. Coordinate the work with other work requiring access doors.

PART 2 PRODUCTS

2.01 ACCESS UNITS - FLOORS

A. Hatch and Frame Units: Aluminum, single leaf, for carpet and composition floor covering
   1. Size: 2' x 2'.
   2. Hardware:
      a. Lock: Screw driver slot for quarter turn cam lock.
      b. Removable wrench lift handle.
   3. Model "T" manufactured by Bilco or approved equal.

2.02 FABRICATION

A. Weld, fill, and grind joints to ensure flush and square unit.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that rough openings for door and frame are correctly sized and located.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Install frames plumb and level in openings. Secure rigidly in place.

C. Finally position units to provide convenient access to the concealed work requiring access and avoid obstructons.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 08330

COILING DOORS AND GRILLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead coiling insulated service doors.

B. Motor operators.

C. Accessories.

1.02 RELATED SECTIONS

A. Division 5 - Structural Steel: Supports for side coiling door/grille.

B. Division 8: Lock cylinders.

C. Division 9 - Paint.

D. Division 16 - Equipment Wiring: Disconnects, service to motors and controls, and interconnecting wiring and conduit.

1.03 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. NFPA 70 - National Electrical Code; National Fire Protection Association.

C. NFPA 80 - Standard for Fire Doors and Windows; National Fire Protection Association.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard details and catalog data. Provide installation instructions.

C. Shop Drawings:
   1. Shop drawings for the fabrication and installation of curtains and frames.
   2. Include details of each frame type, elevations, conditions at openings, details of construction, location, and installation requirements of finish hardware and reinforcements.
   3. Schedule openings using same reference numbers for details and openings as those on the drawings.

D. Advise the C.O.R. in writing should any doors be ineligible for standard fire resistance labels due to door size, hardware, vision openings, or other features required by the Contract Documents.

E. Submit manufacturer's recommended operation, cleaning, and maintenance instructions.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products indoors and protect from moisture, construction traffic, and damage.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Provide products fabricated by Atlas Door; or approved equal

2.02 OVERHEAD COILING INSULATED SERVICE DOORS

A. Provide Model "T" Series Thermal Doors.
   1. Operation: Motor operator.
   2. Mounting: Interior face mounted on prepared opening.

B. Curtain and Bottom Bar:
   1. Slats: Type "T3" insulated slats; 2-5/8 inches high x 7/8 inch thick; U-value of 0.16; cold roll formed interlocking front and back slats, assembled in continuous lengths to form curtains.
   2. Slat material: ASTM A 653/A 653M galvanized steel; zinc coated.
   3. Slat finish: Powder coat colored finish on both sides of slat. Color: To be selected.
   4. Slat gage: As required by width of opening and wind loading of 20 psf or 87 mph in the fully closed position.
   5. Insulation: Environmentally safe CFC-free polyurethane foam injected to fill all voids and to provide continuous insulation protection the full height of the slat, including slat interlocks. Self bonding to interior slat surfaces. R-value of 6.25.
   6. Endlocks:
      a. Continuous endlocks.
      b. Material: Stamped steel.
   7. Bottom bar: Reinforce curtain bottom with angles, material to match curtain material.
      a. Provide astragal weather seal.
      b. Slope bottom bar to match contour in finished floor.

C. Weatherstripping: Guide weatherstripping on both sides.

D. Hood:
   1. Material: 22 gage galvanized steel.
   2. Shape: Round.
   3. Finish: Primed, gray or tan.
   4. Weatherstripping: Neoprene hood baffle to minimize air infiltration.

E. Locking:
   1. Motor operated doors: Integral gearing of motor operator to provide locking for door.
   2. Cylinder lock on bottom bar.

2.03 MOTOR OPERATED UNIT COMPONENTS

A. Motor Operators: Model _____.

B. Sensor Edge:
1. Electric edge: Foam rubber astragal with vinyl-coated nylon cover, continuous foil tape electrical contacts.
2. Fail safe control: Upon loss of continuity in circuit, open door and prevent motor operation until circuit/edge is repaired.

C. Panic Release Device: Allow emergency egress for motor operated units; comply with ADA requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install units in accordance with manufacturer's instructions.

B. Ensure that units are installed plumb and true, free of warp or twist, and within tolerances specified by manufacturer for smooth operation.

C. Install electrical components in accordance with NFPA 70.

3.03 DEMONSTRATION

A. Instruct Owner's personnel in proper operation and maintenance of units.

3.04 ADJUST AND CLEAN

A. Clean units in accordance with manufacturer's instructions.

B. Restore slight blemishes in finishes in accordance with manufacturer's instructions to match original finish. Remove and provide new units where repairs are not acceptable to the C.O.R..

END OF SECTION

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 08360

OVERHEAD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Overhead sectional doors, manually and electrically operated.

B. Operating hardware and supports.

C. Electrical controls.

1.02 RELATED SECTIONS

A. Section 05500 - Metal Fabrications: Steel channel opening frame.

B. Section 07900 - Joint Sealers: Perimeter sealant and backup materials.

C. Section 16131 - Conduit: Empty conduit from control units to door operator.

1.03 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

B. DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors; Door & Access Systems Manufacturers' Association, International.

C. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association.

D. NFPA 70 - National Electrical Code; National Fire Protection Association.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, installation details and electrical connections.

C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and electrical connections.

D. Operation Data: Include electrical control adjustments and other adjustments.

E. Maintenance Data: Include data for motor and transmission, shaft and gearing, lubrication frequency, spare part sources.

F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.05 QUALITY ASSURANCE

A. Installer: Company specializing in performing the work of this section approved by manufacturer.

1.06 WARRANTY

A. See Section 01780 - Closeout Submittals for warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for electric motor and transmission.

PART 2 PRODUCTS

2.01 STEEL DOOR COMPONENTS

A. Steel Doors: Flush steel, insulated; standard lift operating style with track and hardware; complying with DASMA 102, Commercial application.
   1. Door Nominal Thickness: 2 inches thick.
   2. Exterior Finish: Pre-finished with powder coat of color as selected.
   3. Interior Finish: Pre-finished with powder coat of color as selected.

B. Door Panels: Flush steel construction; outer steel sheet of 0.058 inch thick, flat profile; inner steel sheet of 0.058 inch thick, flat profile; core reinforcement of ____ inch thick sheet steel roll formed to channel shape, rabbeted weather joints at meeting rails; insulated.

2.02 DOOR COMPONENTS

A. Hinge and Roller Assemblies: Heavy duty hinges and adjustable roller holders of galvanized steel; floating hardened steel bearing rollers, located at top and bottom of each panel, each side.

B. Lift Mechanism: Torsion spring on cross head shaft, with braided galvanized steel lifting cables.
   1. For Manual Operation: Requiring maximum exertion of 25 lbs force to open.

C. Sill Weatherstripping: Resilient hollow rubber strip, one piece; fitted to bottom of door panel, full length contact.

D. Jamb Weatherstripping: Roll formed steel section full height of jamb, fitted with resilient weatherstripping, placed in moderate contact with door panels.

E. Head Weatherstripping: EPDM rubber seal, one piece full length.

F. Panel Joint Weatherstripping: Neoprene foam seal, one piece full length.

G. Lock: Inside center mounted, adjustable keeper, spring activated latch bar with feature to retain in locked or retracted position; interior and exterior handle.

H. Lock Cylinders: See Section 08710.

2.03 MATERIALS

A. Sheet Steel: ASTM A 653/A 653M, galvanized to G60/Z180 Coating Designation, plain surface.

B. Insulation: Rigid polyurethane,.

2.04 ELECTRICAL OPERATION

A. Electrical Characteristics:
   1. 1/2 hp; manually operable in case of power failure, transit speed of 12 inches per second.
   2. Refer to Section 16155 - Equipment Wiring: Electrical connections.

B. Motor: See to Section 16255.

C. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

D. Disconnect Switch: Factory mount disconnect switch in control panel.

E. Electric Operator: Side mounted on cross head shaft, adjustable safety friction clutch; brake system actuated by independent voltage solenoid controlled by motor starter; enclosed gear driven limit switch; enclosed magnetic cross line reversing starter; mounting brackets and hardware.

F. Safety Edge: At bottom of door panel, full width; electro-mechanical sensitized type, wired to stop door upon striking object; hollow neoprene covered to provide weatherstrip seal.

G. Control Station: Standard three button (open-close-stop) momentary type control for each electric operator.
   1. 24 volt circuit.
   2. Surface mounted.
   3. Locate at inside door jamb.

H. Hand Held Transmitter: Digital control, resettable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Prepare opening to permit correct installation of door unit to perimeter air and vapor barrier seal.

3.03 INSTALLATION

A. Install door unit assembly in accordance with manufacturer's instructions.

B. Anchor assembly to wall construction and building framing without distortion or stress.

C. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

D. Fit and align door assembly including hardware.

E. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.

3.04 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/16 inch.

B. Maximum Variation from Level: 1/16 inch.

C. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch from 10 ft straight edge.

D. Maintain dimensional tolerances and alignment with adjacent work.

3.05 ADJUSTING

A. Adjust door assembly for smooth operation and full contact with weatherstripping.

B. Have manufacturer's field representative present to confirm proper operation and identify adjustments to door assembly for specified operation.

3.06 CLEANING AND PROTECTION

A. Clean doors, frames.

B. Remove temporary labels and visible markings.

C. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 08410

METAL-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass and glass and metal infill panels.

B. Aluminum doors and frames and door hardware.

C. Perimeter sealant.

1.02 RELATED SECTIONS

A. Section 04720-Cast Stone: Preparation of adjacent work to receive work of this section.

B. Section 05400-Cold-Formed Metal Framing.

C. Section 05500 - Metal Fabrications: Steel attachment devices.

D. Section 07900 - Joint Sealers: Perimeter sealant and back-up materials.

E. Section 08711 - Door Hardware: Hardware items other than specified in this section.

F. Section 08800 - Glazing.

1.03 REFERENCES

A. AA DAF-45 - Designation System for Aluminum Finishes; The Aluminum Association, Inc..

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association.

C. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; American Architectural Manufacturers Association (part of AAMA 501).

D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association.

E. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers (ANSI/ASCE 7-95).

F. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.

G. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

H. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

I. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

J. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

K. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

L. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

M. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

N. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

O. ASTM E 1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference.

P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings (Part of Steel Structures Painting Manual, Vol. Two).

1.04 PERFORMANCE REQUIREMENTS

A. Design and size components to withstand the stated wind load requirements, as measured in accordance with ASTM E 330:

B. Movement: Accommodate movement between storefront and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.

C. Air Infiltration: Limit air infiltration through assembly to 0.06 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.

D. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 2.86 lbf/sq ft.

E. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.

F. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

1.05 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Design Data: Provide framing member structural and physical characteristics, engineering calculations, dimensional limitations.

E. Samples: Submit two samples 12 inches in size illustrating finished aluminum surface, glass, glazing materials.

F. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

G. Report of field testing for water leakage.

1.06 QUALITY ASSURANCE

A. Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed at Montana.

B. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years of documented experience.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond to aluminum when exposed to sunlight or weather.

1.08 PROJECT CONDITIONS

A. Coordinate the work with installation of firestopping components or materials.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.10 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Kawneer; Product EnCORE System.

2.02 COMPONENTS

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: Class I color anodized.

B. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.

C. Infill Panels: Insulated, aluminum sheet face and back, with edges formed to fit glazing channel and sealed.

D. Doors: Glazed aluminum.

2.03 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209 (ASTM B209M).

C. Structural Steel Sections: ASTM A 36/A 36M; galvanized in accordance with ASTM A 123/A 123M at 2.0 oz/sq ft.

D. Fasteners: Stainless steel.

E. Perimeter Sealant: Type (silicone, low modulus specified in Section 07900.

F. Glass: As specified in Section 08800.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: As specified in Section 08800.

I. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

2.04 FINISHES

A. Comply with AA DAF-45 for aluminum finishes required.

B. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.

2.05 HARDWARE

A. Door Hardware: As specified in Section 08711.

B. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

C. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

2.06 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices. Fabricate anchors.

D. Coat concealed metal surfaces that will be in contact with cementitious materials or dissimilar metals with bituminous paint.

E. Arrange fasteners and attachments to conceal from view.

F. Reinforce components internally for door hardware.

G. Reinforce framing members for imposed loads.

H. Finishing: Apply factory finish to all surfaces that will be exposed in completed assemblies.
   1. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Coordinate attachment and seal of perimeter air and vapor barrier materials.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of mastic and secure.

J. Install glass and infill panels in accordance with Section 08800, using exterior wet/dry glazing method.

K. Install perimeter sealant in accordance with Section 07900.

3.03 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.

B. Test installed storefront for water leakage in accordance with AAMA 501.2.

3.05 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.06 CLEANING AND PROTECTION

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by method acceptable to sealant manufacturer.

D. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

E. Protect finished work from damage.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 08520

ALUMINUM WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum windows with fixed sash, operating sash, and infill panels.

B. Site glazing.

C. Operating hardware.

D. Insect screens.

1.02 RELATED SECTIONS

A. Division 5 - Metal Fabrications: Steel lintels.

B. Division 6 - Wood Blocking and Curbing: Wood perimeter shims.

C. Division 7 - Joint Sealers: Perimeter sealant and back-up materials.

D. Division 8 - Glazing.

1.03 REFERENCES

A. AA DAF-45 - Designation System for Aluminum Finishes; The Aluminum Association, Inc..

B. AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association.

D. AAMA 1503.1 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association.

E. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association.

F. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers (ANSI/ASCE 7-95).

G. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

H. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

I. ASTM B 221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

J. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

K. ASTM E 330 - Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

L. ASTM E 331 - Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

M. ASTM E 1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference.

N. ASTM F 588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact.

O. FS RR-W-365 - Wire Fabric (Insect Screening); Federal Specifications and Standards.

P. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings (Part of Steel Structures Painting Manual, Vol. Two).

1.04 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions.

C. Shop Drawings: Indicate opening dimensions, elevations of different types, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, _____, and installation requirements.

D. Samples: Submit two samples, 12 x 12 inch in size illustrating typical corner construction, accessories, and finishes.

E. Submit two samples of operating hardware.

F. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

1.05 QUALITY ASSURANCE

A. Manufacturer and Installer: Company specializing in fabrication of residential aluminum windows of types required, with not fewer than three years of experience.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Comply with requirements of AAMA CW-10.

B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.07 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.08 WARRANTY

A. See Division 1 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Kawneer; Product Sealair Architectural Windows or approved equal.
   1. Series 8225T-L, Thermal Lanced

2.02 WINDOWS

A. Windows: Tubular aluminum sections, factory fabricated, factory finished, thermally broken, vision glass, related flashings, anchorage and attachment devices.
   1. Performance Requirements: AAMA/NWWDA 101/I.S.2 R15

B. Fixed, Non-Operable Type:
   1. Construction: Thermally broken.
   2. Glazing: Double; clear; transparent.
   3. Exterior Finish: Class II natural anodized.
   4. Interior Finish: Class II natural anodized.

C. Outswinging Casement Type:
   1. Construction: Thermally broken.
   2. Provide screens.
   3. Glazing: Double; clear; transparent.
   4. Exterior Finish: Class II natural anodized.
   5. Interior Finish: Class II natural anodized.

2.03 COMPONENTS

A. Insect Screen Frame: Rolled aluminum frame of rectangular sections; fit with adjustable hardware; nominal size similar to operable glazed unit.

B. Insect Screens: FS RR-W-365, woven aluminum mesh; 14/18 mesh size.

C. Operable Sash Weatherstripping: Wool pile; permanently resilient, profiled to achieve effective weather seal.

D. Glass and Glazing Materials: As specified in Division 8, Glazing.

E. Sealant and Backing Materials: As specified in Division 7, Joint Sealants.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.

B. Concealed Steel Items: Profiled to suit mullion sections; galvanized in accordance with ASTM A 123/A 123M to 2.0 oz/sq ft.

2.05 HARDWARE

A. Sash lock: Lever handle with cam lock. .

B. Operator: Lever action handle fitted to projecting sash arms with limit stops.

C. Projecting Sash Arms: Cadmium plated steel, friction pivot joints with nylon bearings, removable pivot clips for cleaning.

2.06 FABRICATION

A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.

C. Prepare components to receive anchor devices.

D. Arrange fasteners and attachments to ensure concealment from view.

E. Prepare components with internal reinforcement for operating hardware.

F. Provide steel internal reinforcement in mullions as required to meet loading requirements.

G. Provide internal drainage of glazing spaces to exterior through weep holes.

H. Assemble insect screen frames with mitered and reinforced corners. Secure wire mesh tautly in frame. Fit frame with four, spring loaded steel pin retainers.

I. Double weatherstrip operable units.

2.07 FINISHES

A. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31 Clear anodic coating not less than 0.4 mils thick.

B. Touch-Up Primer for Galvanized Steel Surfaces: SSPC-Paint 20, zinc rich.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.02 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.

C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.

D. Install sill and sill end angles.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.

G. Install operating hardware not pre-installed by manufacturer.

H. Install perimeter sealant in accordance with requirements specified in Division 7, Joint Sealants.

3.03 ERECTION TOLERANCES

A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

3.04 FIELD QUALITY CONTROL

A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E 1105.
   1. Test one window of each type, as directed by C.O.R..
   2. If any window fails, test additional windows at Contractor's expense.

B. Replace windows that have failed field testing and retest until performance is satisfactory.

3.05 ADJUSTING AND CLEANING

A. Adjust hardware for smooth operation and secure weathertight closure.

B. Remove protective material from factory finished aluminum surfaces.

C. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

D. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and

window manufacturer.

END OF SECTION

SECTION 08711 - DOOR HARDWARE (SCHEDULED BY NAMING PRODUCTS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Commercial door hardware for the following:

a. Swinging doors.
b. Sliding doors.

2. Cylinders for doors specified in other Sections.

B. Related Sections include the following:
1. List below only products and construction that the reader might expect to find in this Section but are specified elsewhere.
2. Division 8 Section "Steel Doors and Frames" for astragals provided as part of a fire-rated labeled assembly and for door silencers provided as part of the frame.
3. Division 8 Section "Flush Wood Doors" for astragals provided as part of a fire-rated labeled assembly.
4. Division 8 Section "Access Doors" for access door hardware.
5. Division 8 Section "Aluminum Entrances and Storefronts."

1.3 SUBMITTALS

A. Product Data: Include installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:

C. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
   a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.

3. Content: Include the following information:
   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.

D. Product Certificates: Signed by manufacturers of electrified door hardware certifying that products furnished comply with requirements.

1. Certify that door hardware approved for use on types and sizes of labeled fire doors complies with listed fire door assemblies.

E. Maintenance Data: For each type of door hardware to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

C. Regulatory Requirements: Comply with provisions of the following:

1. Where indicated to comply with accessibility requirements, comply with [**Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG),**"] [**ANSI A117.1,**] [**FED-STD-795, "Uniform Federal Accessibility Standards,**"] as follows:

   a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.
   b. Door Closers: Comply with the following maximum opening-force requirements indicated:

1) Interior Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
2) Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
3) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

c. Thresholds: [**Not more than 1/2 inch (13 mm) high**] [**Not more than 3/4 inch (19 mm) high for exterior sliding doors**]. Bevel raised thresholds with a slope of not more than 1:2.

2. NFPA 101: Comply with the following for means of egress doors:

a. Latches, Locks, and Exit Devices: Not more than 15 lbf (67 N) to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
b. Delayed-Egress Locks: Lock releases within 15 seconds after applying a force not more than 15 lbf (67 N) for not more than 3 seconds.
c. Door Closers: Not more than 30 lbf (133 N) to set door in motion and not more than 15 lbf (67 N) to open door to minimum required width.
d. Thresholds: Not more than 1/2 inch (13 mm) high.

D. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver keys to COR by registered mail or overnight package service.

1.6 COORDINATION

A. Coordinate layout and installation of recessed pivots and closers with floor construction. Cast anchoring inserts into concrete. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

B. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.7 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section**, and the Door Hardware Schedule at the end of Part 3**.
   1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Schedule at the end of Part 3. Products are identified by using door hardware designations, as follows:

   1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

2.2 HINGES AND PIVOTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

   1. Hinges: see schedule

   2. Pivots and Pivot Hinges: see schedule
      a. Manufacturers of pivot sets must be coordinated with manufacturers of floor closers.

B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

C. Fasteners: Comply with the following:
   1. Screws: Phillips flat-head screws; [**machine screws (drilled and tapped holes) for metal doors**] [**wood screws for wood doors and frames**]. Finish screw heads to match surface of hinges.

2.3 LOCKS AND LATCHES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

   1. Mechanical Locks and Latches:
      a. Schlage Lock Company; an Ingersoll-Rand Company (SCH).

2.4 DOOR BOLTS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Flush Bolts: See schedule

2.5 EXIT DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by the following: see schedule for manufacturers

B. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.

C. Fire Exit Devices: Complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.

D. Outside Trim: material and finish to match locksets, unless otherwise indicated.
1. Match design for locksets and latchsets, unless otherwise indicated.

2.6 CYLINDERS AND KEYING

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Cylinders:
a. Schlage Lock Company; an Ingersoll-Rand Company (SCH) or approved equal.
b. Contractor shall provide construction cylinders for the period up to substantial completion.
c. The project cylinders shall be shipped directly to the COR and installed by the Contractor at Substantial Completion

2.7 OPERATING TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by manufacturers indicated in the schedule or approfed equal.

2.8 ACCESSORIES FOR PAIRS OF DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Astragals: see schedule

2.9 CLOSERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Surface-Mounted Closers: see schedule

2. Closer Holder Release Devices: see schedule

B. Power-Assist Closers: As specified in Division 8 Section "Power Door Operators" for access doors for the disabled or where listed in the Door Hardware Schedule. Provide electrohydraulic, electromechanical, and pneumatic types as indicated.

C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.

2.10 STOPS AND HOLDERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following: see schedule

C. Silencers for Wood Door Frames: BHMA Grade 1; neoprene or rubber, minimum 5/8 by 3/4 inch (16 by 19 mm); fabricated for drilled-in application to frame.

D. Silencers for Metal Door Frames: BHMA Grade 1; neoprene or rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame.

2.11 DOOR GASKETING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Door Gasketing: see schedule

2. Door Bottoms: see schedule

B. General: Provide continuous weather-strip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated or scheduled. Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.
1. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
2. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
3. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

C. Air Leakage: Not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283.

D. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.

E. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL 10B or NFPA 252.

F. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

G. Gasketing Materials: Comply with ASTM D 2000 and AAMA 701/702.

2.12 THRESHOLDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following: see schedule

2.13 SLIDING DOOR HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by the following: see schedule

2.14 MISCELLANEOUS DOOR HARDWARE

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following: see schedule

2.15 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. BHMA Designations: Comply with base material and finish requirements indicated by the following, unless otherwise indicated:
   1. U.S. 26D unless otherwise stated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.
   1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107.

B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated in schedule.

1. Configuration: Provide one power supply for each door opening.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.4 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

B. Six-Month Adjustment: Approximately six months after date of Substantial Completion, Installer shall perform the following:
   1. Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.
   2. Consult with and instruct Owner's personnel on recommended maintenance procedures.
   3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

3.5 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DOOR HARDWARE SCHEDULE

HW-1

Hinges	1279 4-1/2 x 4-1/2	Hager	4
Lockset	D70~~C~~2RD SPA 626	Schlage	1
Wall Bumper	25C US26D	Glynn-Johnson	1

HW-2

Hinges	1279 4-1/2 x 4-1/2	Hager	4
Lockset	D80~~G2~~RD SPA 626	Schlage	1
Wall Bumper	25C US26D	Glynn-Johnson	1

HW-3

Hinges	1279 4-1/2 x 4-1/2	Hager	4
Lockset	D70~~G2~~RD SPA 626	Schlage	1
Floor Stop	UT-2F US26D	Elmes	1

HW-4

Hinges	1279 4-1/2 x 4-1/2	Hager	4
Lockset	D80~~G2~~RD SPA 626	Schlage	1
Floor Stop	UT-2F US26D	Elmes	1

HW-5

Hinges	1279 4-1/2 x 4-1/2	Hager	4
Passage Set	D10S SPA 626	Schlage	1
Wall Bumper	25C US26D	Glynn-Johnson	1

HW-6

Hinges	1279 4-1/2 x 4-1/2	Hager	4
Passage Set	D10S SPA 626	Schlage	1
Floor Stop	UT-2F US26D	Elmes	1

HW-7

Hinges	1279 4-1/2 x 4-1/2	Hager	8
Lockset (A)	D80~~G2~~RD SPA 626	Schlage	1
Flush Bolts (IA)	FB6W US26D	Glynn-Johnson	1 pair
Floor Stops	UT-2F US26D	Elmes	2

A=Active leaf, IA=Inactive leaf, verify with Owner

HW-8

Hinges	BB1279 4-1/2 x 4-1/2	Hager	4
Closer	4010 AL Pull Side Mount	LCN	1
Push Plate	1001-2 US32D	Trimco	1
Pull Plate	1014-2 US32D	Trimco	1
Wall Bumper	25C US26D	Glynn-Johnson	1
Kick Plate	.050 10" x 40" US32D	Trimco	2

HW-9

Hinges	BB1279 4-1/2 x 4-1/2	Hager	4
Closer	4010 AL Pull Side Mount	LCN	1
Privacy Set	D40S SPA 626	Schlage	1
Wall Bumper	25C US26D	Glynn-Johnson	1
Kick Plate	.050 10" x 40" US32D	Trimco	2

HW-10

Hinges	BB1199 4-1/2 x 4-1/2	Hager	4
Exit Device	33L US26D	Von Duprin	1
Auto Door Opener	4622 AL	LCN	1
Actuators	956	LCN	2
Threshold	272A x 42"	Pemko	1

HW-11

Hinges	BB1199 4-1/2 x 4-1/2	Hager	4
Exit Device	33L US26D	Von Duprin	1
Closer (storeroom/night latch function)	4020-18G AL	LCN	1
With drop plate Threshold	272A x 42"	Pemko	1
Mortise cylinder			1

HW-12

Hinges	BB1199 4-1/2 x 4-1/2	Hager	8
Exit Device (storeroom/night latch function)	3347L US26D	Von Duprin	1
Exit Device (storeroom/night latch function)	3347L-DT US26D	Von Duprin	1
Auto Door Openers	4622 AL	LCN	1
Actuators	956	LCN	2
Threshold	272A x 72”	Pemko	1
Closer with drop plate	4020-18G AL	LCN	1
Actuator Pedestals- (doors 100-1, 100-2 only)	BPS SM-CL	WIKK Indust.	2
Mortise cylinder			1

HW-13

Hinges	1279 4-1/2 x 4-1/2	Hager	8
Passage Set (A)	D10S SPA 626	Schlage	1
Flush Bolts (IA)	FB6W US26D	Glynn-Johnson	1 pair
Wall Bumper	25C US26D	Glynn-Johnson	1

HW-14

Hinges	BB1199 4-1/2 x 4-1/2	Hager	4
Lockset	D70~~C2~~RD SPA 626	Schlage	1
Closer	4110 AL push side mount	LCN	1
Weatherstrip	S88D	Pemko	1
Threshold	285A+276A x 36”	Pemko	1
Door Shoe	216APK	Pemko	1

HW-14a

Hinges	BB1199 4-1/2 x 4-1/2	Hager	4
Lockset	D70~~C2~~RD SPA 626	Schlage	1
Auto Door Opener	4622 AL	LCN	1
Weatherstrip	S88D	Pemko	1
Threshold	285A+276A x 36”	Pemko	1
Door Shoe	216APK	Pemko	1
Actuators	956	LCN	2

HW-15

Hinges	BB1199 4-1/2 x 4-1/2	Hager	8
Lockset	D80RD SPA 626	Schlage	1
OH Stop/Holders	GJ90-H-6 US26D	Glynn-Johnson	2
Flush Bolts	3917 12" US26D	Trimco	2
Weatherstrip	S88D	Pemko	1
Threshold	285A+276A x 36"	Pemko	1
Door Shoes	216APK	Pemko	2
Astragal	303AS	Pemko	1

HW-16

Pocket Pivots	75523	Dorma	8
Closers	TS93-6 PKT 90	Dorma	2
Push Plates	1001-2 US32D	Trimco	2
Pull Plates	1014-2 US32D	Trimco	2
Door Holders	EM504-24AD	Dorma	2
Smoke Seal	S88D	Pemko	1
Astragal	303AS	Pemko	1

HW-16a

Pocket Pivots	75523	Dorma	8
Closer	TS93-6 PKT 90	Dorma	1
Push Plates	1001-2 US32D	Trimco	2
Pull Plates	1014-2 US32D	Trimco	2
Door Holders	EM504-24AD	Dorma	2
Smoke Seal	S88D	Pemko	1
Astragal	303AS	Pemko	1
Actuators	956	LCN	2
Auto Door Opener	4622 AL	LCN	1

HW-17

Sliding Set	407.59.224	Hafele	1
Flush Pulls	17N US26D	Hager	2
Edge Pull	22N US26D	Hager	1
Flush Bolt	282D US26D	Hager	1
Ball Latch	GJ 21A US26D	Glynn-Johnson	1

Note: Flush bolt shall be mounted on flush panel face of the door (verify with Owner on which side). Unit shall be mounted 2" horizontally from the strike edge of the door to the vertical centerline of the flush bolt and 12" vertically from the bottom edge of the door to the horizontal centerline of the flush bolt.

HW-18

Hinges	1279 5 x 4-1/2	Hager	4
Lockset	D70~~C~~2RD SPA 626	Schlage	1
Wall Bumper	25C US26D	Glynn-Johnson	1

HW-19

Track	R2641 US2H	Stanley	1
Hanger	RBR2660 US2C	Stanley	4
Track Bracket	R2610C US2H	Stanley	15+/-
End Cap	R2610-EC US2H	Stanley	2
Padlock	PL4000 452	Schlage	1

HW-20

Sliding Set	407.59.224	Hafele	1
Flush Pulls	17N US26D	Hager	2
Edge Pull	22N US26D	Hager	1
Ball Latch	GJ 21A US26D	Glynn-Johnson	1

HW-21

Cylinder lock compatible w/ o.h. door hardware – verify w/ mfr.

HW-22

Hinges	1279 5 x 4-1/2	Hager	4
Lockset	D70~~C~~2RD SPA 626	Schlage	1
Floor Stop	UT-2F US26D	Elmes	1

HW-23

Hinges	1279 4-1/2 x 4-1/2	Hager	4
Passage Set	D10S SPA 626	Schlage	1
Floor Stop	UT-2F US26D	Elmes	1
Door Seal	S88D	Pemko	1
Auto Door Bottom	434RL	Pemko	1

HW-24

Hinges	1279 4-1/2 x 4-1/2	Hager	4
Lockset (A)	D70~~C~~2RD SPA 626	Schlage	1
Flush Bolts (IA)	FB6W US26D	Glynn-Johnson	1 pair
Floor Stop	UT-2F US26D	Elmes	1

HW-25

Track	XY2641 US2H	Stanley	1
Hanger	BBXYT2600 US2C	Stanley	2
Track Bracket	XY2650-C US2C	Stanley	7+/-
End Cap	XY2641-EC	Stanley	2
Offset Pull	12G US26D (room side)	Hager	1
Flush Pull	16N US26D (hallway side)	Hager	1

Note: Include (2) track stoppers, and (1) floor guide.

HW-26

Hinges	BB1199 4-1/2 x 4-1/2	Hager	4
Exit Device (storeroom/night latch function)	33L-BE US26D	Von Duprin	1
Closer with drop plate	4020-18G AL	LCN	1
Threshold	272A x 42”	Pemko	1
Mortise cylinder			1

HW-27

Hinges	BB1199 4-1/2 x 4-1/2	Hager	8
Lockset	D70RD SPA 626	Schlage	1
Closer	4110 AL push side mount	LCN	2
Flush Bolts	3917 12” US26D	Trimco	2
Weatherstrip	S88D	Pemko	1
Threshold	283A+276A x 72”	Pemko	1
Door Shoes	216APK	Pemko	2
Astragal	303AS	Pemko	1

HW-28

Hinges	1279 4-1/2 x 4-1/2	Hager	8
Passage Set (A)	D10S SPA 626	Schlage	1
Flush Bolts (IA)	FB6W US26D	Glynn-Johnson	1 pair
Floor Stop	UT-2F US26D	Elmes	1

HW-29

Hinges	1279 4-1/2 x 4-1/2	Hager	8
Passage Set (A)	D10S SPA 626	Schlage	1
Flush Bolts (IA)	FB6W US26D	Glynn-Johnson	1 pair
Floor Stop	UT-2F US26D	Elmes	2
Door Seal	S88D	Pemko	1
Auto Door Bottom	434RL	Pemko	2
Astragal	303AS	Pemko	1

HW-30

Hinges	BB1199 4-1/2 x 4-1/2	Hager	8
Exit Device (storeroom/night latch function)	3347L US26D	Von Duprin	1
Exit Device (storeroom/night latch function)	3347L-DT US26D	Von Duprin	1
Closer With drop plate	4020-18G AL	LCN	2
Threshold	272A x 72”	Pemko	1
Mortise cylinder			1

HW-31

Hinges	BB1199 4-1/2 x 4-1/2	Hager	4
Exit Device	33EO US26D	Von Duprin	1
Closer	4020-18G AL	LCN	2
Threshold	272A x 36”	Pemko	1

HW-32

Hinges	1279 4-1/2 x 4-1/2	Hager	8
Passage Set (A)	D10S SPA 626	Schlage	1
Closer	4110 AL push side mount	LCN	1
Flush Bolts (IA)	FB6W US26D	Glynn-Johnson	1 pair
Floor Stop	UT-2F US26D	Elmes	1
Actuators	956	LCN	2
Auto Door Opener	4622 AL	LCN	1

HW-33

Hinges	1279 4-1/2 x 4-1/2	Hager	4
Lockset	D70RD SPA 626	Schlage	1
Closer	TS93-6 PKT 90	Dorma	1
Wall Bumper	25C US26D	Glynn-Johnson	1
Smoke Seal	S88D	Pemko	1

HW-34

Hinges	1279 4-1/2 x 4-1/2	Hager	2
Lockset	L460 626	Schlage	1

HW-35

Hinges	BB1199 4-1/2 x 4-1/2	Hager	8
Exit Device (storeroom/night latch function)	3347L US26D	Von Duprin	1
Closer with Drop plate	4020-18G AL	LCN	1
Threshold	272A x 72”	Pemko	1
Mortise cylinder			1

END OF SECTION 08711

SECTION 08800 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Doors.
   3. Interior borrowed lites.
   4. Storefront framing.

1.3 DEFINITIONS

A. Manufacturer: A firm that produces primary glass or fabricated glass as defined in referenced glazing publications.

B. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

C. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- (300-mm-) square Samples for glass.
   1. Insulating glass for each designation indicated.
   C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
   1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products indicated in schedules at the end of Part 3.

2.2 PRIMARY FLOAT GLASS

A. Float Glass: ASTM C 1036, Type I (transparent glass, flat), Quality q3 (glazing select); class as indicated in schedules at the end of Part 3.

2.3 WIRED GLASS

A. Wired Glass: ASTM C 1036, Type II (patterned and wired glass, flat), Class 1 (clear), Quality q8 (glazing); 6.4 mm thick; of form and mesh pattern indicated below:
   1. Polished Wired Glass: Form 1 (wired, polished both sides), and as follows:

      a. Mesh m2 (square).

2.4 INSULATING GLASS

A. Insulating-Glass Units: Preassembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in the Insulating-Glass Schedule at the end of Part 3.

B. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated in the Insulating-Glass Schedule at the end of Part 3 are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

C. Sealing System: Dual seal, with primary and secondary sealants as follows:
   1. Manufacturer's standard sealants.

D. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.5 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

   1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range for this characteristic.

B. Elastomeric Glazing Sealant Standard: Comply with ASTM C 920 and other requirements indicated for each liquid-applied, chemically curing sealant in the Glazing Sealant Schedule at the end of Part 3, including those referencing ASTM C 920 classifications for type, grade, class, and uses.

2.6 GLAZING GASKETS

A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.8 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

B. Grind smooth and polish exposed glass edges.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where the length plus width is larger than 50 inches (1270 mm) as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.4 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.5 SEALANT GLAZING (WET)

A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkaline deposits, or stains; remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08800

****

SECTION 08950 IS REVISED IN ITS ENTIRETY BY AMENDMENT R0007

****

SECTION 08950

TRANSLUCENT WALL AND ROOF ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated insulated translucent fiberglass systems, polycarbonate structured sheet, or polycarbonate composite (honeycomb) panels.

B. Installation system

C. Flashing

D. Perimeter sealant.

1.02 RELATED SECTIONS

A. Division 7 - Joint Sealers: System perimeter sealant and back-up materials.

B. Division 8 - Aluminum Windows.

C. Division 8 - Glazing.

D. Division 9 - Paints and Coatings.

1.03 REFERENCES (Use current abstract or editions)

A. AA DAF-45 - Designation System for Aluminum Finishes; The Aluminum Association, Inc..

B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association.

C. AAMA 501.1 - Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure; American Architectural Manufacturers Association (part of AAMA 501).

D. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; American Architectural Manufacturers Association.

E. AAMA 1503.1 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; American Architectural Manufacturers Association.

F. ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

G. ASTM E 331 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference.

1.04 PERFORMANCE REQUIREMENTS

A. System Design: Design and size components to withstand dead loads and live loads caused by snow, hail, and positive and negative wind loads acting on plane of panel.

B. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable code.

1.05 SUBMITTALS

A. See Division 1 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, panel configuration, internal drainage details. Submit copies of manufacturer's specifications, standard detail drawings, and installation instructions for panels. Include manufacturer's certification or other data substantiating that the materials and finishes comply with the requirements.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, to include anchorages, trim, flashing, corners and accessories and field connections as required. Show small-scale layout and elevations of entire work.

D. Samples: Submit one sample panel, approximately 12"x24" inch in size, illustrating prefinished or finished aluminum surface, specified panel with skins, glazing materials illustrating edge and corner.

E. Test reports to be furnished by panel system manufacturer in accordance with Division 1, Submittals. The manufacturer shall submit certified test reports made by an independent testing organization for each type and class of panel system. Reports shall verify that the material will meet all performance requirements of this specification. Previously completed test reports will be acceptable if by current manufacturer and indicative of products used on this project. Test reports required are:
   1. Flame Spread and Smoke Development (ASTM E-84)
   2. Burn Extent (ASTM D-635)
   3. Color Difference (ASTM D-2244)
   4. Impact Strength (Free Falling Ball Method)/(Hurricane Large Missile Cannon test per PA201)
   5. Tensile Bond Strength (ASTM C-297 after aging by ASTM D 1037)
   6. Shear Bond Strength (ASTM D-1002 after 5 different aging conditions.)
   7. Beam Bending Strength (ASTM E-72)
   8. Insulation "U" Factor (by NFRC 100, ASTM C-236, E-1423, and C-1199)
   9. Condensation Resistance Factor (AAMA 1503)
   10. Performance for Window Type PC-55/P-HC-5 (AAMA/NWWDA 101/I.S.2)

F. ICBO Evaluation report for translucent panels and proof of regular, independent quality control monitoring shall be submitted.

G. Current UL listing documenting that face sheets are manufactured by the translucent panel fabricator for fiberglass material.

H. Current compliance to Quality Management Standards SI ISO 9002 for polycarbonate sheet material.

I. Complete energy and structural calculations and all above data must be submitted.

J. Installation Data: Special installation requirements.

1.06 QUALITY ASSURANCE

A. Translucent system , or composite panel system manufacturer must be listed by a recognized building code authority, including the International Conference of Building Officials (ICBO) which requires quality control inspections by an approved agency for panel construction. Panels used on this project must be included in ICBO listing.

B. Materials and products shall be manufactured by a company continuously and regularly employed in the manufacture of similar materials for a period of at least ten (10) consecutive years; and which can show evidence of these materials being satisfactorily used on at least five (5) projects of similar size scope and type successful use for ten (10) years or longer. Provide name of project and geographic location including point of contact for the owner and telephone number.

C. Erection shall be by an installer who has been in the business of erecting similar materials for at least five (5) consecutive years; and can show evidence of satisfactory completion of projects of similar size scope and type.

1.7 WARRANTY:

A. System Warranty For Fiberglass and Polycarbonate: Provide written warranty signed by manufacturer, agreeing to repair or replace work which exhibits defects in materials or workmanship. Defects are defined to include uncontrolled leakage of water, abnormal aging or deterioration, or failure to perform as required. Also, defects include fiberbloom, cracking, crazing, delamination of coating from exterior sheet, or more than 15 percent discoloration.

1. Warranty Period: 5 years from date of completion.

1.08 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Handle work of this section in accordance with AAMA CW-10.

B. Protect prefinished aluminum surfaces or other component surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Puncture wrappings at ends for ventilation.

C. Store translucent panel units, facing sheets, or composite panels on the long edge several inches above the ground blocked and under cover to prevent warping and in accordance with manufacturer's storage and handling instructions.

D. Combustion type heaters must be properly vented to the exterior to prevent possible staining of panels.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fiberglass: Kalwall Window System; Skywall Translucent Systems; Major Industries, Inc.; or approved equilvalent.

B. Thermoplastics (Polycarbonate or Acrylic): CPI International; Duo Guard Industries, Inc. or approved equivalent.

2.02 MATERIALS

A. TRANSLUCENT FACING
1. Translucent faces shall be manufactured from glass fiber reinforced thermoset resins by insulated panel system fabricator especially for architectural grade panels. Thermoplastic (polycarbonate and acrylic) faces are acceptable.
2. Flammability - The interior face sheet shall be UL listed and have a flame spread rating no greater than 15 and smoke developed no greater than 185 when tested in accordance with ASTM E-84. Burn extent by ASTM D 635 shall be no greater than 1".
3. Weatherability -
   a. The full thickness of the exterior face shall not change color more than (DELTA E by ASTM D-2244).
   b. The exterior face shall have a permanent glass veil erosion barrier to provide maximum long-term resistance to reinforcing fiber exposure and shall be warranted against it for 25 years by face sheet manufacturer. Plastic surface films or veils are acceptable.
4. Appearance
   a. The faces shall be uniform in color to prevent splotchy appearance. Faces shall be completely free of ridges and wrinkles, which prevent proper surface contact in bonding to the aluminum grid core. Clusters of air bubbles/pinholes, which collect moisture and dirt, will not be acceptable.
   b. Exterior face sheet shall be manufacturer standard thickness for the system named and Crystal in color. Interior face sheets shall be manufacturer standard thickness for the system named and crystal in color. Faces shall not vary more than + 10% in thickness.
5. Strength
   a. The exterior face sheet shall be uniform in strength and repel impact in accordance with manufacturers standard procedure. Face sheet shall be resistant to penetration by pencil point or other small, sharp objects.

B. GRID CORE

1. The thermally broken I-beams shall be 6063-T6 with provisions for mechanical interlocking of muntin-mullion and perimeter to prevent high and low intersections, which do not allow full bonding surface to contact with face material. Ferrous Metals are not allowed. Width of I-beam shall be no less than 7/16. Aluminum I-beam for the grid shall be machined to tolerances of not greater than + .002.. Thermally broken composite grid core shall have a minimum condensation resistance factor of 80 by AAMA 1503 measured on the grid line. A silkscreened grid to be applied on polycarbonate or acrylic panels to simulate the design pattern as indicated on the drawings.

C. SYSTEMS: (Translucent 2-3/4-Inch Nominal Fiberglass System with Aluminum Framing Members)

1. Kalwall Window System: Primary system.
2. Skywall Translucent System: Primary system.
3. Major Industries, Inc.: Guard-Tite System.

D.. SYSTEMS: (Polycarbonate Composition 3-Inch Glazing System with Aluminum Framing Members)

1. CPI International: LiteWall System, Quadwall 3.0 Panelized Insulated Wall System
2. Duo Guard Industries, Inc.: Series 2000-Interlocking System

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify wall openings and adjoining air barrier and vapor retarder materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install translucent panel system in accordance with manufacturer instructions and as indicated on drawings.

B. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.

3.03 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

C. Sealant Space Between Panel System Members and Adjacent Construction: Maximum of 3/4 inch and minimum of 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. Inspection shall monitor quality of installation and glazing.

3.05 MANUFACTURER'S FIELD SERVICES

A. Translucent panel product manufacturers or Polycarbonate system product manufacturers to provide field surveillance of the installation of their products.

3.06 CLEANING

A. Remove protective material from prefinished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

3.07 PROTECTION OF FINISHED WORK

A. Protect finished Work from damage.

END OF SECTION

SECTION 09255 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Nonload-bearing steel framing members for gypsum board assemblies.
   2. Gypsum board assemblies attached to steel framing.
   3. Cementitious backer units installed with gypsum board assemblies.
   4. Glass-mat, water-resistant gypsum backing board installed with gypsum board assemblies.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 5 Section "Cold-Formed Metal Framing" for load-bearing steel framing.
   2. Division 6 Section "Rough Carpentry" for wood framing and furring, and gypsum sheathing applied over wood framing.

1.3 DEFINITIONS

A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

A. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each type of product specified.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.

B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.

D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
   1. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum board manufacturer's recommendations, whichever are more stringent.

B. Room Temperatures: For nonadhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours before application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.

C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts during hot, dry weather to prevent finishing materials from drying too rapidly.

PART 2 - PRODUCTS

2.1 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

A. General: Provide components complying with ASTM C 754 for conditions indicated.

B. Wire Ties: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.062 inch (1.6 mm) thick.

C. Wire Hangers: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, 0.162-inch (4.1-mm) diameter.

D. Channels: Cold-rolled steel, 0.0598-inch (1.5-mm) minimum thickness of base (uncoated) metal and 7/16-inch- (11.1-mm-) wide flanges, and as follows:

1. Carrying Channels: 2 inches (50.8 mm) deep, 590 lb/1000 feet (88 kg/100 m), unless otherwise indicated.
2. Finish: Rust-inhibitive paint, unless otherwise indicated.

E. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth of 7/8 inch (22.2 mm), and minimum thickness of base (uncoated) metal as follows:
1. Thickness: 0.0329 inch (0.84 mm), unless otherwise indicated.
2. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating.

F. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M) to form 1/2-inch- (12.7-mm-) deep channel of the following configuration:
1. Double-Leg Configuration: Hat-shaped channel with 1-1/2-inch- (38.1-mm-) wide face connected to flanges by double-slotted or expanded-metal legs (webs).

2.2 STEEL FRAMING FOR WALLS AND PARTITIONS

A. General: Provide steel framing members complying with the following requirements:

1. Protective Coating: ASTM A 653, G 40 (ASTM A 653M, Z 90) hot-dip galvanized coating.

B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:

1. Thickness: 0.0179 inch (0.45 mm), unless otherwise indicated.
2. Thickness: 0.0329 inch (0.84 mm) as follows:
   a. For head runner, sill runner, jamb, and cripple studs at door and other openings.
   b. In locations to receive cementitious backer units.
   c. Where indicated.
3. Depth: 3-5/8 inches (92.1 mm), unless otherwise indicated.
4. Depth: 6 inches (152.4 mm) where indicated.
5. Depth: 2-1/2 inches (63.5 mm) where indicated.

C. Deflection Track: Manufacturer's top runner complying with the requirements of ASTM C 645 and with 2-inch- (50.8-mm-) deep flanges.

D. Steel Flat Strap and Backing Plate: Steel sheet for blocking and bracing complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M), length and width as indicated, and with a minimum base metal (uncoated) thickness as follows:
1. Thickness: 0.0179 inch (0.45 mm), unless otherwise indicated.

E. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

2.3 GYPSUM BOARD PRODUCTS

A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
1. Widths: Provide gypsum board in widths of 48 inches (1219 mm).

B. Gypsum Wallboard: ASTM C 36 and as follows:
1. Type: Regular for vertical surfaces, unless otherwise indicated.
2. Type: Type X where required for fire-resistance-rated assemblies.
3. Edges: Tapered.
4. Thickness: 5/8 inch (15.9 mm) unless otherwise indicated.

2.4 CEMENTITIOUS BACKER UNITS

A. Provide cementitious backer units complying with ANSI A118.9, of thickness and width indicated below, and in maximum lengths available to minimize end-to-end butt joints.
1. Thickness: 5/8 inch (15.9 mm).

B. Available Products: Subject to compliance with requirements, cementitious backer units that may be incorporated in the Work include, but are not limited to, the following:
1. DUROCK Cement Board; United States Gypsum Co.

2.5 TRIM ACCESSORIES

A. Accessories for Interior Installation: Cornerbead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:

1. Material: Formed metal or plastic, with metal complying with the following requirement:

a. Steel sheet zinc coated by hot-dip or electrolytic process, or steel sheet coated with aluminum or rolled zinc.

2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:

a. Cornerbead on outside corners, unless otherwise indicated.
b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
c. Fire-rated chase framing shapes as indicated on drawings and as recommended by USG.
d. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
e. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
f. One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

2.6 JOINT TREATMENT MATERIALS

A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.

B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
1. Use pressure-sensitive or staple-attached, open-weave, glass-fiber reinforcing tape with compatible joint compound where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.

C. Joint Tape for Cementitious Backer Units: As recommended by cementitious backer unit manufacturer.

D. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
1. Ready-Mixed Formulation: Factory-mixed product.
a. Taping compound formulated for embedding tape and for first coat over fasteners and face flanges of trim accessories.
b. Topping compound formulated for fill (second) and finish (third) coats.
c. All-purpose compound formulated for both taping and topping compounds.

E. Joint Compound for Cementitious Backer Units: Material recommended by cementitious backer unit manufacturer.

2.7 MISCELLANEOUS MATERIALS

A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.

B. Steel drill screws complying with ASTM C 1002 for the following applications:
1. Fastening gypsum board to steel members less than 0.033 inch (0.84 mm) thick.

C. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. Steel drill screws of size and type recommended by unit manufacturer for fastening cementitious backer units.

E. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

F. Sound-Attenuation Blankets: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing).
1. Mineral-Fiber Type: Fibers manufactured from glass, slag wool, or rock wool.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

3.3 INSTALLING STEEL FRAMING, GENERAL

A. ASTM C 840 includes installation requirements that are not included in ASTM C 754.

B. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.

C. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."

3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

A. Suspend ceiling hangers from building structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
4. Do not connect or suspend steel framing from ducts, pipes, or conduit.

B. Sway-brace suspended steel framing with hangers used for support.

C. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.
1. Wire Hangers: 48 inches (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.

D. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) as measured both lengthwise on each member and transversely between parallel members.

E. Furring members must be wire-tied to supports in most fire-resistance-rated assemblies. Verify requirements of applicable assemblies and revise paragraph below to suit Project.

F. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

G. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

3.5 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.

B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch (3 mm) from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing

over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
2. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.

D. Terminate partition framing at suspended ceilings where indicated.

E. Install steel studs and furring in sizes and at spacings indicated.
1. Single-Layer Construction: Space studs 16 inches (406 mm) o.c., unless otherwise indicated.
2. Cementitious Backer Unit Construction: Space studs 16 inches (406 mm) o.c., unless otherwise indicated.

F. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.

G. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
1. Install 2 studs at each jamb, unless otherwise indicated.
2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint.
3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.

H. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.6 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.

B. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid joints other than control joints at corners of framed openings where possible.

F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

G. Attach gypsum panels to framing provided at openings and cutouts.

H. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors over 32 inches (813 mm) wide. Apply spot grout at each jamb anchor clip and immediately insert gypsum panels into frames.

I. Form control and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.

J. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases that are braced internally.
   1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect open concrete coffers, concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
   1. Space screws a maximum of 12 inches (304.8 mm) o.c. for vertical applications.

L. Space fasteners in panels that are tile substrates a maximum of 8 inches (203.2 mm) o.c.

3.7 GYPSUM BOARD APPLICATION METHODS

A. Single-Layer Application: Install gypsum wallboard panels as follows:
   1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
   3. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistance-rated assemblies. Use maximum-length panels to minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of board.

B. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:

1. Install cementitious backer units to comply with ANSI A108.11 at locations indicated to receive wall tile.
2. Install water-resistant gypsum backing board panels in toilet rooms, shower rooms, locker rooms, and other surfaces subject to frequent wetting except under tile, and where indicated. Install with 1/4-inch (6.4-mm) open space where panels abut other construction or penetrations.

C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows:
1. Fasten with screws.

3.8 INSTALLING TRIM ACCESSORIES

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

B. Install cornerbead at external corners.

C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
3. Install U-bead where indicated.

D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by C.O.R. for visual effect.

3.9 FINISHING GYPSUM BOARD ASSEMBLIES

A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.

B. Prefill open joints, rounded or beveled edges, and damaged areas using setting-type joint compound.

C. Apply joint tape over gypsum board joints, except those with trim accessories having flanges not requiring tape.

D. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.

E. Levels of Gypsum Board Finish: Provide the following levels of gypsum board finish per GA-214.
   1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
   2. Level 2 where panels form substrates for tile and where indicated.
   3. Level 4 for gypsum board surfaces, except paintes surfaces and unless otherwise indicated.
   4. Level 5 for gypsum board surfaces where paint is indicated.

F. Use the following joint compound combination as applicable to the finish levels specified:
   1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.

G. Where Level 5 gypsum board finish is indicated, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories; and apply a thin, uniform skim coat of joint compound over entire surface. For skim coat, use joint compound specified for third coat, or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects, tool marks, and ridges and ready for decoration.

H. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration.

I. Where Level 2 gypsum board finish is indicated, embed tape in joint compound and apply first coat of joint compound.

J. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

K. Finish cementitious backer units to comply with unit manufacturer's directions.

3.10 CLEANING AND PROTECTION

A. Promptly remove any residual joint compound from adjacent surfaces.

B. Provide final protection and maintain conditions, in a manner acceptable to Installer, that ensure gypsum board assemblies are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 09255

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Ceramic mosaic tile.
   2. Glazed wall tile.

B. Related Sections include the following:
   1. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   2. Division 9 Section "Gypsum Board Assemblies" for cementitious backer units installed in gypsum wallboard assemblies.

1.3 DEFINITIONS

A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

B. Facial Dimension: Actual tile size (minor facial dimension as measured per ASTM C 499).

1.4 SUBMITTALS

A. Product Data: For each type of tile, mortar, grout, and other products specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

1.8 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Tile and Trim Units: Furnish quantity of full-size units equal to 5 percent of amount installed, for each type, composition, color, pattern, and size indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, those indicated in the ceramic tile installation schedules at the end of this Section.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Tile Products:
      a. Floor tile: unglazed ceramic mosaic : American Olean
      b. Wall tile: glazed ceramic: American Olean Crystalline II and American Olean Matte
   2. Tile-Setting and -Grouting Materials:
      a. American Olean Tile Company.
      b. Laticrete International, Inc.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
   1. Colors are indicated on drawings. If a manufacturer other than American Olean is approved, provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
   2. Provide tile trim and accessories that match color and finish of adjoining flat tile.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

2.3 TILE PRODUCTS

A. Unglazed Ceramic Mosaic Tile: Provide factory-mounted flat tile complying with the following requirements:
   1. Composition: Porcelain with abrasive admixture.
   2. Module Size: 2 by 2 inches (50.8 by 50.8 mm).
   3. Nominal Thickness: 1/4 inch (6.35 mm).
   4. Face: Plain with cushion edges.

B. Glazed Wall Tile: Provide flat tile complying with the following requirements:
   1. Module Size: 4-1/4 by 4-1/4 inches (108 by 108 mm).
   2. Thickness: 5/16 inch (8 mm).
   3. Face: Plain with modified square edges or cushion edges.

C. Trim Units: Provide tile trim units to match characteristics of adjoining flat tile and to comply with the following requirements:
   1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
   2. Shapes: As follows, selected from manufacturer's standard shapes:
      a. Base for Thin-Set Mortar Installations: Coved
      b. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose.
      c. External Corners for Thin-Set Mortar Installations: Surface bullnose.
      d. Internal Corners: Field-butted square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

2.4 SETTING MATERIALS

A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
   1. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid-latex additive complying with the following requirements:
      a. Latex Additive: Styrene butadiene rubber.
      b. For wall applications, provide nonsagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.

2.5 GROUTING MATERIALS

A. Sand-Portland Cement Grout: ANSI A108.10, composed of white or gray cement and white or colored aggregate as required to produce color indicated.
   1. Mixture of Dry-Grout Mix and Latex Additive: Mixture of factory-prepared, dry-grout mix and latex additive complying with the following requirements:
      a. Unsanded Dry-Grout Mix: Dry-set grout complying with ANSI A118.6 for materials described in Section H-2.3, for joints 1/8 inch (3.2 mm) and narrower.
      b. Sanded Dry-Grout Mix: Commercial portland cement grout complying with ANSI A118.6 for materials described in Section H-2.1, for joints 1/8 inch (3.2 mm) and wider.
      c. Latex Additive: Styrene butadiene rubber.

2.6 MISCELLANEOUS MATERIALS

A. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, latex, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with C.O.R..

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
   1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.
   2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."

H. Grout tile to comply with the requirements of the following tile installation standards:
   1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 FLOOR TILE INSTALLATION

A. General: Install tile to comply with requirements in the Ceramic Tile Floor Installation Schedule, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.

B. Joint Widths: Install tile on floors with the following joint widths:
   1. Ceramic Mosaic Tile: 1/16 inch (1.6 mm).

3.5 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with requirements in the Ceramic Tile Wall Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:
   1. Wall Tile: 1/16 inch (1.6 mm).

3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove latex-portland cement grout residue from tile as soon as possible.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.

1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

END OF SECTION 09310

SECTION 09512 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Ceilings consisting of acoustical tiles and concealed suspension systems.

1.2 SUBMITTALS

A. Product Data: For each type of product specified.

B. Samples for Verification: Full-size units of each type of ceiling assembly indicated; in sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
   1. 1’x1’ samples of each acoustical tile type, pattern, and color.
   2. Set of 12-inch- (300-mm-) long samples of concealed suspension system members.
   3. Set of 12-inch- (300-mm-) long samples of exposed moldings for each color and system type required.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed acoustical tile ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Ceiling Units: Obtain each acoustical ceiling tile from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Suspension System: Obtain each suspension system from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

D. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:
   1. Fire-response tests were performed by UL, ITS/Warnock Hersey, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
   2. Surface-burning characteristics of acoustical tiles comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
   3. Fire-resistance-rated assemblies, which are indicated by design designations from UL's "Fire Resistance Directory," from ITS/Warnock Hersey's "Directory of Listed Products,"

or from listings of another testing and inspecting agency, are identical in materials and construction to those tested per ASTM E 119.

4. Products are identified with appropriate markings of applicable testing and inspecting agency.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet-work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.6 COORDINATION

A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size units equal to 2.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Tile: Armstrong “Cirrus”, angled tegular edge, fine texture, ¾” thick.

B. Suspension Grid: Armstrong “Prelude”, 15/16” exposed ee system, white. Shadow molding at perimeters.

2.2 ACOUSTICAL TILES, GENERAL

A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.

2.3 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung, unless otherwise indicated.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
   2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

E. Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical tile edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and structural framing to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage, and other conditions affecting performance of acoustical tile ceilings.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordination: Furnish layouts for preset inserts, clips, and other ceiling anchors whose installation is specified in other Sections.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width units at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical tile ceilings to comply with publications referenced below per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
   1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
   2. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
   3. U.B.C.'s "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings": U.B.C. Standard 25-2.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure; that are appropriate for substrate; and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise indicated; and provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical units.
   1. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3 mm in 3.6 m). Miter corners accurately and connect securely.
   2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

E. Arrange directionally patterned acoustical tiles as follows:
   1. As indicated on reflected ceiling plans.

F. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.
   1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
   2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches (305 mm) o.c.

3.4 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09512

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 09632

STONE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Stone on floors.

B. Stone setting and grouting.

1.02 RELATED SECTIONS

A. Section 07900 - Joint Sealers.

1.03 REFERENCES

A. ANSI A108 Series/A118 Series/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).
   1. ANSI A118.4 - American National Standard Specifications for Latex-Portland Cement Mortar.
   2. ANSI A118.6 - American National Standard Specifications for Ceramic Tile Grouts.

B. ASTM C 629 - Standard Specification for Slate Dimension Stone.

C. TCA (HB) - Handbook for Ceramic Tile Installation; Tile Council of America, Inc..

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide instructions for using grout.

C. Samples: Mount stone and apply grout on 2 plywood panels, 2x24 inch in size illustrating pattern, color variations, and grout joint size variations.

D. Samples: Submit sample of colored grout.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.
   1. Include list of liquids detrimental to appearance of stone finish.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with TCA Handbook instructions for Methods specified.

B. Installer Qualifications: Company specializing in performing the work of this section approved by manufacturer.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Maintain 50 degrees F during installation of flooring materials.

1.07 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.

B. Provide 10 sq ft of each size, color, and surface finish of stone flooring specified.

PART 2 PRODUCTS

2.01 STONE

A. Slate: ASTM C 629, Classification II - Interior; free of defects detrimental to appearance or durability:
   1. Manufacturer: American Olean; Variety: Natural Slate or approved equal.
   2. Unit Size: 12x 12 inches.
   3. Thickness: 3/8 inch.
   4. Color: variegated.

2.02 ADHESIVE, MORTAR, AND GROUT MATERIALS

A. Provide mortar and grout materials from same manufacturer.

B. Manufacturers:
   1. American Olean or as recommended by American Olean.
   2. Substitutions: See Section 01600 - Product Requirements.

C. Mortar Bed Materials: Portland cement, sand, latex additive, and water.

D. Mortar Bond Coat Materials:
   1. Latex-Portland Cement Type: ANSI A118.4.

E. Standard Grout: Any type specified in ANSI A118.6, color as selected.
   1. Color Admixture: color as selected, site mixed.

2.03 ACCESSORY MATERIALS

A. Cleavage Membrane: No.15 asphalt saturated felt.

B. Cleaner: Recommended by stone producer and grout manufacturer as not harmful to stone, joint materials, or adjacent surfaces.

C. Sealer: Colorless, slip and stain resistant which will not detrimentally affect stone and adjacent work.

2.04 MORTAR AND GROUT MIX

A. Mix and proportion pre-mixed setting bed and grout materials in accordance with manufacturer's instructions.

B. Add mortar color in accordance with manufacturer's instructions. Control uniformity of mix and coloration.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work.

3.02 PREPARATION

A. Vacuum clean substrate surfaces; damp clean stone.

B. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

C. Clean stone prior to installation, with edges and surfaces free of dirt or foreign material.

D. Do not use wire brushes or implements that mark or damage exposed surfaces.

3.03 INSTALLATION - GENERAL

A. Install stone in accordance with manufacturer's instructions.

B. Lay stone units to pattern indicated. Do not interrupt pattern through openings.

C. Cut and fit stone units tightly to penetrations, leaving sealant joint space. Ensure finish trim will cover cut edges. Form corners and bases neatly. Align floor and base joints.

D. Maintain uniform joint width subject to variance in tolerance allowed in stone unit size. Make joints watertight, without voids, cracks, excess mortar or excess grout.

E. Maintain joint width of 3/8 inch where abutting vertical surfaces or protrusions.

F. Sound test the units after setting. Replace hollow sounding units.

G. Keep expansion and control joints free of mortar or grout. Apply sealant to joints.

H. Grout joints. Pack and work grout into voids. Neatly tool to flush surface.

3.04 THINSET METHOD

A. Install in accordance with TCA Handbook Method F113, with mortar bond coat.

B. Allow thinset materials to cure prior to grouting.

3.05 CLEANING

A. Clean stone and grout surfaces with cleaner; seal with sealer.

END OF SECTION

SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Resilient wall base.
   2. Resilient flooring accessories.
   3. Resilient carpet accessories.

B. Related Sections include the following:
   1. Division 9 Section "Carpet."
   2. Division 9 Section "Linoleum Floor Coverings"

1.3 SUBMITTALS

A. Product Data: For each type of product specified.

B. Samples for Initial Selection: Manufacturer's standard sample sets consisting of sections of units showing the full range of colors and patterns available for each type of product indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather, with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).

C. Move products into spaces where they will be installed at least 48 hours before installation, unless longer conditioning period is recommended in writing by manufacturer.

1.6 PROJECT CONDITIONS

A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive resilient products for at least 48 hours before installation, during installation, and for at least 48 hours after installation, unless manufacturer's written recommendations specify longer time periods. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

B. Do not install products until they are at the same temperature as the space where they are to be installed.

C. Coordinate resilient product installation with other construction to minimize possibility of damage and soiling during remainder of construction period. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
   1. Furnish not less than 10 linear feet (3 linear m) for each 500 linear feet (150 linear m) or fraction thereof, of each different type, color, pattern, and size of resilient product installed.
   2. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Rubber Base: Burke “BurkeBase” or approved equal
   1. Straight base with carpet
   2. Coved base with resilient flooring
   3. Premolded inside and outside corners
   4. Transition strips, carpet bar, reducer strips, nosings, edgings, cap strips and other accessories as required for carpet and resilient flooring
   5. Location of base indicated on drawings
   6. Color selected by Architect from manufacturer’s full range of colors.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of resilient products will occur, with Installer present, for compliance with manufacturer's requirements, including those for maximum moisture content. Verify that substrates and conditions are satisfactory for resilient product installation and comply with requirements specified. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient products.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Broom and vacuum clean substrates to be covered immediately before installing resilient products. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. General: Install resilient products according to manufacturer's written installation instructions.

B. Apply resilient wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
   1. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
   2. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
   3. Do not stretch base during installation.
   4. Install premolded outside and inside corners before installing straight pieces.

C. Place resilient products so they are butted to adjacent materials and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.

3.4 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing resilient products:
   1. Remove adhesive and other surface blemishes using cleaner recommended by resilient product manufacturers.
   2. Sweep or vacuum horizontal surfaces thoroughly.
   3. Do not wash resilient products until after time period recommended by resilient product manufacturer.
   4. Damp-mop or sponge resilient products to remove marks and soil.

B. Protect resilient products against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by resilient product manufacturer.

C. Clean resilient products not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean products according to manufacturer's written recommendations.

END OF SECTION 09653

SECTION 09654 - LINOLEUM FLOOR COVERINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Linoleum sheet flooring.

B. Related Sections include the following:
1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base, reducer strips, and other accessories installed with linoleum floor coverings.

1.3 SUBMITTALS

A. Product Data: For each type of product specified.

B. Samples for Initial Selection: Manufacturer's color charts consisting of sections of units showing the full range of colors and patterns available for each type of product indicated.

C. Maintenance Data: For linoleum floor coverings to include in the maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing linoleum floor coverings similar to those required for this Project and with a record of successful in-service performance.

B. Source Limitations: Obtain each type, color, and pattern of linoleum floor covering specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver linoleum floor coverings and related products to Project site in manufacturer's original, unopened cartons and containers, each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.

B. Store products in dry spaces protected from the weather with ambient temperatures maintained between 50 and 90 deg F (10 and 32 deg C).

C. Store rolls upright.

D. Move linoleum floor coverings and related products into spaces where they will be installed at least 72 hours in advance of installation.

1.6 PROJECT CONDITIONS

A. Maintain a temperature of not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive linoleum floor coverings for at least 72 hours before installation, during installation, and for at least 72 hours after installation. After postinstallation period, maintain a temperature of not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

B. Maintain relative humidity in spaces to receive linoleum floor coverings before, during, and after installation within the range recommended in writing by manufacturer.

C. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by manufacturer.

D. Install linoleum floor coverings after other finishing operations, including painting and ceiling installation, have been completed.

E. Do not install linoleum floor coverings over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive, as determined by floor covering manufacturer's recommended bond and moisture tests.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) in roll form for each 500 linear feet (150 linear m) or fraction thereof, of each product, color, and pattern of linoleum sheet flooring installed.
2. Deliver extra materials to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to:
   1. Forbo Industries, Maroleum or approved equal
   2. Colors and patterns indicated on drawings.

2.2 PRODUCTS

A. Linoleum Floor Coverings: Consisting of oxidized linseed or other vegetable drying oil and rosin, mixed with ground cork or wood flour, mineral filler, and pigments. Mixture is bonded and keyed to a burlap (jute) or other suitable fibrous backing so that backing is partially embedded in mixture. Patterns and colors extend through entire floor covering thickness.

B. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by floor covering manufacturer for applications indicated.

C. Adhesives: Water-resistant type recommended in writing by floor covering manufacturer for products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where installation of linoleum floor coverings will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for floor covering installation and comply with requirements specified.

B. Concrete Substrates: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond, moisture, and pH tests recommended in writing by floor covering manufacturer.
   2. Substrate finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving resilient flooring.
   3. Substrates are free of cracks, ridges, depressions, scale, and foreign deposits.

3.2 PREPARATION

A. General: Comply with linoleum floor covering manufacturer's written installation instructions for preparing substrates indicated to receive linoleum floor coverings.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

D. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.3 FLOOR COVERING INSTALLATION, GENERAL

A. Comply with manufacturer's written installation instructions.

B. Scribe, cut, and fit floor coverings to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings.

C. Extend floor coverings into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use chalk or other nonpermanent, nonstaining marking device.

E. Adhere floor coverings to substrates using a full spread of adhesive applied to substrate to comply with adhesive and floor covering manufacturers' written instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times.

1. Provide completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

F. Roll floor coverings according to floor covering manufacturer's written instructions.

3.4 SHEET FLOORING INSTALLATION

A. Lay out sheet flooring to comply with the following requirements:

1. Maintain uniformity of floor covering direction.
2. Arrange for a minimum number of seams and place them in inconspicuous and low-traffic areas, and not less than 6 inches (150 mm) away from parallel joints in flooring substrates.

3. Match edges of sheet flooring for color shading and pattern at seams according to manufacturer's written recommendations.
4. Avoid cross and butt seams.
5. Eliminate deformations that result from hanging method used during the drying process (stove bar marks) according to manufacturer's written recommendations.

3.5 CLEANING AND PROTECTING

A. Perform the following operations immediately after installing flooring products:

1. Remove adhesive and other surface blemishes using cleaner recommended in writing by floor covering manufacturer.
2. Sweep and vacuum floor thoroughly.
3. Do not wash floor until after time period recommended in writing by floor covering manufacturer.
4. Damp-mop floor to remove marks and soil using method and cleaner recommended in writing by floor covering manufacturer.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by floor covering manufacturer.

1. Apply protective floor polish to floor surfaces that are free from soil, adhesive, and surface blemishes.

   a. Seal linoleum with not less than 3 coats of floor polish.
   b. Use commercially available product recommended in writing by floor covering manufacturer.
   c. Coordinate selection of floor polish with Owner's maintenance service.

2. Do not move heavy and sharp objects directly over floor surfaces. Place plywood or hardboard panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

C. Clean floor surfaces not more than 4 days before dates scheduled for inspections intended to establish date of Substantial Completion in each Project area. Clean floor coverings according to manufacturer's written recommendations.

1. After cleaning, restore polish finish according to floor covering manufacturer's written recommendations.

END OF SECTION 09654

SECTION 09680 - CARPET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Tufted carpet.

B. Related Sections include the following:
   1. Division 9 Section **"Resilient Wall Base and Accessories"** for resilient wall base and accessories installed with carpet.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate required.

B. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet: 12-inch- (300-mm-) square Sample.

C. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.

D. Maintenance Data: For carpet to include in maintenance manuals specified in Division 1. Include the following:
   1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

C. Product Options: Products and manufacturers named in Part 2 establish requirements for product quality in terms of appearance, construction, and performance. Other manufacturers' products comparable in quality to named products and complying with requirements may be considered. Refer to Division 1 Section "Substitutions."

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

A. General: Comply with CRI 104, Section 6.1, "Site Conditions; Temperature and Humidity."

B. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

C. Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet manufacturer.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Carpet: Full-width rolls equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

PART 2 - PRODUCTS

2.1 CARPET

A. Products: Subject to compliance with requirements, provide the following:
   1. Interface; Marrakesh
      a. Color: As indicated on drawings

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by the following:

1. Carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and that is recommended by the following:
   1. Carpet manufacturer.

C. Seaming Cement: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance. Verify that substrates and conditions are satisfactory for carpet installation and comply with requirements specified.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by the following:
      a. Carpet manufacturer.
   2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet.
   3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and carpet manufacturer's written installation instructions for preparing substrates indicated to receive carpet installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by the following:
   1. Carpet manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Direct-Glue-Down Installation: Comply with CRI 104, Section 8, "Direct Glue-Down Installation."

B. Comply with carpet manufacturer's written recommendations for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.
   1. Level adjoining border edges.

C. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

D. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

F. Install pattern parallel to walls and borders.

G. Install carpet cushion seams at 90-degree angle with carpet seams.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
   2. Remove yarns that protrude from carpet surface.
   3. Vacuum carpet using commercial machine with face-beater element.

B. Protect installed carpet to comply with CRI 104, Section 15, "Protection of Indoor Installations."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet manufacturer.

END OF SECTION 09680

SECTION 09900 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and field painting of the following:
   1. Exposed exterior items and surfaces.
   2. Exposed interior items and surfaces.
   3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. This Section does not include:
   1. Epoxy coating and powder coating, see Section 09960

C. Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the C.O.R. will select from standard colors and finishes available.
   1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components:
      a. Architectural woodwork and casework (contractor's option).
      b. Metal lockers.
      c. Elevator entrance doors and frames.
      d. Elevator equipment.
      e. Finished mechanical and electrical equipment.
      f. Light fixtures.
      g. Distribution cabinets.
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Foundation spaces.
      b. Furred areas.
      c. Pipe spaces.
      d. Duct shafts.

e. Elevator shafts.

3. Finished metal surfaces include the following:
   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper.
   e. Bronze and brass.
4. Operating parts include moving parts of operating equipment and the following:
   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.
5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

E. Related Sections include the following:
1. Division 2 Section "Hot-Mix Asphalt Paving" for traffic-marking paint.
2. Division 5 Section "Structural Steel" for shop priming structural steel.
3. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
4. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
5. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
6. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.
7. Divisions 15 and 16: Painting of mechanical and electrical work is specified in Divisions 15 and 16, respectively. Note that all ductwork, piping conduit and other mechanical and electrical appurtenances in ceiling spaces where exposed, will be painted unless specifically excluded.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
1. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
2. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Product Data: For each paint system specified. Include block fillers and primers
1. Material List: Provide an inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.

2. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material proposed for use.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of finish-coat material indicated.

C. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.
1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the Owner.
   1. Quantity: Furnish the Owner with an additional 5 percent, but not less than 1 gal. (3.785 L) or 1 case, as appropriate, of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products in the paint schedules.

B. Manufacturers Names: The following manufacturers are referred to in the paint schedules by use of shortened versions of their names, which are shown in parentheses:
   1. Benjamin Moore & Co. (Moore).
   2. PPG Industries, Inc. (PPG).
   3. Pratt & Lambert, Inc. (P & L).
   4. Sherwin-Williams Co. (S-W).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
   1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: Provide custom colors of the finished paint systems to match the Architect's samples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.
   1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify the C.O.R. about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.
   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
   1. Provide barrier coats over incompatible primers or remove and reprime.
   2. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
      a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
      b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
      c. When transparent finish is required, backprime with spar varnish.

d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
   a. Touch up bare areas and shop-applied prime coats that have been damaged. Wirebrush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.
4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
   2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
   3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
   1. Paint colors and finishes are indicated in the schedules on the drawings.
   2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
   3. Provide finish coats that are compatible with primers used.
   4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
   5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   6. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
   7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
   8. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
   1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
   2. Omit primer on metal surfaces that have been shop primed and touchup painted.
   3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
   4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
   1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
   2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

F. Mechanical items to be painted include, but are not limited to, the following:
   1. Piping, pipe hangers, and supports.
   2. Heat exchangers.
   3. Tanks.
   4. Ductwork.
   5. Insulation.
   6. Motors and mechanical equipment.
   7. Accessory items.

G. Electrical items to be painted include, but are not limited to, the following:
   1. Conduit and fittings.
   2. Switchgear.
   3. Panelboards.

H. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

I. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
   1. Provide satin finish for final coats.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
   1. The Contractor will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the COR.
   2. The testing agency will perform appropriate tests for the following characteristics as required by the COR:
      a. Quantitative material analysis.
      b. Abrasion resistance.
      c. Apparent reflectivity.
      d. Flexibility.
      e. Washability.
      f. Absorption.
      g. Accelerated weathering.
      h. Dry opacity.
      i. Accelerated yellowness.
      j. Recoating.
      k. Skinning.
      l. Color retention.
      m. Alkali and mildew resistance.
   3. The COR may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove noncomplying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible.

3.5 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
   1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by C.O.R..

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
   1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.7 EXTERIOR PAINT SCHEDULE

A. Smooth Wood: Provide the following finish systems over smooth wood siding and other smooth, exterior wood surfaces:
   1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
      a. Primer: Exterior, alkyd or latex, wood primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).
         1) PPG: 72-1 Sun-Proof Exterior House & Trim Wood Primer Flat--Latex.
      b. First and Second Coats: Semigloss, waterborne, exterior, acrylic enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
         1) PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House and Trim Paint.

B. Wood Trim: Provide the following finish systems over exterior wood trim:
   1. Medium-Shade, Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
      a. Primer: Exterior, acrylic-latex primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).

         1) PPG: 72-1 Sun-Proof Exterior House & Trim Wood Primer Flat--Latex.
      b. First and Second Coats: Semigloss, waterborne, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.4 mils (0.061 mm).
         1) PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House and Trim Paint.

C. Plywood: Provide the following finish systems over exterior plywood:
   1. Some types of plywood can be difficult to paint unless properly prepared. Some wood species, particularly fir, absorb most of the resin in the primer unless a sealer is first ap-

plied to the surface. Follow manufacturers' written instructions closely when painting plywood.

2. Low-Luster Finish: 2 finish coats over a primer.
   a. Primer: Exterior, acrylic-latex, wood primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).
      1) PPG: 72-1 Sun-Proof Exterior House & Trim Wood Primer Flat--Latex.
   b. First and Second Coats: Low-sheen (eggshell or satin), exterior, acrylic-emulsion paint applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
      1) PPG: 76 Line Sun-Proof Exterior House & Trim Acrylic Satin Latex.

D. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.
   1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
      a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).
         1) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
      b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.0 mils (0.076 mm).
         1) PPG: 6-282 Speedhide Interior/Exterior Gloss-Oil Enamel.
   2. Deep-Color, Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.
      a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).
         1) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Primer, Red.
      b. First and Second Coats: Deep-color, full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.7 mils (0.094 mm).
         1) PPG: 1 Line Sun-Proof Exterior Gloss Oil House & Trim Paints, Deeptone or Rustic Tinting Base.

E. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:
   1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a galvanized metal primer.
      a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
         1) PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
      b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
         1) PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House and Trim Paint.
         2) P & L: Z/F 3100 Series Aqua Royal Latex House & Trim Finish.

F. Aluminum: Provide the following finish systems over exterior aluminum surfaces:
1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
a. Primer: Rust-inhibitive, acrylic- or alkyd-based, metal primer, as recommended by the manufacturer for use over aluminum, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).
1) PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.
b. First and Second Coats: Semigloss, exterior, acrylic-latex enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
1) PPG: 78 Line Sun-Proof Semi-Gloss Acrylic Latex House and Trim Paint.

3.8 INTERIOR PAINT SCHEDULE

A. Concrete Masonry Units: Provide the following finish systems over interior concrete masonry block units:
1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a block filler.
a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils (0.13 mm).
1) PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.
b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
1) PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.
a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
1) PPG: 17-10 Quick-Drying Interior Latex Primer-Sealer.
b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).
1) PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.
2. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.
a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
1) PPG: 17-10 Quick-Dry Interior Latex Primer-Sealer.
b. First and Second Coats: Full-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).
1) PPG: 51 Line Brilliant Reflections Interior/Exterior Latex Gloss Enamel.

C. Woodwork and Hardboard: Provide the following paint finish systems over new, interior wood surfaces:
   1. Semigloss, Acrylic-Enamel Finish: 2 finish coats over a wood undercoater.
      a. Undercoat: Alkyd- or acrylic-latex-based, interior wood undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
         1) PPG: 6-755 Speedhide Interior Water-Based Undercoater.
      b. First and Second Coats: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).
         1) PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.
   2. Semigloss, Alkyd-Enamel Finish: 2 finish coats over a primer.
      a. Primer: Alkyd or latex-based, interior enamel undercoater applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).
         1) PPG: 17-255 Quick-Drying Enamel Undercoater.

D. Stained Woodwork: Provide the following stained finishes over new, interior woodwork:
   1. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sealer coat and an alkyd-based, interior wood stain. Wipe wood filler before applying stain.
      a. Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.
         1) PPG: None required.
      b. Stain Coat: Alkyd-based, interior wood stain applied at spreading rate recommended by the manufacturer.
         1) PPG: 77-302 Rez Interior Semi-Transparent Stain.
      c. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.
         1) PPG: 77-30 Rez Interior Quick-Drying Sealer and Finish.
      d. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.
         1) PPG: 77-7 Rez Varnish, Interior Satin Oil Clear.

E. Natural-Finish Woodwork: Provide the following natural finishes over new, interior woodwork:
   1. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sanding sealer. Provide wood filler on open-grain wood before applying first varnish coat.
      a. Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.
         1) PPG: None required.
      b. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.
         1) PPG: 77-30 Rez Interior Quick-Drying Sealer and Finish.

c. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.
   1) PPG: 77-7 Rez Varnish, Interior Satin Oil Clear.

F. Ferrous Metal: Provide the following finish systems over ferrous metal:
   1. Semigloss, Acrylic-Enamel Finish: One finish coat over an enamel undercoater and a primer.
      a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).
         1) PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.
      b. Undercoat: Alkyd, interior enamel undercoat or semigloss, acrylic-latex, interior enamel, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).
         1) PPG: 6-6 Speedhide Interior Quick-Drying Enamel Undercoater.
      c. Finish Coat: Semigloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).
         1) PPG: 88-110 Satinhide Interior Enamel Wall & Trim Lo-Lustre Semi-Gloss Latex.

G. Cotton or Canvas Covering over Insulation: Provide the following finish system on cotton or canvas insulation covering:
   1. Flat Acrylic Finish: 2 finish coats. Add fungicidal agent to render fabric mildewproof.
      a. First and Second Coats: Flat, latex-based, interior paint applied at spreading rate recommended by the manufacturer.
         1) PPG: 6-700 Series Speedhide Ultra Interior Wall Flat Latex 100 Percent Acrylic.

END OF SECTION 09900

SECTION 09960

HIGH-PERFORMANCE COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. High performance coatings.

B. Powder coating of ferrous iron surfaces as indicated on drawings.

1.02 RELATED SECTIONS

A. Section 09900 - Paints and Coatings.

1.03 REFERENCES

A. FS TT-C-535 - Coating, Epoxy, Two Component, for Interior Use on Metal, Wood, Wallboard, Painted Surfaces, Concrete and Masonry; Federal Specifications and Standards.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating coating materials.

C. Samples: Submit two samples 12x_12 inch in size illustrating colors for selection.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Data: Include cleaning procedures and repair and patching techniques.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Do not install materials when temperature is below 55 degrees F or above 90 degrees F.

B. Maintain this temperature range, 24 hours before, during, and 72 hours after installation of coating.

C. Restrict traffic from area where coating is being applied or is curing.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. High-Performance Coatings:
   1. Tenemec Co., Inc.; Product Tufcoat or approved equal.
   2. Powder Coating: Shop-applied 2-coat powder-coat finish similar to process achieved by Powder Coating of Montana of Missoula, Montana. Powder coating shall be polyester with a 2-4 mil thickness. Color as selected by Architect from powder coating manufacturer's standard colors. Sandblast and prime steel as directed by powder coat manufacturer..
   3. Substitutions: Section 01600 - Product Requirements.

2.02 MATERIALS

A. Coatings - General: Provide complete multi-coat systems formulated and recommended by manufacturer for the applications indicated, in the thicknesses indicated; number of coats specified does not include primer or filler coat.

B. Epoxy Coating: Two coats, water-based epoxy, FS TT-C-535, Type II, semi-gloss finish.
   1. Primer for gypsum wallboard: 51-792 PVA Sealer.

C. Primers: As recommended by coating manufacturer for specific substrate , unless otherwise specified.

D. Shellac: Pure, white type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that substrate surfaces are ready to receive work as instructed by the coating manufacturer. Obtain and follow manufacturer's instructions for examination and testing of substrates.

3.02 PREPARATION

A. Clean surfaces of loose foreign matter.

B. Remove substances that would bleed through finished coatings. If unremovable, seal surface with shellac.

C. Remove finish hardware, fixture covers, and accessories and store.

D. Protect adjacent surfaces and materials not receiving coating from overspray; mask if necessary to provide adequate protection. Repair damage.

3.03 PRIMING

A. Apply primer to all surfaces, unless specifically not required by coating manufacturer. Apply in accordance with coating manufacturer's instructions.

3.04 COATING APPLICATION

A. Apply coatings in accordance with manufacturer's instructions, to thicknesses specified.

B. Apply in uniform thickness coats, without runs, drips, pinholes, brush marks, or variations in color, texture, or finish. Finish edges, crevices, corners, and other changes in dimension with full coating thickness.

3.05 CLEANING

A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

B. Clean surfaces immediately of overspray, splatter, and excess material.

C. After coating has cured, clean and replace finish hardware, fixtures, and fittings previously removed.

3.06 PROTECTION OF FINISHED WORK

A. Protect elements adjacent to the work of this section from damage and disfigurement.

3.07 SCHEDULE

A. Colors: As indicated on Finish Schedule.

END OF SECTION

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 10100

VISUAL DISPLAY BOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Porcelain enamel markerboards.

B. Tackboards.

C. Factory assembled lecture units .

1.02 RELATED SECTIONS

A. Division 6 - Wood Blocking and Curbing: Wood grounds for support of visual display boards.

1.03 REFERENCES

A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

1.04 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data for products specified. Include Material Safety Data Sheets, when applicable.

C. Shop Drawings: Provide shop drawings for each type of visual display board specified.

D. Selection Samples: Submit set of color chips displaying manufacturer's full range of colors and finishes.

E. Maintenance Data: Provide data on cleaning require ments, stain removal, and recommended maintenance precautions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instructions for handling and storage of units.

1.06 FIELD CONDITIONS

A. Field measure prior to fabrication, to ensure proper fit.

B. Do not begin installation of visual display boards until environmental conditions approximate normal occupied conditions.

1.07 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.

B. Submit manufacturer's "Life of the Building" warranty, stating that under normal usage and maintenance, and when installed in accordance with manufacturer's instructions and recommendations, porcelain enamel steel chalkboards and markerboards are guaranteed for the life of the building.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide visual display boards as manufactured by Claridge Products and Equipment, Inc.; Harrison, Arkansas 72602-0910. ASD. Tel: (870) 743-2200. Fax: (870) 743-1908.
   1. Substitutions: See Section 01600 - Product Requirements.

2.02 MARKERBOARD MATERIALS

A. Steel Face Sheets: 0.0239 inch (24 gage) commercial quality steel, fired with porcelain enamel, using the DuPont process.
   1. Face sheets with high-fired brittle ground and finish coats are not acceptable.
   2. Fire porcelain enamel finish at approximately 1000 degrees F, or lowest possible temperature thereunder to reduce steel and porcelain stresses and achieve superior enamel bond and hardness.

B. Core Material: 3/8 inch particle board.

C. Backing Material: 0.002 inch aluminum foil.

D. Metal Trim and Accessories: ASTM B 221 (ASTM B 221M) aluminum alloy.

E. Laminations: Hot-type neoprene contact adhesive applied to both surfaces automatically.
   1. Each substrate shall have minimum 80 percent covering with 1.5-2.0 dry mils of adhesive.
   2. Panel components shall have uniform pressure applied mechanically over entire area.
   3. Laminations shall be made by manufacturer of face sheet.

F. Adhesive: As recommended by manufacturer for project conditions.

2.03 PORCELAIN ENAMEL MARKERBOARDS

A. Provide "LCS" markerboards for project from manufacturer's Series 1.
   1. Metal trim and accessories: Series 2, Type C, heavy gage aluminum extrusions; etched and anodized satin finish.
   2. Size: As indicated on drawings.
   3. Color: As selected from manufacturer's standard colors.

2.04 TACKBOARDS

A. Provide tackboards that are integrated with chalkboards and markerboards, as indicated on the drawings.
   1. Tackboard surfacing: Claridge Cork; 1/4 inch thick cork and oxidized linseed oil laminated to backing of burlap and 1/4 inch hardboard.
   2. Color: As selected from manufacturer's standards.

3. Designer Series

2.05 LECTURE UNITS

A. Premiere Lecture Units by Claridge or approved equal

B. Size: 4' x 6' x 3 3/4"

C. Location: As indicated on drawings.

D. Style: Contemporary

E. Color: wood to be selected by Architect.

2.06 FABRICATION

A. Laminate facing sheet and backing sheet to core material under pressure, using manufacturer's recommended adhesive.

B. Provide factory-assembled visual display boards, except where sizes demand partial field assembly.

C. Assemble units in one piece without joints, wherever possible. Where required dimensions exceed maximum panel size available, provide 2 or more pieces of equal length, as indicated on approved shop drawings. Assemble to verify fit at factory, then disassemble for delivery and final assembly at project site.

PART 3 EXECUTION

3.01 INSTALLATION

A. Comply with manufacturer's installation instructions.

B. Install visual display boards level and plumb, keeping perimeter trim aligned in accordance with manufacturer's recommendations.

3.02 ADJUSTING AND CLEANING

A. Verify that all accessories are installed as required for each unit.

B. Upon completion of installation, clean surfaces and trim in accordance with manufacturer's recommendations, leaving all materials ready for use.

END OF SECTION

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

NOTE: THIS SPECIFICATION SECTION IS FOR INFORMATION ONLY. THE WORK DESCRIBED HEREIN IS NOT IN CONTRACT.

SECTION 10105

WALL DISPLAY SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface-mounted wall display system.

1.02 RELATED SECTIONS

A. Section 09255-Gypsum Board Assemblies: for substrate and backing.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide Manufacturers data sheets and descriptions.

C. Samples: Submit 1 section of molding with hanger, 12 inch in size, illustrating complete system including color.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Deliver system components to project site in sealed original containers.

B. Store materials containers under cover and elevated above grade.

1.05 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.

B. Supply 10 extra hanger assemblies for Owner's use in maintenance of project.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Walker Display Incorporated or approved equal

2.02 MATERIALS

2.03 SURFACE-MOUNTED WALL DISPLAY SYSTEM

A. Walker Picture System.

2.04 COMPONENTS

A. Two Piece Molding: location and extent as indicated on drawings.

B. Acrylic Rods, clear, 6 feet long.
   1. 1 for each 2 feet of molding, minimum 2 per segment of molding.

C. "Lock on" rod sleeves,
   1. 1 for each rod.
   2. Color to match molding

D. "Hi-Holders" designed for holding wire on most artwork
   1. 1 for each rod.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 10155 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes toilet compartments follows:
   1. Type: Solid-plastic, polymer resin.
   2. Compartment Style: Overhead braced and floor anchored.

B. Related Sections include the following:
   1. Division 5 Section "Metal Fabrications" for supports that attach units to overhead structural system.
   2. Division 10 "Toilet and Bath Accessories" for toilet paper holders, grab bars, purse shelves, and similar accessories.

1.3 SUBMITTALS

A. Product Data: For each type and style of toilet compartment and screen specified. Include details of construction relative to materials, fabrication, and installation. Include details of anchors, hardware, and fastenings.

B. Shop Drawings: For fabrication and installation of toilet compartment and screen assemblies. Include plans, elevations, sections, details, and attachments to other work.
   1. Show locations of reinforcement and cutouts for compartment-mounted toilet accessories.

C. Samples for Initial Selection: Manufacturer's color charts consisting of sections of actual units showing the full range of colors, textures, and patterns available for each type of compartment or screen indicated.

D. Samples for Verification: Of each compartment or screen color and finish required, prepared on 6-inch- (150-mm-) square Samples of same thickness and material indicated for Work.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions in areas of installation by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate supports, adjacent construction, and fixture locations to ensure actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by :
   1. Compression Polymers Group; Comtec Industries, Standard Series S200 or approved equal.

2.2 MATERIALS

A. General: Provide materials that have been selected for surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are unacceptable.

B. Solid-Plastic, Polymer Resin: High-density polyethylene (HDPE) with homogenous color throughout. Provide material not less than 1 inch (25 mm) thick with seamless construction and eased edges in color and pattern as follows:
   1. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range of colors and patterns.

C. Pilaster Shoes and Sleeves (Caps): ASTM A 666, Type 302 or 304 stainless steel, not less than 0.0312 inch (0.8 mm) thick and 3 inches (75 mm) high, finished to match hardware.

D. Stirrup Brackets: Manufacturer's standard ear or U-brackets for attaching panels and screens to walls and pilasters of the following material:
   1. Material: Stainless steel.

E. Full-Height (Continuous) Brackets: Manufacturer's standard design for attaching panels and screens to walls and pilasters of the following material:
   1. Material: Stainless steel.

F. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories of the following material:
   1. Material: Stainless steel.

G. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile in manufacturer's standard finish.

H. Heat-Sink Strip: Manufacturer's standard continuous, extruded-aluminum strip in manufacturer's standard finish.

I. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. General: Provide standard doors, panels, screens, and pilasters fabricated for compartment system. Provide units with cutouts and drilled holes to receive compartment-mounted hardware, accessories, and grab bars, as indicated.

B. Solid-Plastic, Polymer-Resin Compartments and Screens: Provide aluminum heat-sink strips at exposed bottom edges of HDPE units to prevent burning.

C. Overhead-Braced-and-Floor-Anchored Compartments: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.
   1. Provide manufacturer's standard 4-inch- (100-mm-) high, overhead cross bracing.

D. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be handicapped accessible.
   1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold door open at any angle up to 90 degrees.
   2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit with combination rubber-faced door strike and keeper designed for emergency access. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be handicapped accessible.
   3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
   4. Door Bumper: Manufacturer's standard rubber-tipped bumpers at out-swinging doors or entrance screen doors.
   5. Door Pull: Manufacturer's standard unit that complies with accessibility requirements of authorities having jurisdiction at out-swinging doors. Provide units on both sides of doors at compartments indicated to be handicapped accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch (13 mm) between pilasters and panels and not more than 1 inch (25 mm) between panels and walls. Secure units in position with manufacturer's recommended anchoring devices.

1. Secure panels to walls and panels with not less than 2 stirrup brackets attached near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

B. Overhead-Braced-and-Floor-Anchored Compartments: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than 2 fasteners. Hang doors and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

3.2 ADJUSTING AND CLEANING

A. Hardware Adjustment: Adjust and lubricate hardware according to manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors and swing doors in entrance screens to return to fully closed position.

B. Provide final protection and maintain conditions that ensure toilet compartments and screens are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10155

SECTION 10500

LOCKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Locker units with hinged doors.

B. Locker benches.

1.02 REFERENCES

A. ASTM A 653/A 653M - Standard Specification for Steel Sheets, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.03 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on locker types, sizes and accessories.

C. Shop Drawings: Indicate locker plan layout, numbering plan and combination lock code.

D. Samples: Submit two samples 3 x 6 inches in size, of each color scheduled; applied to specified base metal.

E. Manufacturer's Installation Instructions: Indicate component installation assembly.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Protect locker finish and adjacent surfaces from damage.

PART 2 PRODUCTS

2.01 MATERIALS

A. Sheet Steel: ASTM A 653/A 653M SS Grade 50 (340), G90/Z275 coating, stretcher leveled; to the following minimum thicknesses:
   1. Body and Shelf: 24 gage 0.024 inch
   2. Door Outer Face: 18 gage 0.048 inch
   3. Door Inner Face: 20 gage 0.036 inch
   4. Door Frame: 16 gage 0.060 inch
   5. Hinges: 14 gage 0.075 inch
   6. Base: 20 gage 0.036 inch
   7. Trim: 20 gage 0.036 inch

2.02 ACCESSORIES

A. For Each Locker: Two single prong wall hooks, coat hanger bar.

B. Locker Benches: Stationary type; bench top of laminated _____ species wood, stained, sealed and varnished; pedestals of _____, ____ inches high.

2.03 FABRICATION

A. Locker Units:

B. Depth: 24 inches.

C. Height: 84 inches.

D. Configuration: single tier.

E. Mounting: Surface mounted.

F. Base: Metal base.
1. Base Height: 4 inch.

G. Locking: Equipped for padlock hasps.

H. Ventilation Method: Door louvers.

I. Class: Conventional.

J. Locker Body: Formed and flanged; with steel stiffener ribs; electric spot welded.

K. Frames: Formed channel shape, welded and ground flush, welded to body, resilient gaskets and latching for quiet operation.

L. Doors: Hollow channel construction, 1 3/16 inch thick; welded construction, channel reinforced top and bottom with intermediate stiffener ribs, grind and finish edges smooth.

M. Hinges: Two for doors under 42 inches high; three for doors over 42 inches high; weld securely to locker body and door.

N. Locking device supplied by Owner.

O. Provide ventilation openings at top and bottom of each locker.

P. Form recess for operating handle and locking device.

Q. Finish edges smooth without burrs.

R. Fabricate sloped metal tops, ends and closure pieces.

S. Provide perforated end panels and filler strips.

2.04 FINISHING

A. Clean, degrease, and neutralize metal; prime and finish with two coats of baked enamel.

B. Paint locker units 1 color, as selected.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that prepared bases are in correct position and configuration.

B. Verify bases are properly sized.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install lockers plumb and square.

C. Place and secure on prepared base.

D. Bolt adjoining locker units together to provide rigid installation.

E. Install filler panels.

F. Install accessories.

G. Replace components that do not operate smoothly.

3.03 CLEANING

A. Clean locker interiors and exterior surfaces.

END OF SECTION

This page intentionally blank

SECTION 10520 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
Portable fire extinguishers.
Fire-protection cabinets for the following:
a. Portable fire extinguishers.

B. Related Sections include the following:
Division 9 Section "Painting" for field-painting fire-protection cabinets.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
Fire Extinguishers: Include rating and classification.
Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
Provide extinguishers listed and labeled by FM.

1.5 COORDINATION

A. Coordinate size of cabinets to ensure that type and capacity of fire extinguishers indicated and provided by Owner under separate Contract are accommodated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
Portable Fire Extinguishers:
a. Kidde: Walter Kidde, The Fire Extinguisher Co.
Fire-Protection Cabinets:
b. Modern Metal Products; Div. of Technico.
c. Potter-Roemer; Div. of Smith Industries, Inc.
d. Thomas Enterprises.
e. Watrous; Div. of American Specialties, Inc.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.

Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows: Stainless-Steel Sheet: ASTM A 666/A 666M, Type 302 or Type 304 alloy.

2.3 PORTABLE FIRE EXTINGUISHERS

A. General: Provide fire extinguishers of type, size, and capacity for each cabinet and other locations indicated.

B. Multipurpose Dry-Chemical Type: UL-rated 4-A:60-B:C, 10-lb (4.5-kg) nominal capacity, in enameled-steel container.

2.4 FIRE-PROTECTION CABINETS

A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
Fire-Rated Cabinets: Listed and labeled to meet requirements of ASTM E 814 for fire-resistance rating of wall where it is installed.

a. Construct fire-rated cabinets with double walls fabricated from 0.0478-inch- (1.2-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material.
b. Provide factory-drilled mounting holes.

Cabinet Metal: Enameled-steel sheet.
Fire extinguisher.

B. Cabinet Mounting: Suitable for the following mounting conditions:
Semirecessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.

C. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
Trimless: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet.
a. Provide recessed flange, of same material as box, attached to box to act as plaster stop.

Stainless-steel sheet.

D. Door Material: Manufacturer's standard, as follows:
Stainless-steel sheet.

E. Door Glazing: Manufacturer's standard, as follows:
Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm.
a. Door Style: Manufacturer's standard design, as follows:

Center glass panel with frame.

F. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
Provide minimum 1/2-inch- (13-mm-) thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
Provide inside latch and lock for break-glass panels.

G. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.5 ACCESSORIES

A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.
Provide brackets for extinguishers located in cabinets.

B. Lettered Door Handle: Provide one-piece, cast-iron door handle with the word "FIRE" embossed into face.

C. Door Locks: Provide cylinder lock, with all cabinets keyed alike.

D. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.
Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
   a. Lettering Color: Red.
   b. Orientation: Horizontal.

2.6 COLORS AND TEXTURES

A. Colors and Textures: As indicated by referencing manufacturer's designations.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:
Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.

2.8 STAINLESS-STEEL FINISHES

A. General: Remove or blend tool and die marks and stretch lines into finish. Grind and polish surfaces to produce uniform, directionally textured polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

B. Polished and Buffed Finish: Oil-ground, 180-grit finish followed by buffing.

C. Satin, Directional Polish: No. 6 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for hose valves, hose racks, and cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets are to be installed.

C. Examine fire extinguishers for proper charging and tagging.
Remove and replace damaged, defective, or undercharged units.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing fire-protection specialties.

B. Install in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
Prepare recesses for cabinets as required by type and size of cabinet and trim style.
Fasten mounting brackets to structure and cabinets, square and plumb.
Fasten cabinets to structure, square and plumb.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust cabinet doors that do not swing or operate freely.

B. Refinish or replace cabinets and doors damaged during installation.

C. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

END OF SECTION 10520

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 10651

OPERABLE PANEL PARTITIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustic operable panel partition.

B. Ceiling track and operating hardware.

1.02 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Wood blocking and track support shimming.

1.03 REFERENCES

A. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

C. ASTM E 413 - Classification for Rating Sound Insulation.

D. ASTM E 557 - Standard Practice for Architectural Application and Installation of Operable Partitions.

E. ASTM E 596 - Standard Test Method for Laboratory Measurement of Noise Reduction of Sound-Isolating Enclosures.

F. FS CCC-W-408 - Wall Covering, Vinyl-Coated; Federal Specifications and Standards.

1.04 SUBMITTALS

A. See Division 1- Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on partition materials.

C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, and stacking depth.

D. Samples for Selection: Submit two samples of full manufacturer's color range for selection of colors.

E. Samples for Review: Submit two samples of surface finish, 12 x 12 inches size, illustrating quality.

F. Manufacturer's Instructions: Indicate special procedures.

G. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods. Describe cleaning materials detrimental to finish surfaces and hardware finish.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this section with minimum 5 years of experience.

1.06 PROJECT CONDITIONS

A. Coordinate the work with other sections providing panel finish materials to this section.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Design is based on Hufcor; Product Model 5500R or approved equal.

2.02 COMPONENTS

A. Operable Panel Partition: Center opening; paired panels; center stacking; manually operated.
   1. Sound Transmission Class (STC): 43-47 calculated in accordance with ASTM E 413, based on tests conducted in accordance with ASTM E 90, on panel size of 100 sq ft.
   2. Flame/Smoke Rating Panel Finish: 25/50, in accordance with ASTM E 84.
   3. Installed partition system track capable of supporting imposed loads, with maximum deflection of 1/360 of span.

B. Panel Construction:

C. Core: 16 gage formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, internally reinforced at suspension points, with acoustical insulation fill.
   1. Thickness with Finish: 3 inches.
   2. Factory applied surface finish.
   3. Trim: Trimless.
   4. Hinges: Continuous piano type, 18 gage stainless steel.
   5. Panel to Panel Seals: continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.

D. Track: Extruded aluminum; 2 1/4"x3 1/2" inches size; thickness and profile designed to support loads.

E. Carriers: Nylon wheels on trolley carrier at top of every 1 panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.

F. Acoustic Seals: Flexible acoustic seals at jambs, ceilings, retractable floor and ceiling seals,.

G. Vinyl Coated Fabric: FS CCC-W-408, Type III - Heavy, Class 1 - Regular; polyvinyl fluoride finish for washability and improved flame retardance; color as selected from manufacturer's standard range, over 1/4" tackable layer..

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify track supports are laterally braced and will permit track to be level within 1/4 inch of required position and parallel to the floor surface.

C. Verify floor flatness of 1/8 inch in 10 feet, non-cumulative.

D. Verify wall plumbness of 1/8 inch in 10 feet, non-cumulative.

3.02 INSTALLATION

A. Install partition in accordance with manufacturer's instructions and ASTM E 557.

B. Fit and align partition assembly level and plumb.

C. Lubricate moving components.

3.03 ADJUSTING

A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.

B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.

C. Adjust partition assembly to achieve lightproof seal.

3.04 CLEANING

A. Clean finish surfaces and partition accessories.

3.05 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation of partition, identify potential operational problems.

END OF SECTION

This page intentionally blank

SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Toilet and bath accessories.
2. Grab bars
3. Shower curtain rods

B. Related Sections include the following:
1. Division 9 Section "Ceramic Tile" for ceramic toilet and bath accessories.
2. Division 10 Section "Toilet Compartments" for compartments and screens.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required. Use designations indicated in the Toilet and Bath Accessory Schedule and room designations indicated on Drawings in product schedule.

C. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE

A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.

B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.

1. Products of other manufacturers with equal characteristics, as judged solely by Architect, may be provided.

1.5 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering accessories that may be incorporated into the Work include, but are not limited to, the following:

1. Toilet and Bath Accessories:
   a. Bobrick Washroom Equipment, Inc.
2. Underlavatory Guards:
   a. Brocar Products, Inc.
   b. Truebro, Inc.

B. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Toilet and Bath Accessory Schedule at the end of Part 3.

2.2 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch (0.8-mm) minimum nominal thickness, unless otherwise indicated.

B. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch (0.9-mm) minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.

C. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION

A. General: One, maximum 1-1/2-inch- (38-mm-) diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

B. General: Names or labels are not permitted on exposed faces of accessories. On interior surface not exposed to view or on back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.

C. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.

D. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.

E. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
   1. Provide galvanized steel backing sheet, not less than 0.034 inch (0.85 mm) and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.

F. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
   1. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
   2. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

G. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.

C. Install grab bars to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 10800

This page intentionally blank

SECTION 11132 - PROJECTION SCREENS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Electrically Operated Front-projection screens.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for wood backing for recessed screen installation.

1.3 DEFINITIONS

A. Gain: Ratio of light reflected from or refracted by screen material to that reflected perpendicularly from a magnesium carbonate surface as determined per FS GG-S-00172D(1).

B. Half-Gain Angle: The angle, measured from the axis of the screen surface, to the most central position on perpendicular plane through the horizontal centerline of the screen where the gain is half of the peak gain.

1.4 SUBMITTALS

A. Product Data: For each type of screen specified.

1.5 Shop Drawings: Show layout and types of projection screens. Include the following:
   1. Location of screen centerline relative to ends of screen case.
   2. Location of wiring connections.
   3. Connections to suspension systems for pendant- and recess-mounted screens.
   4. Anchorage details.
   5. Details of juncture of exposed surfaces with adjacent finishes.
   6. Frame details.
   7. Accessories.
   8. Wiring Diagrams: For electrically operated units.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain projection screens through one source from a single manufacturer. Obtain each screen as a complete unit, including necessary mounting hardware and accessories.

B. Coordination of Work: Coordinate layout and installation of projection screens with other construction supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system, and partitions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver projection screens until building is enclosed, other construction within spaces where screens will be installed is substantially complete, and installation of screens is ready to begin.

PART 2 - PRODUCTS

2.1 FRONT-PROJECTION SCREENS

A. Material and Viewing Surface of Front-Projection Screens: Provide screens manufactured from mildew- and flame-resistant fabric of type indicated for each type of screen specified and complying with the following requirements:
   1. Glass-beaded viewing surface with gain characteristics complying with FS GG-S-00172D(1) for Type C screen surface.
      a. Provide washable, glass-beaded viewing surface.
   2. Material: Vinyl-coated glass-fiber fabric.
   3. Mildew Resistance: Provide mildew-resistant screen fabrics as determined by FS 191A/5760.
   4. Seamless Construction: Provide screens in sizes indicated without seams.
   5. Edge Treatment: Black masking borders.
   6. Provide extra drop length of dimension indicated to comply with the following requirements for fabric color and location of drop length:
      a. Color: Same as viewing surface.
      b. Location: At top of screen.
   7. Size of Viewing Surface: As indicated.

B. Electrically Operated Screens, General: Provide manufacturer's standard UL-labeled units consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation. Remotely control operation of each screen to comply with the following:
   1. Single-Station Control: 3-position control switch with metal device box and cover plate for flush wall mounting and for connection to 120-V, ac power supply.

      2. Motor: Provide either motor in roller or end-mounted motor.
   3. Motor in Roller: Instant-reversing motor of size and capacity recommended by screen manufacturer with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions,

and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.

4. End-Mounted Motor: Instant-reversing, gear-drive motor of size and capacity recommended by screen manufacturer with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Locate motor in its own compartment as follows:

5. Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a 3/8-inch- (9.5-mm-) diameter, metal rod with ends of rod protected by plastic caps.

a. Roller for end-mounted motor supported by self-aligning bearings in brackets.
b. Roller for motor in roller supported by vibration- and noise-absorbing supports.

C. Electrically Operated Screens without Ceiling Closure: Units designed and fabricated for recessed installation with bottom of case entirely or partially open under screen compartment, to allow lowering and raising of screen, but closed under motor compartment, and as follows:

1. Screen Case: Aluminum and fire-retardant hardboard construction, factory primed.

D. Products: Subject to compliance with requirements, provide one of the following:

1. Glass-Beaded Viewing Surfaces:
a. High Power; Da-Lite Screen Co., Inc.

2. Electrically Operated Screens without Ceiling Closure, End-Mounted Motor:

a. Series 700; Bretford Manufacturing, Inc.
b. Series 900; Bretford Manufacturing, Inc.
c. Series 7500; Bretford Manufacturing, Inc.
d. Series 9500; Bretford Manufacturing, Inc.
e. Senior Electrol; Da-Lite Screen Co., Inc.
f. Rolleramic; Draper Shade & Screen Co., Inc.
g. Model B; Stewart Filmscreen Corp.

3. Electrically Operated Screens without Ceiling Closure, Motor in Roller:

a. Cosmopolitan Electrol; Da-Lite Screen Co., Inc.
b. Paragon; Draper Shade & Screen Co., Inc.
c. Premier; Draper Shade & Screen Co., Inc.
d. Targa; Draper Shade & Screen Co., Inc.
e. Model A; Stewart Filmscreen Corp.
f. Model A-B; Stewart Filmscreen Corp.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install projection screens at locations indicated to comply with screen manufacturer's written instructions.

B. Install front-projection screens with screen cases in position and relationship to adjoining construction indicated. Securely anchor to supporting substrate in a manner that produces a smoothly operating screen with vertical edges plumb and viewing surface flat when screen is lowered.

1. Test electrically operated units to verify that screen, controls, limit switches, closure, and other operating components are in optimum functioning condition.

3.2 PROTECTING AND CLEANING

A. Protect projection screens after installation from damage during construction. If damage occurs despite such protection, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION

SECTION 11610 - LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Bench-top laboratory fume hoods.
2. Fume hood base cabinets with countertops.
3. Laboratory sinks and cup sinks in fume hoods.
4. Water, laboratory gas, and electrical service fittings in fume hoods.

B. Related Sections include the following:

1. Division 12 Section "Wood Laboratory Casework" for wood laboratory casework, including countertops, sinks, and service fittings.
2. Division 15 Sections for fume hood duct connections, including ducts.
3. Division 15 and 16 Sections for installing service fittings in fume hoods.

1.3 PERFORMANCE REQUIREMENTS

A. Containment: Provide fume hoods with the following performance ratings at a face velocity of 100 fpm (0.51 m/s) and a release rate of 4.0 L/min. when tested according to ASHRAE 110:

1. As-Manufactured Rating: AM 0.10 (0.10 ppm).
2. As-Manufactured Rating: AM 0.05 (0.05 ppm).
3. As-Manufactured Rating: AM 0.02 (0.02 ppm).

1.4 SUBMITTALS

A. Product Data: For each type of laboratory fume hood specified.

B. Shop Drawings: For laboratory fume hoods. Include plans, elevations, sections, details, and attachments to other work.

1. Indicate locations of blocking and other supports required for installing fume hoods.
2. Indicate locations and types of service fittings, together with associated service connections required.
3. Indicate plumbing connections, duct connections, electrical connections, and locations of access panels.

4. Include roughing-in information for mechanical, plumbing, and electrical connections.
5. Show adjacent walls, doors, windows, other building components, laboratory casework, and other laboratory equipment. Indicate clearances from above items.
6. Include layout of fume hoods in relation to lighting fixtures and air-conditioning registers and grilles.
7. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for fume hood exterior, cabinets, and each type of top material indicated.

D. Product Test Reports: Based on evaluation of tests performed by manufacturer and witnessed by a qualified independent testing agency, indicate compliance of fume hoods with requirements based on comprehensive testing of hoods.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain laboratory fume hoods through one source from a single manufacturer.

1. Obtain through same source from the same manufacturer as laboratory casework specified in Division 12 Section "Wood Laboratory Casework."

B. Product Designations: Drawings indicate sizes and types of fume hoods by referencing designated manufacturer's catalog numbers. Other manufacturers' hoods of similar sizes and types, and complying with the Specifications may be considered. Refer to Division 1 Section "Substitutions."

C. Fume Hood Standard: Provide fume hoods complying with the requirements of SEFA 1.1, "Laboratory Fume Hoods--Recommended Practices."

D. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR, Part 1201 for Category II materials.

1.6 PRODUCT HANDLING

A. Coordinate delivery of fume hoods with delivery of other laboratory casework components.

B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.7 COORDINATION

A. Coordinate installation of fume hoods with laboratory casework, fume hood exhaust ducts, and plumbing and electrical work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fisher Hamilton Scientific, Inc.

2.2 MATERIALS

A. Steel Sheet: Commercial-quality, cold-rolled, carbon-steel sheet, complying with ASTM A 366 (ASTM A 366M); matte finish; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.

B. Stainless-Steel Sheet: ASTM A 666, Type 302 or 304, stretcher leveled, No. 4 finish.

C. Epoxy: Factory-molded, modified, epoxy-resin formulation, uniform mixture throughout, full thickness with smooth, nonspecular finish.

1. Physical Properties: Comply with the following minimum requirements:

a. Flexural strength: 15,000 psi (100 MPa).
b. Compressive strength: 30,000 psi (200 MPa).
c. Hardness (Rockwell M): 100.
d. Water absorption (24 hours): 0.02 percent (maximum).
e. Heat distortion point: 350 deg F (177 deg C).
f. Thermal-shock resistance: Highly resistant.

2. Flame Spread: 25 or less per ASTM E 84.
3. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, test procedure 3.9.5:

a. Acetone: Moderate effect.
b. Acetic acid (98 percent): No effect.
c. Hydrochloric acid (37 percent): No effect.
d. Nitric acid (70 percent): No effect.
e. Phosphoric acid (85 percent): No effect.
f. Sulfuric acid (33 percent): No effect.
g. Benzene: No effect.
h. Butyl alcohol: No effect.
i. Carbon tetrachloride: No effect.
j. Ethyl acetate: No effect.
k. Ethyl ether: No effect.
l. Formaldehyde: No effect.
m. Phenol (85 percent): No effect.
n. Xylene: No effect.
o. Ammonium hydroxide (28 percent): No effect.
p. Sodium hydroxide (50 percent): Moderate effect.

q. Zinc chloride: No effect.

D. Glass-Fiber Cement Board: 1/4-inch- (6.35-mm-) thick, glass-fiber cement board complying with ASTM C 1186.

E. Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

F. Laminated Safety Glass: ASTM C 1172, Kind LT; Kind FT, Condition A, Type I, Class I, Quality q3 lites with clear, polyvinyl butyral interlayer.

G. Polycarbonate Glazing: Clear, uncoated polycarbonate sheet manufactured by the extrusion process and complying with the following requirements:

1. Impact Resistance: 12 to 16 ft-lbf/in. (640 to 850 J/m) per ASTM D 256, Method A (Izod type).
2. Elongation and Modulus of Elasticity: 110 percent maximum and 340,000 psi (2345 MPa), respectively, per ASTM D 638 (ASTM D 638M).
3. Heat Deflection: 270 deg F (132 deg C) at 264 psi (1820 kPa) per ASTM D 638 (ASTM D 638M).
4. Flame Spread: 25 or less per ASTM E 84.

2.3 CONVENTIONAL FUME HOODS

A. Provide conventional fume hoods designed to operate with a face velocity of 100 fpm (0.51 m/s) with sash fully open. As sash is closed, hood exhaust volume decreases and face velocity increases. With sash closed, hood maintains a slight negative pressure to confine fumes and gases.

B. Splay top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.

C. Variable Air Volume Control: Equip fume hoods with an electronic control unit with a sensing device that monitors face velocity and a motorized damper on the exhaust connection that maintains a constant face velocity by controlling air volume in response to control unit.

2.4 FABRICATION

A. Steel Exterior: Fabricate from steel sheet, 0.0478 inch (1.2 mm) thick, with component parts screwed together to allow removal of end panels, front fascia, and airfoil, and to allow access to plumbing lines and service fittings. Apply finish to interior and exterior surface of component parts before final assembly.

B. Ends: Double-wall end panels without projecting corner posts or other obstructions to interfere with smooth, even airflow. Close area between double walls at front of fume hood and as needed to house sash counterbalance weights, utility lines, and remote-control valves.

C. Interior Lining: Unless otherwise indicated, provide fume hoods with linings of the following material:

1. Material: Glass-fiber cement board with acid-resistant, light-reflecting, white finish.

2. Material: Steel sheet, 0.0478 inch (1.2 mm) thick, epoxy coated.
3. Material: Glass-fiber-reinforced polyester not less than 1/4 inch (6.35 mm) thick.
4. Material: Epoxy, 1/4 inch (6.35 mm) thick.
5. Material: Any material above.

D. Lining Assembly: Unless otherwise indicated, assemble with stainless-steel fasteners or epoxy adhesive, concealed where possible. Provide end panels, back panel, and top fastened together with cleats or steel angles to form a rigid assembly to which exterior is attached.

1. Seal joints with chemical-resistant sealant before assembly to prevent open joints or spaces. Use stainless-steel, truss-head screws or rivets (not countersunk) for assembly of panels and to provide maximum strength joints.
2. Punch fume hood lining side panels to receive remote controls and service fittings as indicated. Furnish removable plug buttons for holes not used for indicated fittings.

E. Molded Glass-Fiber-Reinforced Polyester Lining: Molded unit consisting of end panels, back panel, preset rear baffle, and top bonded together into a single piece and reinforced to form a rigid assembly to which exterior is attached.

1. Punch fume hood lining side panels to receive remote controls and service fittings as indicated. Furnish removable plug buttons for holes not used for indicated fittings.

F. Stainless-Steel Lining Assembly: Welded unit consisting of end panels, back panel, top, and countertop; reinforced to form a rigid assembly to which exterior is attached.

G. Rear Baffle: Provide baffle, of same material as fume hood lining, at rear of hood with adjustable openings at top and bottom for adjustment of airflow through hood. Secure baffle to cleats at rear of hood with stainless-steel screws. Fabricate baffle for easy removal for cleaning behind baffle.

1. Provide control adjustment strips at top and bottom with plastic or stainless-steel knobs.
2. Provide remote-control adjustment from outside front of fume hood, where indicated.

H. Exhaust Plenum: Full width of fume hood and with adequate volume to provide uniform airflow from hood, of same material as hood lining.

1. Provide stainless-steel, epoxy-coated steel, or glass-fiber-reinforced polyester duct stub for exhaust connection.

I. Sash: Provide operable sashes of type indicated. Fabricate from 0.0500-inch- (1.3-mm-) thick, stainless-steel or PVC extrusions. Form into 4-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.

J. Sash: Provide operable sashes of type indicated. Fabricate from 0.0500-inch- (1.3-mm-) thick stainless steel into 4-sided frame with bottom corners welded and finished smooth. Make top member removable for glazing replacement. Set glazing in chemical-resistant, U-shaped gaskets.

1. Glaze with laminated safety glass, with 3-mm-thick plies.
2. Glaze with 5-mm-thick tempered safety glass.

3. Glaze with safety glass either 5-mm-thick monolithic or laminated with 3-mm-thick plies.
4. Counterbalance vertical sliding sash with sash weight and stainless-steel cable system. Provide ball-bearing sheaves, plastic glides in stainless-steel guides, and stainless-steel lift handles. Provide rubber bumpers at top and bottom of each sash unit.

K. Lights: Provide a vaporproof, 2-tube, rapid-start, fluorescent light fixture, of longest practicable length, complete with tubes at each fume hood. Shield tubes from hood interior by 1/4-inch-(6.35-mm-) thick laminated glass or 3-mm-thick tempered glass, sealed into hood with chemical-resistant rubber gaskets. Set units so fluorescent tubes are easily replaceable from outside of hood.

1. Provide fluorescent tubes with a color temperature of 3500 K and a minimum color rendering index of 85.

L. Base Cabinets: Comply with requirements of Division 12 Section "Wood Laboratory Casework."

M. Countertops and Cup Sinks: Unless otherwise indicated, provide countertops and cup sinks as follows:

1. Epoxy Tops: Fabricate with front overhang of 1 inch (25 mm) over base cabinets, formed with continuous drip groove on underside 1/2 inch (13 mm) from edge and with factory cutouts for sinks.

a. Top Configuration: Flat, with square edges.
b. Top Thickness: 1 inch (25 mm).

2. Cup Sinks: 3-by-6-inch (75-by-150-mm) nominal size with 1-1/2-inch NPS (DN40) outlets with strainers and tailpieces a minimum of 6 inches (150 mm), of the same material as sink, or as otherwise approved by Architect.

N. Filler Strips: Wood or metal, as applicable to match adjoining surfaces. Provide as necessary to close openings between fume hood base cabinet or hood exterior and adjacent building construction.

O. Fasteners: Provide stainless-steel fasteners where exposed to fumes in hood.

2.5 ACCESSORIES

A. Service Fittings: Comply with requirements of Division 12 Section "Wood Laboratory Casework."

1. Provide service fittings with exposed surfaces, including fittings, escutcheons, and trim, finished with acid- and solvent-resistant, baked-on plastic coating in manufacturer's standard metallic brown, aluminum, or other color as approved by Architect.
2. Provide service fittings with parts exposed within fume hoods made from polyvinylidene fluoride.
3. Provide service fittings complying with either of the above.

B. Airflow Indicator: Provide fume hoods with airflow indicator of the following type:

1. Indicator Type: Direct-reading aneroid (Magnehelic-type) gage that measures fume hood exhaust duct static pressure as an indication of airflow.
2. Indicator Type: Thermal anemometer that measures fume hood face velocity and indicates whether it is below normal, normal, or above normal.
3. Indicator Type: Thermal anemometer that measures fume hood face velocity and displays as digital readout.
4. Indicator Type: Any indicator type above.

C. Airflow Alarm: Provide fume hoods with audible and visual alarm that activates when airflow sensor reading is outside of preset range.

1. Provide with thermal-anemometer airflow sensor.
2. Provide with either thermal-anemometer or aneroid (Magnehelic-type) gage airflow sensor.
3. Provide with reset and test switches.
4. Provide with switch that silences audible alarm and automatically resets when airflow returns to within preset range.

D. Sash Alarm: Provide fume hoods with audible and visual alarm that activates when sash is opened beyond preset position.

1. Provide with silence and test switches.

E. Sash Stops: Provide fume hoods with sash stops to limit hood opening to 50 percent of sash height. Sash stops can be manually released to open sash fully for cleaning hood and for placing large apparatus within hood.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install fume hoods according to Shop Drawings and manufacturer's written instructions. Install plumb, level, aligned, and securely anchored to building and adjacent laboratory casework. Securely attach access panels but provide for easy removal and secure reattachment. Where hoods abut other finished work, apply filler strips and scribe for accurate fit with fasteners concealed where practical.

B. Comply with requirements of Division 15 and 16 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring. Install according to Shop Drawings and manufacturer's written instructions. Securely anchor fittings, piping, and conduit to fume hoods and casework, unless otherwise indicated.

3.2 FIELD QUALITY CONTROL

A. Field test hoods according to fume hood standard after completing installation to demonstrate proper operation.

1. Adjust fume hoods, hood exhaust fans, and building's HVAC system, or replace hoods and make other corrections until tested hoods perform as specified.
2. After making corrections, retest fume hoods that failed to perform as specified.

3.3 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near-silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. Repair or remove and replace defective work as directed on completion of installation.

C. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

END OF SECTION 11610

SECTION 12348 - WOOD LABORATORY CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Wood-faced laboratory casework.
2. Laboratory countertops.
3. Laboratory sinks.
4. Accessories.
5. Water, laboratory gas, and electrical service fittings.

B. Related Sections include the following:

1. Division 6 Section "Rough Carpentry" for wood blocking for anchoring laboratory casework.
2. Division 9 Section "Gypsum Board Assemblies" for reinforcements in gypsum board partitions for anchoring laboratory casework.
3. Division 11 Section "Laboratory Fume Hoods" for fume hoods.
4. Division 15 and 16 Sections for installing service fittings specified in this Section.

1.3 DEFINITIONS

A. Exposed Portions of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches (1200 mm) above floor, and visible surfaces in open cabinets or behind glass doors.

1. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets after installation shall not be considered exposed.

B. Semiexposed Portions of Casework: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches (1980 mm) or more above floor are defined as semiexposed.

C. Concealed portions of casework include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.4 SUBMITTALS

A. Product Data: For each type of product specified.

B. Shop Drawings: For wood laboratory casework. Include plans, elevations, sections, details, and attachments to other work.

1. Indicate locations of blocking and other supports required for installing casework.
2. Indicate locations and types of service fittings, together with associated service supply connection required.
3. Include details of utility spaces showing supports for conduits and piping.
4. Include details of exposed conduits, where required for service fittings.
5. Show adjacent walls, doors, windows, other building components, and other laboratory equipment. Indicate clearances from above items.
6. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for cabinets and each type of top material indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain laboratory casework, including tops, sinks, service fittings, and accessories, through one source from a single manufacturer.

1. Obtain through same source from the same manufacturer as fume hoods specified in Division 11 Section "Laboratory Fume Hoods."

B. Product Designations: Drawings indicate sizes, configurations, and finish material of casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes, similar door and drawer configurations, same finish material, and complying with the Specifications may be considered. Refer to Division 1 Section "Substitutions."

C. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with the requirements of NFPA 30 for design, construction, and capacity of storage cabinets by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver laboratory casework until painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions" Article below.

B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels through remainder of construction period.

1.8 COORDINATION

A. Coordinate layout and installation of metal framing and reinforcement in gypsum board assemblies for support of wood laboratory casework.

1.9 EXTRA MATERIALS

A. Furnish complete touchup kit for each type and finish of laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged casework finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wood-Faced Laboratory Casework:

a. Fisher Hamilton Scientific, Inc.

2.2 MATERIALS

A. Exposed Materials: Comply with the following:

1. Exposed Wood: Do not use 2 adjacent exposed faces that are noticeably dissimilar in color, grain, figure, or natural character markings.

a. Wood Species: Maple; plain sliced.

2. Solid Wood: Clear hardwood lumber matching selected species, free of defects, selected for compatible grain and color and kiln dried to 7 percent moisture content.
3. Plywood: Hardwood plywood of species indicated, selected for compatible color and grain. HPVA HP-1, Grade AA faces at least 1/50 inch (0.5 mm) thick and Grade J crossbands. Edgeband exposed edges with minimum 1/8-inch- (3-mm-) thick, solid-wood edging of the same species as face veneer.

B. Semiexposed Materials: Comply with the following:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects and kiln dried to 7 percent moisture content. Any hardwood species similar in color and grain to exposed portions.
2. Plywood: Hardwood plywood of any species similar in color and grain to exposed portions. HPVA HP-1, Grade C faces and Grade J crossbands. Semiexposed backs of plywood with exposed faces shall be the same species as faces.
3. Metal: Commercial-quality, cold-rolled, carbon-steel sheet, complying with ASTM A 366 (ASTM A 366M); matte finish; suitable for exposed applications.

C. Concealed Materials: Comply with the following:

1. Solid Wood or Plywood: Any hardwood or softwood species, with no defects affecting strength or utility. Hardwood and softwood lumber kiln dried to 7 and 12 percent moisture content, respectively. Concealed backs of plywood with exposed or semiexposed faces shall be the same species as faces.

D. Clear Float Glass for Glazed Doors: ASTM C 1036, Type I, Class 1, Quality q3, 5.5 mm thick.

2.3 DESIGN, COLOR, AND FINISH

A. Design: Provide wood laboratory casework of the following design:

1. Flush overlay.

B. Colors and Finishes: Comply with the following requirements for colors and finishes of wood laboratory casework:

1. Colors and Finishes: Provide Architect's selections from wood casework manufacturer's full range of colors and finishes.

2.4 FABRICATION

A. Construction: Provide wood-faced laboratory casework of the following minimum construction:

1. Bottoms and ends of cabinets, shelves, and tops of wall cabinets and tall cabinets: 3/4-inch (19-mm) plywood.
2. Top frames of base cabinets: 3/4-by-2-inch (19-by-51-mm) solid wood with mortise and tenon or doweled connections, glued and pinned or screwed.
3. Backs of cabinets: 3/4-inch (19-mm) plywood where exposed, 1/4-inch (6.4-mm) hardboard dadoed into sides, bottoms, and tops where not exposed.
4. Drawer fronts: 3/4-inch (19-mm) plywood or solid hardwood.
5. Drawer sides and backs: 1/2-inch (13-mm) solid wood or 7/16-inch (11-mm) plywood, with glued dovetail joints.

6. Drawer bottoms: 1/4-inch (6.4-mm) hardboard glued and dadoed into front, back, and sides of drawers.
7. Doors 48 inches (1220 mm) or less in height: 3/4 inch (19 mm) thick with solid hardwood stiles and rails, particleboard or medium-density fiberboard cores, and hardwood face veneers and crossbands.
8. Doors more than 48 inches (1220 mm) in height: 1-1/16 inch (27 mm) thick with solid hardwood stiles and rails, honeycomb cores, and hardwood face veneers and crossbands.
9. Stiles and rails of glazed doors: 1-1/16-by-3-inch (27-by-76-mm) solid hardwood with mortise and tenon or doweled connections, glued and screwed.

B. Leg Shoes: Vinyl or rubber, black, open-bottom type.

C. Utility-Space Framing: Manufacturer's standard steel framing units consisting of 2 cold-rolled C-channel uprights, not less than 1-5/8 inches (41 mm) square by 0.10 inch (2.5 mm) thick, connected together at the top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch (32-by-6-mm) flat bars. Framing units may be made by welding C-channel material specified for uprights into rectangular frames instead of using U-shaped brackets.

D. Base Molding: Extruded vinyl or rubber, black, 4 inches (100 mm) high. Provide on fronts and exposed sides of floor-mounted casework.

E. Filler Strips: Provide as needed to close space between cabinets and walls, ceilings, and indicated equipment. Fabricate from the same material and with the same finish as cabinets.

2.5 FINISH FOR WOOD LABORATORY CASEWORK

A. Preparation: Machine sand lumber and plywood for casework construction before assembling. Sand edges of doors and drawer fronts and molded shapes with profile-edge sander. Hand sand casework after assembling for uniform smoothness at least equivalent to that produced by 220 grit sanding and without machine marks, cross sanding, or other surface blemishes.

B. Staining: Remove fibers and dust with compressed air or tack cloths and apply wash-coat sealer and stain to exposed and semiexposed surfaces as required to provide uniform, color-matching, approved samples.

C. Chemical-Resistant Finish: Apply manufacturer's standard 2-coat, chemical-resistant, baked, clear finish consisting of a thermosetting catalyzed sealer and a thermosetting catalyzed conversion varnish. Hand sand and wipe clean between applying sealer and topcoat. Topcoat may be omitted on fully concealed surfaces.

D. Chemical and Physical Resistance of Finish System: Provide wood laboratory casework with finish system complying with the following requirements for chemical and physical resistance:

1. Chemical Resistance: Capable of withstanding application of not less than 5 drops (0.25 mL) of the following reagents applied to finish surface; covered with a watch glass for 60 minutes, rinsed, and dried; with no permanent change in gloss, color, film hardness, adhesion, or film protection.

a. Acetic acid (98 percent).
b. Hydrochloric acid (37 percent).
c. Nitric acid (10 percent).
d. Phosphoric acid (75 percent).
e. Sulfuric acid (25 percent).
f. Acetone.
g. Benzene.
h. Carbon tetrachloride.
i. Ethyl acetate.
j. Ethyl alcohol.
k. Ethyl ether.
l. Formaldehyde (37 percent).
m. Methyl ethyl ketone.
n. Toluene.
o. Xylene.
p. Ammonium hydroxide (28 percent).
q. Potassium hydroxide (40 percent).
r. Sodium carbonate (saturated).
s. Sodium chloride (saturated).
t. Sodium hydroxide (25 percent)

2. Moisture Resistance: No visible effect when exposed to the following:

a. Hot water at a temperature of 190 to 205 deg F (88 to 96 deg C), trickled down the surface at a 45-degree angle for 5 minutes.
b. Constant moisture using a 2-by-3-by-1-inch (51-by-76-by-25-mm) cellulose sponge, soaked with water, in contact with surface for 100 hours.

2.6 CASEWORK HARDWARE

A. Hardware, General: Provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Hinges: Stainless-steel, complying with BHMA 156.9, Grade 1, with antifriction bearings and rounded tips. Provide 2 for doors less than 48 inches (1200 mm) high and 3 for doors more than 48 inches (1200 mm) high.

C. Pulls: Solid aluminum, stainless steel, or chrome-plated brass, fastened from back with 2 screws. For sliding doors, provide stainless-steel or chrome-plated recessed flush pulls. Provide 2 pulls for drawers more than 24 inches (600 mm) wide.

D. Door Catches: Nylon-roller spring catch or dual, self-aligning, permanent magnet catch. Provide 2 catches on doors more than 48 inches (1200 mm) high.

E. Drawer Guides: Metal-channel, self-closing drawer guides, designed to prevent rebound when drawers are closed, with nylon-tired, ball-bearing rollers, and complying with BHMA A156.9, Type B05091.

F. Label Holders: Stainless steel or chrome plated, sized to receive standard label cards approximately 1 by 2 inches (25 by 51 mm), attached with screws or brads.

1. Provide on all drawers.

G. Drawer and Cupboard Locks: Cylindrical type, 5-pin tumbler and cam, brass with chrome-plated finish, complying with BHMA A156.11, Grade 1.

1. Provide minimum of 2 keys per lock and 6 master keys.
2. Provide where indicated.

H. Sliding-Door Hardware Sets: Manufacturer's standard, to suit type and size of sliding-door units.

I. Adjustable Shelf Supports: Mortise-type steel standards and steel shelf rests, with epoxy powder-coated finish, complying with BHMA A156.9, Types B04071 and B04091.

2.7 TOPS, SINKS, AND TROUGHS

A. Tops, General: Provide smooth, clean exposed tops and edges in uniform plane free of defects. Make exposed edges and corners uniformly beveled. Provide front and end overhang of 1 inch (25 mm) over base cabinets, formed with continuous drip groove on underside 1/2 inch (13 mm) from edge.

B. Sinks, General: Provide sizes indicated or manufacturer's closest standard size of equal or greater volume, as approved by Architect.

1. Outlets: 1-1/2-inch NPS (DN40) outlets with strainers and tailpieces a minimum of 6 inches (150 mm) long, of the same material as sink, or as otherwise approved by Architect.
2. Overflows: For each sink, except cup sinks, provide overflow of standard beehive or open-top design and with separate strainer. Height 2 inches (51 mm) less than sink depth. Provide in the same material as sink.

C. Epoxy Tops, Sinks, and Troughs: Factory molded of modified epoxy-resin formulation, uniform mixture throughout full thickness with smooth, nonspecular finish.

1. Physical Properties: Comply with the following minimum requirements:

a. Flexural strength: 15,000 psi (100 MPa).
b. Compressive strength: 30,000 psi (200 MPa).
c. Hardness (Rockwell M): 100.
d. Water absorption (24 hours): 0.02 percent (maximum).
e. Heat distortion point: 350 deg F (177 deg C).
f. Thermal-shock resistance: Highly resistant.

2. Chemical Resistance: Epoxy-resin material has the following ratings when tested with indicated reagents according to NEMA LD 3, test procedure 3.9.5:

a. Acetone: Moderate effect.
b. Acetic acid (98 percent): No effect.
c. Hydrochloric acid (37 percent): No effect.
d. Nitric acid (70 percent): No effect.
e. Phosphoric acid (85 percent): No effect.
f. Sulfuric acid (33 percent): No effect.
g. Benzene: No effect.
h. Butyl alcohol: No effect.
i. Carbon tetrachloride: No effect.
j. Ethyl acetate: No effect.
k. Ethyl ether: No effect.
l. Formaldehyde: No effect.
m. Phenol (85 percent): No effect.
n. Xylene: No effect.
o. Ammonium hydroxide (28 percent): No effect.
p. Sodium hydroxide (50 percent): Moderate effect.
q. Zinc chloride: No effect.

3. Colors: Provide products that result in colors complying with the following requirements:

   a. Color: black

4. Top Fabrication: Cast surfaces very smooth, with factory cutouts for sinks. Fabricate plain butt-type joints assembled with epoxy adhesive and prefitted, concealed metal splines.
   a. Top Configuration: Square edge with drip groove and applied backsplash.
   b. Top Thickness: 1” inch
5. Sink Fabrication: Molded in one piece with surfaces smooth, corners coved, and bottom sloped to outlet; 1/2-inch (13-mm) minimum thickness.
   a. Bond epoxy sinks installed in epoxy tops to tops and finish to produce an integral unit with invisible joint line.

2.8 ACCESSORIES

A. As indicated on drawings or equal

2.9 WATER AND LABORATORY GAS SERVICE FITTINGS

A. As indicated on drawings or equal

2.10 ELECTRICAL SERVICE FITTINGS

A. As indicated on drawings or equal

B.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcement, and other conditions affecting performance of wood laboratory casework installation.
   1. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 CASEWORK INSTALLATION

A. Install plumb, level, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

B. Utility-Space Framing: Secure to floor with 2 fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

C. Base Cabinets: Set cabinets straight, plumb, and level. Adjust subtops within 1/16 inch (1.5 mm) of a single plane. Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions with fasteners spaced 24 inches (600 mm) o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch (1.5 mm).

   1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 24 inches (600 mm) o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than 2 fasteners.

D. Wall Cabinets: Hang cabinets straight, plumb, and level. Adjust fronts and bottoms within 1/16 inch (1.5 mm) of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches (600 mm) o.c. Align similar adjoining doors to a tolerance of 1/16 inch (1.5 mm).

E. Install hardware uniformly and precisely. Set hinges snug and flat in mortises, unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

F. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF TOPS

A. Field Jointing: Where possible, make in the same manner as shop jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project site processing of top and edge surfaces is not required. Locate field joints where shown on approved Shop Drawings.

B. Fastenings: Except for epoxy and phenolic-composite tops, use concealed clamping devices for field joints located within 6 inches (150 mm) of front, at back edges, and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
   1. Secure tops, except for epoxy tops, to cabinets with Z-type fasteners or equivalent, using 2 or more fasteners at each front, end, and back.
   2. Secure epoxy tops to cabinets with epoxy cement, applied at each corner and along perimeter edges of not more than 48 inches (1200 mm) o.c.

C. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection. Provide flush hairline joints in tops using clamping devices.
   1. Where necessary to penetrate tops with fasteners, countersink heads approximately 1/8 inch (3 mm) and plug hole flush with material equal to top in chemical resistance, hardness, and appearance.

D. Provide required holes and cutouts for service fittings.

E. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

F. Provide scribe moldings for closures at junctures of top, curb, and splash, with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

3.4 INSTALLATION OF SINKS

A. Underside Installation: Use manufacturer's recommended adjustable support system for table- and cabinet-type installations.

B. Set top edge of sink unit in sink and top manufacturers' recommended chemical-resistant sealing compound and firmly secure to produce a tight and fully leakproof joint. Adjust sink and securely support to prevent movement.

3.5 INSTALLATION OF ACCESSORIES

A. Install accessories according to approved Shop Drawings and manufacturer's written instructions.

B. Securely fasten adjustable shelving supports, stainless-steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.

C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

3.6 INSTALLATION OF SERVICE FITTINGS

A. Comply with requirements of Division 15 and 16 Sections for installing water and laboratory gas service fittings, piping, electrical devices, and wiring.

B. Install fittings according to approved Shop Drawings and manufacturer's written instructions. Bed bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings, piping, and conduit to casework, unless otherwise indicated.

3.7 CLEANING AND PROTECTING

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil (0.15-mm) plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at minimum of 48 inches (1200 mm) o.c.

END OF SECTION 12348

This page intentionally blank

SECTION 12690 - FLOOR MATS AND FRAMES

PART 1 - This Section uses the term Architect. Change this term as necessary to match actual term used to identify the design professional as defined in the General and Supplementary Conditions.

PART 2 - GENERAL

2.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

2.2 SUMMARY

A. This Section includes the following:

1. Frames to be set in concrete floors to receive recessed floor mats.
2. Recessed floor mats of the following type:
   a. Carpet-type mats.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 3 Sections for concrete work, including forming, placing, and finishing concrete floor slabs and grouting frames into recess.

2.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of floor mat and frame specified, including manufacturer's specifications and installation instructions, details of construction relative to materials, dimensions of individual components, profiles, and finishes.

C. Shop drawings showing layout and types of floor mat and frames, full-scale sections of typical installations, details of patterns or designs, anchors, and accessories.

D. Samples for initial selection purposes in form of manufacturer's color charts consisting of actual sections of floor mat and frame materials, showing full range of colors, textures, finishes, and patterns available, for each type of floor mat and frame indicated.

E. Samples for verification purposes in form of 12-inch-square assembled section of floor mat and frame members with selected tread surface showing each type of metal finish and color of ex-

posed floor mat, frames, and accessories required. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

F. Maintenance data in the form of manufacturer's printed instructions for cleaning and maintaining floor mats.

2.4 PROJECT CONDITIONS

A. Field Measurements: Check actual framed openings for mats by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid a delay of the Work.

2.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain floor mats and frames from one source of a single manufacturer.

2.6 SEQUENCING AND SCHEDULING

A. Provide oversized recesses in concrete work to receive frames. Defer frame installation until building enclosure is complete and related interior finish work is in progress.

1. Install frames integrally with principal placing of concrete or cementitious overlayment floor system. Locate, align, and level frame members accurately. Recess in-fill concrete where required for placement of concrete topping.

PART 3 - PRODUCTS

3.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
1. Carpet-Type Mats:
a. Interface: Image Foyer 9100 #500 Brown

3.2 MATERIALS

A. General: Provide colors, patterns, and profiles of materials, including metals and metal finishes indicated or specified. Where not indicated, provide colors, patterns, and profiles selected by Architect from manufacturer's standards.
1. Provide mats with custom inlaid or woven-in graphic (design, logo, emblem, characters, or other graphic) as shown and where shown.

B. Recessed Mat Frames: Size and style to fit floor mat type matching approved sample, for permanent recessed installation in floor, complete with corner pins or reinforcing and installation anchorages.
   1. Extruded Aluminum: ASTM B 221, alloy 6063-T5. Coat surface of frame that will contact cementitious material with zinc chromate paint or manufacturer's standard protective coating.
   2. Provide edge members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and with pieces spliced together by means of straight connecting pins.

3.3 Delete each of following mat types not required.FABRICATION

A. Shop-fabricate units of floor mat work to greatest extent possible in sizes as indicated. Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes. Miter corner joints in framing elements with hairline joints or provide prefabricated corner units without joints. Where possible, verify sizes by field measurement before shop fabrication.

PART 4 - EXECUTION

4.1 INSTALLATION

A. Install recessed frames and mats complying with manufacturer's instructions. Set mat tops at height recommended by manufacturer for most effective cleaning action; coordinate top of mat surfaces with bottom of doors that swing across mats to provide clearance between door and mat.

4.2 PROTECTION

A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near time of Substantial Completion.

B. Defer installation of floor mats until time of Substantial Completion for Project.

END OF SECTION 12690

This page intentionally blank

USDA Forest Service
Missoula, Montana

Construction Specifications
October, 1999

SECTION 13035

LABORATORY CONTROLLED TEMPERATURE ROOMS

GENERAL

1.01 WORK INCLUDED

A. Prefabricated sectional walk-in insulated rooms, including metal skinned insulated panels, insulated swing doors.

1.02 RELATED WORK

A. Division 3 - Concrete

B. Division 5 - Metals

C. Division 9 - Gypsum Board Assemblies

D. Division 9 - Flooring

E. Division 11 - Laboratory Equipment

F. Division 12 - Laboratory Casework

G. Division 15 - Mechanical

H. Division 16 - Electrical

1.03 REFERENCES

A. In addition to complying with current edition of pertinent codes and regulation, comply with the following:
   1. A.S.S.C: American Standard Safety Code for Mechanical Refrigeration ANS B9.1
   2. ASTM: American Society for Testing and Materials
   3. UL: Underwriters Laboratories, Inc. Room insulated panel flame spread rating including labeling of wall panels.
   4. FM: Factory Mutual approval including labeling of insulated panels
   5. UL: Underwriters Laboratories, Inc. Listing of all electrical components, including control console.
   6. NEC: National Electric Code

1.04 SUBMITTALS

A. Refer to Division 1 for procedures.

B. Shop Drawings and Materials List: Prior to fabrication provide shop drawings and complete material list showing dimensions, locations, finishes, details of construction.

C. Samples: Submit prior to fabrication exposed materials finishes in 12" X 12" samples, (1) ea.

D. Submit prior to fabrication detailed anchorage and attachment drawings complying with Local Building

Code and UBC requirements and regulations for seismic restraint.

E. Installation and maintenance Manuals: Minimum of three copies of equipment manuals, bound, including sequential operating instructions, maintenance manuals, wiring diagrams, parts manuals including list of parts with recommended spares, and factory authorized service agencies closest to the Project.

1.05 PRODUCT HANDLING

A. Deliver, store and handle products in a manner to avoid damage. In the event of damage, immediately make repairs and replacements necessary at no additional cost to the Owner.

B. B. Protect the installed work and materials of other trades from installation of this work.

1.06 COORDINATION

A. Check measurement of space and means of access for installation. Report in writing items that may be detrimental to work.

B. Sequencing and Scheduling: Coordinate requirements with related work to insure proper location of required mechanical and electrical services; furnish information for mechanical and electrical interconnections.

1.07 WARRANTY

A. Warrant room walls, doors, and related accessories to be free from defects in materials and workmanship under normal usage for a period of 10 years from date of Substantial Completion. This warranty shall be in addition to and not a limitation of other rights the Owner may have under the Contract Documents.

PRODUCTS

2.01 LABORATORY CONTROLLED TEMPERATURE ROOMS

A. Manufacturers: R.W. Smith & Co., Environmental Growth Chambers, Conviron, Hotpack, or approved equal.

2.02 ROOM CONSTRUCTION

A. Assembly Description: Controlled temperature rooms shall be of modular construction incorporating wall, ceiling, and floor "sandwich panels" consisting of interior and exterior metal skins with a solid core of insulation. Panels shall incorporate an integral mechanical method of fastening and sealing joint to provide a vapor tight seal. Construction shall allow disassembly for possible relocation or expansion at a later date. Each controlled temperature room, unless otherwise specified, shall be complete with environmental conditioning equipment, controls, refrigeration piping, lighting systems and necessary mechanical and electrical components.

B. Modular Panel Construction:
   1. Insulation: Rigid urethane, foamed-in-place, with an initial thermal conductivity factor (K) of not more than 0.118 and not more than 0.145 after curing. Overall wall thickness shall be 4 inches.
      a. Insulation utilizing CFC refrigerants in foaming process are not acceptable.
      b. All insulated panels shall be supplied with Underwriters Laboratory Inc. surface burning

characteristics listing label. Core material flame spread not to exceed 25 and smoke development rating 450 or less.

c. All panels shall meet Factory Mutual System Standard 4880 requirements and bear the Approved label.

2. Panel Joints: All insulated panel edges shall be factory foamed-in-place "tongue & groove". Flexible vinyl gaskets shall be foamed-in-place on all inside and outside male panel edges. Panels shall assemble with integral mechanical fasteners "cam locks", minimum of (3) per full length wall to wall joint. Maximum distance between cam loc devices to be 47". Cam device wrench holes shall be concealed by flush-mounted plastic caps of matching color.
3. Skin Sheets: Interior and exterior exposed skin of walls and ceiling panels shall be die-formed, minimum .032 inch, textured aluminum and shall have a white polyester enamel finish. Unexposed exterior finishes may be aluminized galv-steel.
4. Floor Panels: Shall be similar in construction to wall panels with .100 thick smooth aluminum wear surface. Minimum distributed stationary load capacity to be 500 lbs./sq.ft. Floor panels shall be minimum 4 inch thick and shall contain no wood.
   a. A. D. A. · Floor shall set on existing surface and include interior ramp at door. Ramp shall have a non-skid surface and extend minimum 48 inches from front outside wall to height of floor.
5. Closure Panels: Provide trim material to conceal all spaces, vertical and horizontal, between insulated room and building construction. Finish and texture of closures shall match adjoining insulated panels. Insure access is established to space above insulated room if required. No screws or unsightly fasteners shall be used to install closures or trim. Caulk all surfaces adjacent to trim with approve sealant.

C. Manual Swinging Entrance Door:
1. Door and door frame shall be listed by Underwriters Laboratory.
2. Minimum clear opening of 36" by 78".
3. Door to be flush-mounted in matching insulated panel. Door and jamb panels and exposed surfaces shall match wall panel texture and finish, unless otherwise noted.
4. Door jamb and door perimeter shall be made of extruded fiberglass reinforced plastic (FRP). Tapping plates are to be integral to the construction of both the door and jamb. All hardware to mount to door and frame with tapped screw. No wood to be used in door or jamb construction.
5. Doors handle shall be provided with a cylinder lock door latch and interior safety release. Hardware to be brushed chrome finish.
6. Hinges shall be cam-acting with steel pins and nylon bushings. Finish to match handle.
7. Door shall incorporate an insulated, sealed glass observational window, minimum 14" by 24" with heated frame (on rooms operating below 100C).

PART 3 - EXECUTION

3.01 INSPECTION

A. Prior to installing constant temperature room, verify that preparatory work is complete to the point where this installation may properly commence. Surface conditions for substrates by others are per those sections tolerances.

B. Field verify that rough-in dimensions are as indicated.

3.02 PREPARATION

A. Commencement of Work: Proceed with Work when conditions will permit work to be installed in

complete accordance with the original design, accepted submittals, and the manufacturer's printed instruction.

3.03 INSTALLATION

A. Install in accordance with referenced codes and standards, manufacturer's printed instructions and reviewed submittals as a complete operating system.

B. Set panels plumb and level, square, in true alignment, at proper locations, planes, or elevations, in correct relationship to other work, and securely fasten together. Install floor panels for flush joint between panels

C. Provide and seal penetrations in roof of controlled temperature rooms for fire sprinkler piping installation. Fire sprinkler piping shall be by others.

3.04 FIELD QUALITY CONTROL

A. Deliver operation and maintenance manuals.

B. Clean and polish exposed surfaces in accordance with manufacturer's instruction.

C. Touch up and restore any factory finishes partially damaged or defaced during delivery, relocation, and installation. Repair or remove and replace defective work as approved by the Owner's Representative at no additional cost to the Owner.

3.05 PROTECTION

A. Units shall be protected after installation during remainder of construction.

END OF SECTION

PART 2 PRODUCTS

END OF SECTION

SECTION 14240 - HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Hydraulic passenger elevators.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 3 Section "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
   2. Division 4 Section "Unit Masonry" for setting sleeves, inserts, and anchoring devices in masonry.
   3. Division 5 Section "Structural Steel" for attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
   4. Division 5 Section "Metal Fabrications" for attachment plates, angle brackets, divider beams, and other steel framing for supporting guide-rail brackets.
   5. Division 5 Section "Structural Steel" for hot-rolled steel subsills and entrance frames that are a part of steel frame.
   6. Division 5 Section "Metal Fabrications" for pit ladders.
   7. Division 9 Section "Painting" for field painting of hoistway entrances.
   8. Division 9 Sections for finish flooring in elevator cars.
   9. Division 15 Sections for ventilating hoistways and machine rooms.
   10. Division 16 Sections for electrical service to elevators, including fused disconnect switches, standby power source, and transfer switch.

1.3 DEFINITIONS

A. Hydraulic Elevators: Elevators in which cars are hoisted either directly or indirectly by action of a hydraulic plunger and cylinder (jack); with other components of the Work, including fluid storage tank, pump, piping, valves, car enclosures, hoistway entrances, operation systems, signal equipment, guide rails, electrical wiring, roping (roped hydraulic applications), buffers, and devices for operations, safety, security, required performance at rated speed and capacity, and for complete elevator installation.

B. Defective Elevator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe condi-

tions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for each elevator including capacities, sizes, performances, operations, safety features, controls, finishes, and similar information.

C. Shop Drawings for each elevator showing plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, and relationships with other construction. Indicate variations from specified requirements, maximum dynamic and static loads imposed on building structure at points of support, and locations of signals. Include maximum and average power demands.

D. Samples of exposed finishes for car, hoistway doors, and signal equipment; 3-inch (75-mm) square samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.

E. Maintenance manuals for each different hydraulic elevator, including operation and maintenance instructions, parts listing with sources indicated, recommended parts inventory listing, emergency instructions, and similar information. Include all diagnostic and repair information available to manufacturer's and Installer's maintenance personnel. Submit for Owner's information at project closeout as specified in Division 1.

F. Inspection and acceptance certificates and operating permits as required by governing authorities for normal, unrestricted elevator use.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage the elevator manufacturer or an experienced Installer approved by the elevator manufacturer who has completed elevator installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Regulatory Requirements: In addition to local governing regulations, comply with the applicable provisions of the following:
1. ASME A17.1, "Safety Code for Elevators and Escalators," referred to as the "Code."

a. Seismic Zone: Comply with code requirements for seismic risk zone 2B.

1.6 WARRANTY

A. General Warranty: The elevator warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall

be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Standard Elevator Warranty: Submit a written warranty signed by manufacturer agreeing to repair, restore, or replace defective elevator work within the specified warranty period.
   1. Warranty Period: 12 months from date of Substantial Completion.

1.7 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance service by skilled, competent employees of the elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Use parts and supplies as used in the manufacture and installation of original equipment.
   1. Perform maintenance, including emergency callback service, during normal working hours.
   2. Include 24-hour-per-day, 7-day-per-week emergency callback service.
      a. Response Time: 2 hours or less.

B. Continuing Maintenance Service: Provide a continuing maintenance proposal from Installer to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

C. Continuing Maintenance Service: Provide a continuing maintenance proposal from Installer to Owner, in the form and with terms, conditions, and obligations set forth in "Draft of Elevator Maintenance Agreement" at end of this Section, starting on date initial maintenance service is concluded.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering hydraulic elevators that may be incorporated in the Work include, but are not limited to, the following:
   1. Dover Elevator Corp.
      a. Contract documents are based on an elevator by Dover Elevator Corporation, “Fleetwood” model.
   2. Montgomery Elevator Co.
   3. Otis Elevator Co.

2.2 MATERIALS AND COMPONENTS

A. General: Provide manufacturer's standard elevator systems. Where components are not otherwise indicated, provide standard components, published by manufacturer as included in standard preengineered elevator systems and as required for a complete system.

B. Hydraulic Machines and Elevator Equipment: Provide hydraulic plunger-cylinder units of type indicated below, with electric pump-tank-control system equipment in machine room as indicated.
   1. Hydraulic Machines: Holeless single-acting, beside-the-car, hydraulic plunger-cylinder units.
   2. Pump Unit: Positive displacement pump with a maximum of 10 percent variation between no load and full load and fan-cooled squirrel cage induction motor.
      a. Provide motor with wye-delta starting.

C. Power Supply: 480 V, 60 Hz, 3 phase.

D. Piping: Provide size, type, and weight piping recommended by manufacturer, and provide isolation couplings to prevent sound/vibration transmissions from power unit.

E. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, ladders, sills, and other components of elevator work where installation of devices is specified in another Specification Section.

F. Car Frame and Platform: Welded steel units.

2.3 OPERATION SYSTEMS

A. General: Provide manufacturer's standard microprocessor operation system for each elevator or group of elevators of the type of operation indicated.

B. Single Elevator--Passenger: Provide "Selective-Collective Automatic Operation" as defined in ASME A17.1.

2.4 AUXILIARY OPERATIONS

A. General: In addition to primary operation system features, provide the following operational features for passenger elevators, except where otherwise indicated.

2.5 SIGNAL EQUIPMENT

A. General: Provide signal equipment for each elevator or group of elevators complying with requirements indicated below.
   1. Illuminated hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Fabricate of acrylic or other permanent translucent plastic.
   2. Except for buttons and illuminated elements, fabricate signal equipment with exposed surfaces as follows:

a. Car Fixtures: Satin stainless steel.
b. Hall Fixtures: Satin stainless steel.

B. Car Control Stations: Provide manufacturer's standard semirecessed car control station in each car. Include call buttons for each landing served and other buttons, switches, and controls required for specified car operation. Provide operating device symbols as required by the "Code." Mark other buttons and switches with manufacturer's standard identification for required use or function. Mount in return panel adjacent to car door, if not otherwise indicated.
1. Mount controls as shown or scheduled and at heights complying with ADA Accessibility Guidelines.

C. Emergency Communication System: Provide hands-free audio and visual 2-way emergency communication between each car and a 24-hour monitoring service. System automatically dials preprogrammed number of monitoring service and identifies elevator location to monitoring service. System is contained in flush-mounted cabinet complete with identification, instructions for use, and battery back-up power supply, and complies with ADA regulations.

D. Car Position Indicator: For passenger elevator cars, provide either illuminated-signal type, digital-display type, or segmented type, located above the car door or above the car control station. Also provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served.
1. Include travel direction arrows if not provided in car control station.

E. Hall Push-Button Stations: Provide 1 hall push-button station at each landing for each elevator or group of elevators, but not less than 1 station for each 4 elevators in a group. For each group of passenger elevators, locate between 2 elevators at center of group or at location most convenient for approaching passengers.
1. Provide units with flat faceplate designed for mounting on wall with body of units recessed in wall: 2-button stations at intermediate landings; 1-button stations with direction indication at terminal landings.

F. Hall Lanterns: Provide units with illuminated arrows, but provide single arrow at terminal landings. Match materials, finishes, and mounting method of hall push-button stations.
1. Provide units projecting from faceplates for ease of angular viewing.
2. Place lanterns either above or beside each hoistway entrance, unless otherwise shown. Mount at minimum of 72 inches (1829 mm) above finished floor.
3. With each lantern, provide audible signals indicating car arrival and direction of travel.
a. At manufacturer's option, audible signals may be placed on each car.

2.6 DOOR SAFETY DEVICES

A. Infrared Array: Provide safety device with a uniform array of 36 or more microprocessor-controlled infrared light beams projecting across car entrance. Interruption of one or more of the light beams shall cause the doors to stop and reopen.

2.7 PASSENGER ELEVATOR CAR ENCLOSURES

A. General: Provide manufacturer's standard car enclosures of the selections indicated. Include ventilation, lighting, access doors, doors, power door operators, sills (thresholds), trim, accessories, and wall and ceiling finishes. Provide manufacturer's standard flush-panel horizontal-sliding doors of type indicated. Provide manufacturer's standard protective edge trim system for door and wall panels, except as otherwise indicated.
   1. Floor finish is specified in another Section.

B. Materials and Fabrication: Provide selections indicated for each car enclosure surface; provide manufacturer's standards, but not less than the following:
   1. Satin Stainless Steel: ASTM A 167, Type 302 or 304, with No. 4 satin finish.
   2. Aluminum Sills: Extruded aluminum, with grooved surface, 1/4 inch (6.4 mm) thickness, mill finish.
   3. Fabricate car door frame integrally with front wall of car.
   4. Fabricate car with recesses and cutouts for signal equipment.
   5. Luminous Ceiling: Fluorescent light fixtures and ceiling panels of translucent acrylic or other permanent rigid plastic complying with flammability requirements.
   6. Handrails: Provide manufacturer's standard stainless-steel cylindrical handrails on side walls and back wall, unless otherwise indicated.

2.8 PASSENGER HOISTWAY ENTRANCES

A. General: Provide manufacturer's standard hollow-metal, sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Match car doors for size, number of panels, and door movement. Provide frame size and profile to coordinate with hoistway wall construction.
   1. Where gypsum board wall construction is indicated, fabricate frames with reinforced head sections.

B. Materials and Fabrication: Provide selections indicated; provide manufacturer's standards, but not less than the following:
   1. Satin Stainless-Steel Frames: Formed stainless-steel sheet, ASTM A 167, Type 302 or 304, with No. 4 satin finish.
   2. Satin Stainless-Steel Panels: Flush construction, fabricated from ASTM A 167, Type 302 or 304 stainless steel, with No. 4 satin finish.
   3. Aluminum Sills: Extruded aluminum, with grooved surface, 1/4 inch (6.4 mm) thickness, mill finish.
   4. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for grouting door sills and similar applications.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of elevator work. Examine hoistways,

hoistway openings, pits, and machine rooms, as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's instructions and recommendations.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Coordination: Coordinate elevator work with work of other trades for proper time and sequence to avoid construction delays. Use established benchmarks, lines, and levels to ensure dimensional coordination of the Work.

D. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from elevator system.

E. Install piping above the floor, where possible. Where not possible, install underground piping in Schedule 40 PVC pipe casing assembled with solvent cement fittings.

F. Lubricate operating parts of systems, including ropes, if any, as recommended by manufacturers.

G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

H. Leveling Tolerance: 1/4 inch (6 mm), up or down, regardless of load and direction of travel.

I. Set sills flush with finished floor surface at landings. Fill space under sills solidly with nonshrink, nonmetallic grout.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon nominal completion of elevator installation, and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by the "Code" and by governing regulations and agencies.

B. Advise Owner, C.O.R., and authorities having jurisdiction in advance of dates and times tests are to be performed on elevators.

3.4 DEMONSTRATION

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions. Confer with Owner on requirements for a complete elevator maintenance program.

B. Make a final check of each elevator operation with Owner's personnel present and just prior to date of Substantial Completion. Determine that operation systems and devices are functioning properly.

3.5 PROTECTION

A. Temporary Use: Do not use elevators for construction purposes unless cars are provided with temporary enclosures, either within finished cars or in place of finished cars, to protect finishes from damage.
   1. Provide full maintenance service by skilled, competent employees of the elevator Installer for elevators used for construction purposes. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Use parts and supplies as used in the manufacture and installation of original equipment.
   2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevators. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

B. Provide final protection and maintain conditions, in a manner acceptable to elevator manufacturer and Installer, that ensure elevators are without damage or deterioration at the time of Substantial Completion.

3.6 HYDRAULIC PASSENGER ELEVATOR SCHEDULE
   1. Type: Holeless single-acting, beside-the-car, single cylinder.
   2. Rated Load: 2100 lb
   3. Rated Speed: 150 ft./min. (0.76 m/s).
   4. Operation System: Selective-collective automatic operation.
   5. Auxiliary Operations: As follows:
      a. Standby power operation.
      b. Battery operated lowering.
      c. Keyswitch operation feature.
      d. Secured landing feature.
      e. Anticrime feature.
      f. Front Walls: Stainless steel with integral car door frames.
      g. Side and Rear Walls: Vertical applied panels with plastic laminate finish
      h. Door Faces (Interior): Stainless steel.
      i. Ceiling: Luminous ceiling.

j. Handrails at side and rear walls.
k. Floor prepared to receive carpet (specified in Division 9 Section "Carpet").

6. Hoistway Entrances: As follows:
   a. Size: 36 by 84 inches (914 by 2134 mm).
   b. Type: Single-speed side slide.
   c. Frames: Stainless steel.
   d. Doors: Stainless steel.
7. Additional Requirements: As follows:
   a. Provide local code inspection certificate in each car, mounted under acrylic cover with stainless-steel frame.
   b. Provide protective blanket hooks in each car and one complete set of full-height blankets.

END OF SECTION 14240

This page intentionally blank

SECTION 15000 - MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 MECHANICAL REQUIREMENTS

A. The mechanical requirements are supplemental to the General Requirements of these Specifications. The Mechanical Sections shall apply to phases of the work specified, shown on the Drawings, or required to provide for the complete installation of Mechanical Systems for this project.

B. The work shall include all items, articles, materials, operations and methods listed, mentioned or scheduled in these specifications and the accompanying drawings. All material, equipment and labor shall be furnished together with all incidental items required by good practice to provide the complete systems described.

C. Examine and refer to all Architectural, Civil, Structural, Electrical, Utility, Landscape and Mechanical drawings and specifications for construction conditions which may affect the mechanical work. Inspect the building site and existing facilities for verification of present conditions. Make proper provisions for these conditions in performance of the work and cost thereof.

D. See general requirements for listed Alternate Bids. Note alternates listed and include any changes in work and price required to meet the requirements of the respective alternate.

1.2 CODES AND STANDARDS

A. Work shall meet the requirements of the plans and specifications and shall not be less than the minimum requirements of applicable sections of the latest Codes and Standards of the following Organizations:

American Gas Association (AGA)
American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
American Society of Mechanical Engineers (ASME)
American Water Works Association (AWWA)
National Electrical Code (NEC)
National Electrical Manufacturers Association (NEMA)
National Fire Protection Association (NFPA)
Uniform Plumbing Code
Occupational Safety & Health Act (OSHA)

Plastic Pipe Institute (PPI)
Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
Uniform Mechanical Code (UMC)
Uniform Building Code (UBC)
Requirements of the Serving Utility Company
Local and State Codes and Ordinances
SMACNA Seismic Manual

1.3 FEES AND PERMITS

A. The mechanical contractor shall pay all fees and arrange for all permits required for work done under his contract and under his supervision by subcontract.

B. All usage contracts between the Owner and the serving utilities company, such as membership and usage charges or fees, etc., for the purpose of obtaining the services for the utility company shall be applied for and paid for by the Owner.

C. All permits and fees for connection to the utility, including inspection and staking costs imposed by the utility company or required for proper installation, and all necessary manholes, encasements, valves, service boxes, meters, meter housings or vaults complete as required by the utility company of jurisdictional agency, shall be applied for and paid by the Mechanical Contractor.

1.4 MATERIALS AND EQUIPMENT

A. Manufacturer's trade names and catalog numbers listed are intended to indicate the quality of equipment or materials desired. Submittals must indicate the specific item or items to be furnished in lieu of those specified, together with complete technical and comparative data on specified items and proposed items. See list of prior approved manufacturers at end of this section.

B. Mechanical equipment may be installed with manufacturers standard finish and color except where specific color, finish or choice is indicated. If the manufacturer has no standard finish, equipment shall have a prime coat and two finish coats of gray enamel.

C. This contractor shall be responsible for materials and equipment installed under this contract. Contractor shall also be responsible for the protection of materials and equipment of others from damage as a result of his work.

D. Manufactured material and equipment applied, installed, connected, erected, used, cleaned and conditioned as directed by manufacturer unless herein specified to the contrary.

E. This contractor shall make the required arrangement with General Contractor for the introduction into the building of equipment too large to pass through finished openings.

F. Store materials and equipment indoors at the job site or, if this is not possible, store on raised platforms and protect from the weather by means of waterproof covers. Coverings shall permit circulation of air around the materials to prevent condensation of moisture. Screen or cap openings in equipment to prevent the entry of vermin.

1.5 INTENT OF DRAWINGS

A. The drawings are partly diagrammatic and do not necessarily show exact location of piping and ductwork unless specifically dimensioned. Riser and other diagrams are schematic and do not necessarily show the physical arrangement of the equipment. They shall not be used for obtaining lineal runs of piping or ductwork. Discrepancies shown on different plans, or between plans and actual field conditions shall be brought to the attention of the Contracting Officer for resolution.

1.6 RESPONSIBILITY

A. The mechanical contractor shall be responsible for the installation of a satisfactory and complete system in accordance with the intent of the drawing and specifications. Provide, at no extra cost, all incidental items required for completion of the work even though they are not specifically mentioned or indicated on the drawings or in the specifications.

B. The drawings do not attempt to show complete details of the building construction which affect the mechanical installation; and reference is therefore required to the Architectural, Civil, Structural, Landscape and Electrical drawings and specifications and to shop drawings of all trades for additional details which affect the installation of the work covered under this Division of the Contract.

C. Location of mechanical system components shall be checked for conflicts with openings, structural members and components of other systems having fixed locations. In the event of any conflicts, the Contracting Officer shall be notified.

D. Determine, and be responsible for, the proper location and character of inserts for hangers, chases, sleeves and other openings in the construction required for the work, and obtain this information well in advance of the construction progress so work will not be delayed.

E. Final location of inserts, hangers, etc., required for each installation, must be coordinated with

facilities required for other installations to prevent interference.

F. Take extreme caution not to install work that connects to equipment until such time as complete Shop Drawings of such equipment have been approved by the Contracting Officer. Any work installed by the Contractor, prior to approval of Shop Drawings, will be at the Contractor's risk.

G. At all times during the performance of this Contract, properly protect work from damage and protect the Owner's property from injury of loss. Provide and maintain passageways, guard fences, lights and other facilities for protection required by Public Authority or Local conditions.

H. The contractor shall be responsible for damages due to the work of their Contractors, to the building or its contents, people, etc.

1.7 WORKMANSHIP

A. GENERAL

1. Work under this contract shall be performed by workmen skilled in the particular trade including work necessary to properly complete the installation in a workmanlike manner to present a neat and finished appearance.

B. EXCAVATION AND BACKFILL

1. Provide all excavating and backfilling as required, with backfilling only after approval of the Architect. Backfill to be free of all debris and decayable matter. See Excavation and Backfill requirements in DIVISION 1 -- GENERAL REQUIREMENTS.

C. CUTTING, PATCHING AND FRAMING

1. Obtain Architect's/Engineer's approval before performing any cutting on structural members or patching of building surfaces. Any damage to the building or equipment by this Contractor shall be the responsibility of this Contractor shall be repaired by skilled craftsmen of the trades involved at the contractor’s expense.

2. Chases, openings, sleeves, hangers, anchors, recesses, equipment pads, framing for equipment, provided by others only if so noted on the drawings. Otherwise, they will be provided by this contractor for his work. Whether chases, etc., are provided by this contractor or others, this contractor is responsible for correct size and locations.

1.8 COORDINATION

A. This contractor shall plan his work to proceed with a minimum interference with other trades and it shall be his responsibility to inform the General Contractor of all openings required in the building structure for installation of work, and to provide sleeves as required. Dimensions of equipment installed and/or provided by others shall be checked in order that correct clearances and connections may be made.

1.9 CLEAN UP

A. Keep the premises free from accumulation of waste material or rubbish caused by his work or employees.

B. Upon completion of work, remove materials, scraps and debris relative to his work and leave the premises, including tunnels, crawl spaces, and pipe chases in clean and orderly condition. Remove all dirt and debris from the interior and exterior of all devices and equipment. After construction is completed, wash all mechanical equipment.

1.10 TEMPORARY FACILITIES

A. OFFICES

1. Contractor shall provide a temporary office for himself including:

Lights, heat and telephone. (Pay telephone not permitted.)

B. REMOVAL

1. Contractor shall completely remove his temporary installations when no longer needed and the premises shall be completely clean, disinfected, patched, and refinished to match adjacent areas.

C. LADDERS AND SCAFFOLDS

1. The contractor shall provide their own ladders, scaffolds, etc. of substantial construction for access to their work in various portions of the building as may be required. When no longer needed, they shall be removed by the contractor.

D. PROTECTION DEVICES

1. The contractor shall provide and maintain his own necessary barricades, fences, signal lights, etc., required by all governing authorities or shown on the drawings. When no longer needed, they shall be removed by the contractor. The contractor shall assume all responsibility for which the owner may be held responsible because of lack of above

items.

E. TEMPORARY WATER

1. The contractor shall provide all water required by his trade for construction. Temporary drinking water shall be provided by contractor from a proven safe source dispensed by single service containers, until such time as the construction water outlet has been installed, disinfected and approved for drinking purposes.

F. TEMPORARY FIRE PROTECTION

1. The contractor shall provide all necessary first-aid hand fire extinguishers for Class A, B, C and special hazards as may exist in his own work area only in accordance with good and safe practice and as required by jurisdictional safety authority. The contractor shall provide general area fire extinguishers only.

1.11 SHOP DRAWINGS

A. Provide eight (8) copies of manufacturer's literature and/or certified prints as soon as possible but within ninety (90) days after awarding of Contract, for items of materials, equipment, or systems where called for in specifications. Shop drawings and literature complete showing item used, size, dimensions, capacity, rough-in, etc., as required for complete check and installation. Manufacturers literature showing more than one item shall be clearly marked as to which item is being furnished or it will be rejected and returned without review.

B. Each copy of each item submitted must be clearly marked as follows for purposes of identification and record. Submittals not marked (typewritten only) as described below will be rejected and returned without review.

Date:
Name of Project:
Branch of Work:
Submitted by:
Specification or Plan Reference:

C. Prior to their submission, each submittal shall be thoroughly checked by the contractor for compliance with the Contract Document requirements, accuracy of dimensions, relationship to the work of other trades, and conformance with sound, safe practices as to erection and installation. Each submittal shall then bear a stamp evidencing such checking and shall show corrections made, if any. Submittals requiring extensive corrections shall be revised before submission. Each submittal not stamped and signed by the contractor evidencing such checking will be rejected and returned without review.

D. All submittals will be examined when submitted in proper form for compliance. Such review shall not relieve the contractor of responsibility for errors, for deviation from the contract Documents, nor for violation of sound safety practices.

E. The contractor shall keep in the field office one print of each submittal which has been reviewed and stamped by the Architect or Engineer.

F. Submittals will be required for each item of material and equipment furnished as noted in specifications.

G. Submittals which are incomplete relative to quality requirements, capacity, engineering data, dimensional data or detailed list of specialty or control equipment will be rejected. Lists shall include descriptive coding as specified or shown on drawings.

THE CONTRACTING OFFICER WILL PERFORM SHOP DRAWING REVIEW OF EACH ITEM.

H. Adequately bind each submittal package. Unbound submittals will be returned without review.

I. Schedule of Shop Drawings.

1. Piping
2. Valves
3. Insulation
4. Plumbing fixtures
5. Diffusers, grilles, louvers
6. Acoustical lining
7. Exhaust fans
8. Air distribution accessories
9. Air handling units
10. Pumps
11. Temperature controls
12. Hydronic accessories
13. Unit heaters
14. Fin tube radiation
15. VAV boxes
16. Boilers
17. Infrared heaters
18. Furnaces
19. Condensing units

1.12 OPERATION AND MAINTENANCE MANUALS

A. At the time orders are placed for any item of equipment requiring service or operating maintenance, the contractor shall request the manufacturer furnish three (3) copies of OPERATION AND MAINTENANCE INSTRUCTIONS for each piece of equipment. These shall be included in the brochure of equipment.

1.13 BROCHURE OF EQUIPMENT

A. Upon completion of work, prepare three copies of "Brochure of Equipment" containing data pertinent to equipment and systems on job. Binders containing materials shall be one or more three ring binders of sufficient number to hold all literature. Contained in binders shall be: Installation, maintenance, and operating instructions for each piece of equipment; parts lists; wiring diagrams; one copy of each shop drawing and literature submittal; record drawings, etc.

B. All literature shall be clean, unused and filed under divider headings corresponding to the specifications.

C. These brochures shall be submitted to the Contracting Officer and approved by him before authorization of final payment.

1.14 AS-BUILT DRAWINGS

A. The contractor shall furnish to the Owner and Contracting Officer a marked print showing the location of all concealed or underground pipe or conduit runs and other equipment installed other than as shown on the drawings. Dimension underground lines from established building lines. Indicate all installed pull boxes in conduit runs.

B. The contractor shall furnish to the Contracting Officer a marked print showing the location of all mechanical equipment, plumbing fixtures, piping, ductwork, diffusers, grilles, etc. The location of any item which deviates from the bid documents shall be accurately drawn and dimensioned.

All underground piping and ductwork shall be dimensioned from nearest column and/or exterior walls.

The location of all maintenance related items such as duct access doors, fire dampers, isolation valves, filters, etc., shall be highlighted on as built drawing.

1.15 PLACING SYSTEMS IN OPERATION

A. At the completion of the work and at such time as the Owner shall direct, prior to final acceptance, the contractor performing this work shall put into satisfactory operation the various systems installed under the specifications. At no additional cost to the Owner, furnish the services of a person completely familiar with the installations performed under this specification, to instruct the Owners operating personnel in the proper operation and servicing of the equipment and systems. These services shall be available for a period of no less than one (1) day.

1.16 WARRANTY

A. The contractor shall guarantee that all materials and labor installed are new and of first quality and that any material or labor found defective shall be replaced without cost to the Owner within one (1) year after substantial completion of the Contract or one (1) full season of heating and cooling operation, whichever is the greater. The guarantee shall list the date of the beginning of the one (1) year period which shall be the date that the Substantial Completion Certificate is issued.

B. Any damage to the building, caused by defective work or material of the Contractor within the above mentioned period, shall be satisfactorily repaired without cost to the Owner.

C. The guarantee does not include maintenance of equipment. The Owner shall accept full responsibility for proper operation and maintenance of equipment immediately upon substantial completion and occupancy of the building.

D. Final acceptance by the owner will not occur until all operating instructions are mounted in Equipment Rooms and Operating Personnel thoroughly indoctrinated in the operation of all mechanical equipment by the Contractor.

E. Any equipment, including heat exchangers, boilers, pumps, air handlers, motors, etc., used for temporary heat, shall be brought up to a new condition before final acceptance by the Owner and shall be guaranteed by the Contractor as new equipment.

ACCEPTABLE MANUFACTURERS - MECHANICAL

Acceptable manufacturers of mechanical equipment are as follows: Manufacturers are listed to establish quality and performance. Other manufacturers accepted with approval.

SECTION 15030

TEST AND BALANCE CONTRACTORS

R.G.O., Inc., Terry O'Neill (406) 586-4687
Big Horn Corporation, Barry Robinson (406) 248-5299

SECTION 15070

PIPE SUPPORTS

Crane
Elcen
Fee and Mason
Grinnell

SECTION 15080

VALVES

Crane
Jenkins
Lunkenheimer
Milwaukee
Nibco
Stockham

SECTION 15090

PIPE IDENTIFICATION

Seton

SECTION 15120

VIBRATION ISOLATORS

Consolidated Kinetics
Korfund
Mason Industries
Vibration Mountings

FLEXIBLE PUMP CONNECTIONS

Belmont
Metraflex
Resistoflex
Garlock
Thermoid

SECTION 15130

INSULATION

Armstrong
Certain-Teed
Mansville
Owens-Corning
Pittsburgh
Knauf

SECTION 15410 and 15420

CLEANOUTS, DRAINS, AND CARRIERS

Josam
Smith
Wade
Zurn

SECTION 15440

CIRCULATING PUMP

Armstrong
Bell & Gossett
Taco
Thrush

SECTION 15450

HYDRANTS

Josam
Smith
Wade
Zurn

SECTION 15460

PLUMBING FIXTURES

Aquaglass
American-Standard
Elkay
Fiat
Haws
Just
Kohler
Moen
Delta
Chicago Faucet

Waterless - Urinal

ELECTRIC WATER COOLERS

Elkay
Halsey Taylor
Haws

SECTION 15610

BOILERS - GAS

Aerco

SECTION 15650

WATER TREATMENT EQUIPMENT

Culligan
Dearborn
Mogul

SECTION 15660 and 15670

PUMPS

Armstrong
Bell & Gossett
Taco
Thrush

SPECIALTIES

Adamson
Armstrong
Bell & Gossett
Dunham-Bush
Reco
Taco
Thrush

SECTION 15690

TERMINAL UNITS

Airtherm
Carrier
Dunham-Bush
International
McQuay
Trane

FINTUBE RADIATION

Rittling
Dunham-Bush
Trane
Vulcan

UNIT HEATERS - HOT WATER

Airtherm
Carrier
Dunham-Bush
McQuay
Modine
Trane

SECTION 15810

CEILING EXHAUST FANS

Acme
Broan
Carnes
Greenheck
Cook

SECTION 15810

ROOF EXHAUSTERS

Acme
Carnes
Cook
Greenheck

SECTION 15820

AIR HANDLING UNITS

Airfan
Pace
Temtrol
Governair
Raynor

SECTION 15850

FIRE AND SMOKE DAMPERS

Air Balance
Air Stream
American Warming
Ruskin
United Sheet Metal

DIFFUSERS, REGISTERS AND GRILLES

Anemostat
Barber-Colman
Carnes
Krueger
Titus
Tuttle & Bailey

AIR TERMINAL UNITS

Anemostat
Carnes
Titus
Tuttle & Bailey
York

SECTION 15870

SOUND ATTENUATORS

Aerocustics
Industrial Acoustics
Keene
Koppers
Rink

SECTION 15910 and 15920

CONTROLS

Johnson
Staefa

END OF SECTION

This page intentionally blank

SECTION 15030 - HEATING AND COOLING SYSTEM AND DOMESTIC HOT WATER TESTING AND BALANCING

PART 1 - GENERAL

1.1 QUALITY CONTROL

A. Qualifications of testing agency. Testing and balancing shall be performed by an Independent Air and Hydronics Agency.

B. Testing and balancing standards shall be those of the National Environmental Balancing Bureau (NEBB) and Associated Air Balance Council.

C. FINAL SITE REVIEW

Test and balance contractor shall be in attendance at final site review (one visit required). Contractor shall be prepared to verify/adjust air or water quantities as directed by Contracting Officer. Mechanical Contractor to notify Test and Balance contractor five (5) days in advance of review.

D. DAMPER/VALVE MARKING

1. All volume dampers quadrant arms, handles, etc., shall be marked with spray paint after balancing is completed.

2. All concealed dampers and valves shall be tagged with colored tape installed on ceiling.

1.2 SUBMITTALS

A. Submit HVAC shop drawings, approved by the Contracting Officer, to the Testing and Balancing Agency prior to the commencement of the testing and balancing work.

B. Submit testing and balancing reports to the Contracting Officer as follows:

1. Submit three (3) copies, each in a three-ring binder.

2. Submit Testing and Balancing Data on approved forms which identify each diffuser, grille, register and item of tested equipment, and which show size, type, manufacture, location, area and test data.

C. Submit factory start-up report to the Contracting Officer.

1.3 GUARANTEE

A. Testing and balancing warranty. Air and hydronic quantities shall be re-adjusted as required to provide uniform temperatures and eliminate objectionable noises during a period of one (1) year

beginning at the completion of the testing and balancing work.

1.4 TEST SITE VISIT

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 AIR SYSTEM BALANCING

A. Notification. After the installation and cleaning of HVAC systems and the completion of factory start-up, the Mechanical Contractor shall notify the Testing and Balancing Agency that the systems are fully operable and ready for testing and balancing.

B. Make the following tests, adjustments, and recordings:

1. Test and Adjust supply, return and exhaust fans. Rotation and RPM to design requirements.

2. Test and Record fan motor full load amperes after above adjustments.

3. Make Pitot Tube Traverse at main supply and return and exhaust ducts, and obtain design CFM at fans.

4. Test and Adjust system static pressures, suction and discharge.

5. Test and Adjust system design recirculated air CFM.

6. Test and Adjust system design outside air CFM (maximum and minimum).

7. Test and Record entering air dry bulb temperatures for heating and cooling.

8. Test and Record entering air wet bulb temperatures for cooling.

9. Test and Record leaving air dry bulb temperatures for heating and cooling.

10. Test and Record leaving air wet bulb temperatures for cooling.

11. Adjust main supply, return and exhaust air ducts to proper design CFM.

12. Adjust zones to proper design CFM, supply, return and exhaust.

13. Test and Adjust each diffuser, grille and register to within ten (10) percent of design requirements. Adjust to minimize drafts in all areas. Readings and tests shall include required FPM velocity and test resultant velocity, required CFM and test resultant CFM after adjustments.

14. Adjust automatically operated dampers to operate as specified, indicated, and/or noted.

The Testing Agency shall check controls for proper calibrations and list the controls requiring adjustments by control installers.

15. Mechanical contractor shall change pulleys, belts, and dampers, or provide the dampers required for correct balance as recommended by the Air Balancing Agency, at no additional cost to the Owner.

16. Test and Balance contractor shall verify the existence of and proper operation of all:

Fire Dampers
Smoke Dampers
Volume Dampers

In addition, Test and Balance contractor shall verify proper service access and required access doors to each of the above.

3.2 WATER SYSTEM BALANCING

A. Preliminary checks, settings and adjustments shall be as follows:

1. Open valves to full open position. Close coil bypass stop valves. Set mixing valve to full coil flow.

2. Mechanical contractor shall remove and Clean strainers prior to test and balance and as required by Test and Balance Agency during.

3. Examine the water in the system and determine if water has been treated and cleaned.

4. Check pump rotation.

5. Check expansion tanks to determine that they are not air bound and the system is completely full of water. Check diaphragm type expansion tanks for proper air pressure. Note pressure on pump report.

6. Check air vents at high points of water systems and determine all are installed and operating freely.

7. Set temperature controls so coils are calling for full flow.

8. Check operation of automatic bypass valves.

9. Check and Set operating temperatures of heat exchangers to design requirements.

10. Check system make-up water for proper pressure. Note pressure on pump report. Verify location and operation of backflow preventor and pressure regulating valve.

B. PHASE ONE - WATER SYSTEMS TESTING AND BALANCING

1. Set ground water and hot water pumps to the proper gallon per minute delivery.

2. Adjust water flow of hot water through heat exchangers.

3. Check entering and leaving water temperatures and return water through heat exchangers. Reset to correct design temperature.

4. Check water temperatures at inlet side of cooling and heating coils. Note rise or drop of temperatures from source.

5. Proceed to Balance each ground water coil and hot water coil.

6. Mark Settings and Record Data upon the completion of flow readings and adjustments at coils.

C. PHASE TWO - WATER SYSTEMS TESTING AND BALANCING

1. Recheck settings at the pumps and heat exchangers and re-adjust, if required, after adjustments are made to coils.

2. Install pressure gauges on coil, and read pressure drop through coil at set flow rate on demand for full cooling and full heating. Set pressure drop across bypass valve to match coil full flow pressure drop.

3. Record and Check the following items at each cooling and heating element:

Inlet Water Temperatures.
Leaving Water Temperatures.
Pressure Drop of each Coil.
GPM at each Pump, Coil and Heat Exchanger.
Pump Operating Suction and Discharge Pressure and Final Total Dynamic Head.
List Mechanical Specifications of Pumps.
Rated and Actual Running Amperage of Pump Motor.
Check Control Valves for Operation from Full Open to Full Closed; Record Pressures.

3.3 DOMESTIC HOT WATER BALANCING

A. Check, setting and adjustment.

1. Check pump rotation, amp draw and proper sizing.

2. Set all circuits to proper gpm.

END OF SECTION

This page intentionally blank

SECTION 15060 - PIPE AND FITTINGS

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100

1.2 STANDARDS

A. Piping materials shall meet the requirements of the applicable sections of the latest standards of the following organizations listed below:

American National Standards Institute (ANSI)
American Society for Testing and Materials (ASTM)
American Welding Society (AWS)
American Water Works Association (AWWA)
Cast Iron Soil Pipe Institute (CISPI)
Commercial Standards, National Bureau of Standards (CS)

1.3 SUBMITTALS

A. Submit shop drawings to the Contracting Officer in accordance with the General Conditions and General Requirements for the following:

Copper Pipe and Fittings
Iron Pipe and Fitting
PVC Pipe and Fittings
Steel Pipe

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Cast iron soil pipe and fittings shall meet the requirements of ANSI A-112.5.2; ASTM A 74; CS-188; CISPI HS-67 and 301-69T; or FS WW-P-401.

B. Copper tubing shall meet the requirements of ASTM B 88 and ANSI H-23.1; or FS WW-T-799. Fittings shall meet ANSI B-16.22 and ASTM B 75 (wrought copper) or ANSI B-16.18 or B-16.23 and ASTM B 145 (cast brass). Solder shall be 95 percent tin and 5 percent antimony, meeting ASTM B 32. Brazed joints shall be made with approved silver or copper alloy brazing materials.

C. Polyvinyl chloride (PVC) pipe shall be Type I, Grade 1, and shall meet the requirements of ASTM D 1784 or D 2241; and CS-246. Joints shall be heat or solvent welded socket type for Schedule 40 pipe, and may be threaded for Schedule 80. Fittings shall conform to ASTM D 2467 and ASTM D 2464.

D. Steel pipe shall meet the requirements of ANSI B-36.20 or FS WW-P-406 and ASTM A 120; or ANSI B-36.1 or FS WW-P-404 and ASTM A 53. Cast iron fittings shall meet ASTM A 126, Class B, and ANSI B-16.4 or FS WW-P-501 (threaded); ANSI B-16.1 or FS WW-F-406 (flanged); or ANSI B-16.12 or FS WW-P-491 (drainage). Malleable iron fittings shall meet ASTM A 197 and the above dimensional standards. Steel welding fittings shall meet ASTM A 106, Grade B, or A 234, Grade B. ANSI B-16.9 dimensional standards are not required. Welding fittings shall be factory fabricated.

END OF SECTION

SECTION 15070 - PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100
Vibration Isolation	Section 15120

1.2 QUALITY ASSURANCE

A. Acceptable manufacturers shall be those listed in Section 15000, Mechanical General Requirements.

1.3 SUBMITTALS

A. Submit product data for hangers, supports, inserts, guides, anchors, and specialties in accordance with the General Conditions and General Requirements.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES AND ACCESSORIES

A. Design and size of supporting devices shall support the required loads and permit movement due to expansion and contraction. Conform to details when shown; otherwise, conform to general requirements specified below.

B. Hangers for horizontal piping shall be one of the following:

1. Clevis Type, Grinnell Figure 260, except as otherwise specified.

2. Steel Pipe Clamp, Grinnell Figure 216, where pipe exceeds maximum loading recommended for Clevis type hanger.

3. Trapeze Hangers shall be provided where several pipes can be installed parallel and at the same level. Trapeze hangers shall consist of two (2) steel channels or angles bolted back to back, spaced for rod hangers at each end. Roller chairs, Grinnell Figure 175, or pipe-roll stands, Grinnell Figure 271, shall be used where provision for expansion is required.

C. Floor supports for horizontal piping shall be:

1. Cast Iron Pipe Rests, Grinnell Figure 264, with pipe nipples to suit.

D. Wall supports for horizontal piping shall be one (1) of the following:

1. Steel J-Hook for pipe located close to wall, up to three (3) inch pipe, Fee and Mason Figure 146.

2. Light Welded-Steel Bracket for hanger suspension, 750-pound maximum loading, with hole for one (1) rod, three-quarter (3/4) inch diameter, Fee and Mason Figure 153.

3. Welded-Steel Bracket for pipe-roll stand support, light for 700-pound maximum loading, Fee and Mason Figure 150; medium for 1,500-pound maximum loading, Figure 151; heavy for 3,000-pound maximum loading, Figure 155.

E. Vertical piping supports shall be steel extension pipe-clamps, Grinnell Figure 261, sized according to the manufacturer's rated maximum loading for each size pipe.

F. Beam clamps shall be malleable iron, Grinnell Figure 217, for three-eighths (3/8) inch hanger rods; forged-steel beam clamp, Grinnell Figure 228, for hanger rod up to one and one-half (1-1/2) inches.

G. Pipe covering protection shields shall be galvanized, formed to protect insulation at areas of contact with hangers and supports; 18-gauge material eight (8) inches long for pipes up to three (3) inches and 14-gauge material twelve (12) inches long for pipes four (4) inches and larger.

H. Copper tubing supports shall be as follows:

1. Uninsulated Horizontal Lines. Brass hangers or split-ring extension hanger, Fee and Mason Figure 307.

2. Uninsulated Vertical Lines. Copper tube straps, Chase Brass and Copper Co., Style 1019, with two (2) holes for single tube; 1019-R for two tubes; or 1019-S with one (1) hole for single tube.

2.2 PRESSURE GAUGES, THERMOMETERS, GAS PRESSURE REGULATORS AND WATER PRESSURE REDUCING VALVES.

A. Pressure gauges shall have cast aluminum cases with phoshor bronze bourdon tubes, Monel movement, and brass separable sockets. Gauges in insulated pipes shall have extension neck type sockets. Scale ranges shall be as specified for each use.

B. Thermometers shall be four and one-half (4-1/2) inch dial type, with brass separable sockets. Sockets shall be extension neck type in insulated piping. Thermometers installed less than seven (7) feet above the floor shall be rigid stem type, with bottom or back outlets as required. Above seven (7) feet, provide the universal angle type. Thermometer ranges shall be as specified for each use.

C. Gas pressure regulators shall be spring controlled, with output pressure adjustable from five (5)

inch to fifteen (15) inch water column. Valve seats shall be replaceable without breaking pipe connections. Outdoor units shall have weatherproof screened vent openings. Body and diaphragm casings shall be cast malleable high-tensile strength iron. Valve discs and diaphragms shall be Buna N. Valve trim shall be bronze.

D. Water pressure reducing valves shall be spring controlled, with output pressure adjustable over a range of 60 psi to 100 psi. Bodies and trim shall be of bronze or brass, with composition valve discs. Spring casings may be brass or cast iron. Diaphragms shall be neoprene.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Suspend hangers from supporting rods securely anchored to steel or concrete inserts. Brace supporting rods, which exceed eighteen (18) inches in length, at every fourth (4th) hanger with diagonal bracing attached to slab or beam.

B. Fasten pipe rests to floor.

C. Support vertical pipe at each floor. Rest clamp end extension on structure and bolt clamp to pipe. Where pipe sleeves extend above floor, place pipe clamps below deck and support clamp end extension from inserts.

D. Support horizontal steel, wrought iron and brass pipe as follows:

PIPE SIZE	DIAMETER	MAXIMUM SPACING
Up to 1-1/4 Inches	3/8 Inch	8 Feet
1-1/2 Inches and 2 Inches	3/8 Inch	10 Feet
2-1/2 Inches and 3 Inches	1/2 Inch	10 Feet
4 Inches	5/8 Inch	12 Feet
6 Inches	3/4 Inch	12 Feet

E. Support horizontal cast iron pipe with two (2) hangers at each hub. (One on either side of hub.)

F. Support horizontal lines of copper tubing with hangers spaced not more than eight (8) feet center to center.

G. Support horizontal PVC pipe at one-half (1/2) the maximum spacing listed above.

END OF SECTION

This page intentionally blank

SECTION 15080 - VALVES

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping Section 15100

1.2 QUALITY ASSURANCE

A. Qualifications of manufacturer. Piping system components shall be the products of a single manufacturer.

1.3 SUBMITTALS

A. Submit shop drawings to the Architect-Engineer in accordance with the General Conditions and General Requirements.

PART 2 - PRODUCTS

2.1 VALVES

A. Metallic valves shall be of the following models and manufacture, unless otherwise specified under each respective piping specification:

TYPE OF VALVE	CRANE	JENKINS	LUNKENHEIMER	MILWAUKEE	NIBCO	STOCKHAM
Gate - 3 Inch and Smaller 125# Bronze	430	62	2125	1158	T-122	B-100
Gate - 4 Inch and Larger 125# Cast Iron	465½	651A	1430	F2885	F-617-0	G-623
Globe - 2½ Inch and Smaller 125# Bronze	1	746	2140	502	T-211-B	B-16
Check - 3 Inch and Smaller 125#						

Bronze	37	92 A	2144	509	T -412-B	B-319
Check - 4 Inches and Larger	37 3	624	1790	F2974	F -918-B	G-931

Type of Valve	Rockwell Nordstrom	Walworth
Gas Cocks - 2 Inches and Smaller	114-142	591
Gas Cocks - 2-1/2 Inches and Larger	143	1797F

B. Metallic butterfly valves, 2 inches through 20 inches, shall be suitable for "Dead End" service, and shall be tested at 100 psig. Valves shall be rated at 175 psig through 12 inches and 150 psig over 12 inches.

1. Valve Body shall be cast or ductile iron, lug pattern with stem busing to absorb operator side thrust.

2. Disc shall be aluminum bronze.

3. Stem shall be 300 series stainless steel if exposed to flowing media or 400 series stainless steel if not exposed in any valve position.

4. Seat shall be EPDM.

5. Operators shall be ten-position, lever-lock type through 6 inches and weatherproof worm gear with handwheel or enclosed crew type actuator for sizes 8 inches and larger.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 15090 - PIPING IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100

1.2 SUBMITTALS

A. Submit shop drawings for the following to the Contracting Officer in accordance with the General Conditions and General Requirements:

Pipe Identification
Valve Identification

PART 2 - PRODUCTS

2.1 VALVES

A. Shutoff valves in mains and branches throughout the building shall be plainly identified by means of brass, aluminum or plastic plates attached, or mounted adjacent, to the valves or equipment. Each plate shall be legibly marked, clearly indicating the function of the part of the system to which it is attached.

2.2 PIPE

A. Above ground piping shall be provided with Seton Setmark or similar pipe markers. Arrows indicating the direction of flow shall be placed alongside the lettering indicating the content or function of the pipe. Use the lettering height recommended by the manufacturer.

PART 3 - EXECUTION

3.1 VALVES

A. Identification plates shall be attached or mounted adjacent to the valves or equipment.

3.2 PIPING

A. Pipe markers shall be installed following the manufacturer's recommendations. Spacing of markers shall be on twenty (20) foot centers, or closer, to instantly identify piping, except on long straight runs where forty (40) foot spacing may be used. Install markers at each change in direction of piping.

B. Piping to be identified includes:

Ground Water Supply

Ground Water Return
Hot Water Supply
Hot Water Return
Domestic Cold Water
Domestic Hot Water
Domestic Tempered Water
Domestic Hot Water Recirculation
Natural Gas
Sanitary Waste
Sanitary Vent
Fire Sprinkler

END OF SECTION

SECTION 15100 - INSTALLATION OF EQUIPMENT AND PIPING

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Mechanical Requirements	Section 15000

1.2 WORK FURNISHED AND INSTALLED BY OTHERS

A. Equipment foundations and bases shall be furnished and installed by the General Contractor. All floor mounted or grade mounted mechanical equipment, i.e., air handlers, fans, pumps, boilers, expansion tanks, condensing units, etc., shall be installed on 4" thick concrete pads unless otherwise noted on drawings.

1.3 SCHEDULING

A. Plan the work so that it proceeds with a minimum of interference with other trades. Inform the General Contractor of openings required in the building structure and coordinate mechanical equipment locations with approved Equipment Foundation Drawings.

B. Install pipe and duct sleeves and pipe support inserts before concrete is poured (where applicable).

C. Cutting and patching made necessary by failure to plan the Work shall be accomplished by the General Contractor at the Mechanical Contractor's expense.

1.4 SUBMITTALS

A. Submit certified equipment drawings to the General Contractor for the location of equipment fasteners and pad openings.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Install equipment, accessories and services to permit easy access to filters, motors, drives and other items requiring maintenance. Relocation of equipment connections required to permit normal maintenance shall be accomplished at no additional cost to the Owner.

B. Install access doors to allow for maintenance or operation of concealed motors, valves, control devices or specialties.

C. Make final piping connections to equipment with unions or flanges to permit dismantling. Locate unions or flanges to allow coil removal.

D. Install permanent, protective covers at rotating or reciprocating parts. Provide openings in covers to allow measurement of RPM.

3.2 PIPING INSTALLATION

A. Install piping to conform to building conditions, offsetting to clear structural members and ductwork. Run in furred spaces wherever possible. Run exposed piping parallel or at right angles to the building walls and as high as possible.

B. Install pipe, hangers, anchors and guides to provide piping systems which are self-supporting and not dependent upon connection to equipment.

C. Prevent interference between piping and doors, windows, aisles and passageways.

D. Allow flexibility in the erection of the piping system to prevent excessive stresses in materials and joints due to thermal expansion or equipment vibration.

E. Use full lengths of pipe; short lengths with couplings will not be permitted.

F. Allow for pipe insulation without cutting pipe or fitting coverings.

G. Install chromium-plated escutcheons around piping passing through walls, floors and ceilings.

3.3 PIPE SLEEVES

A. Install pipe sleeves where piping passes through walls, floors or roofs. Where pipes pass through floor slabs in unfinished spaces, extend the top of the sleeve 3 inches above finished floor, but allow for escutcheon at finished floor.

B. Fill the annular space with a firestop material equal to Dow Corning Firestop 2000 sealant or Dow Corning Firestop Foam (20001).. Floor sleeves shall also be pointed with caulking compound, struck off at the top of the sleeve to prevent trapping water. Firestop to be installed according to manufacturer's recommendations.

3.4 METALLIC PIPING SYSTEMS

A. Fabricate welded piping in accordance with the ANSI Standard Code for Pressure Piping.

B. WELD-O-LET or THREAD-O-LET type fittings may be used in lieu of tees for branch connections provided the main is one size larger than the takeoff. Couplings or half couplings may be used at onflow connections such as thermometers.

C. Make joints in metallic piping as follows:

1. Welded Joints. Bevel pipe ends. Weld by electric arc process, using electrodes recommended by the manufacturer of the pipe. Welders shall be qualified and certified for the type of welding to be performed under this Contract and welding done in

conformance to American Welding Society Standards.

2. Screwed Joints. Cut threads accurately, with axis of thread corresponding with axis of pipe. Limit the number of threads so that not more than two (2) threads will show beyond fittings. Make up joints with pipe thread lubricant on outside threads or teflon joint tape.

3. Soldered Joints. Thoroughly clean both the male and female surfaces to be joined; apply flux and sweat according to the fitting manufacturer's directions.

4. Make Brazed Joints using an oxyacetylene flame. Apply flux as recommended for brazing material used. Take care that the pipe is not overheated to the extent that scale forms on pipe.

5. Make Compression Type Joints as recommended by the manufacturer.

6. Provide Unions at each screwed type valve and at each piece of equipment having screwed connections. Unions in steel pipe shall be heavy duty, malleable screwed type, with brass to iron ground joints. Unions in copper tube shall be copper, with solder connections, and copper to copper ground joints.

7. Make joints between cast iron and steel pipe by screwing a half coupling on steel pipe to form a spigot head, then make a caulked joint as specified for cast iron pipe.

8. Make Joints between Copper and Dissimilar Metals with an approved dielectric connection.

3.5 PVC PIPING SYSTEMS

A. Make socket type connections with PVC solvent cement complying to ASTM D 2564. Join 1/2-inch size through 6-inch through 6-inch size with Celanese Piping Systems Heavy Duty Cement having a viscosity range of 1,600 cps to 3,000 cps at 73F.

B. Make joints in PVC piping as follows:

1. Cut the Pipe Square using a special plastic pipe cutter.

2. Clean the Cut End of burrs and irregular surfaces.

3. Using a Clear, Dry Cotton Rag, wipe away loose dirt and moisture from the I.D. and O.D. of the pipe-end and the I.D. of the fitting.

4. Prior to Solvent Welding in unusually warm or cool weather conditions, remove fittings from the cartons and expose for at least one (1) hour to the same temperature conditions as the pipe in order to assure that they are thermally size balanced before joining.

5. Use a Natural Bristle Brush, 1/2 the diameter of the fitting, and apply a complete coating of cleaner to the entire I.D. surface of the fitting socket and to an equivalent area on the O.D. of the pipe end.

6. Immediately after Applying the Cleaner, use a clean cotton rag to vigorously wipe the surface dry, insuring that surface gloss is removed, and is etched and ready to receive the solvent cement. If necessary, re-apply more cleaner and rewipe until surface is thoroughly roughened.

7. Using Another Natural Bristle Brush of the same width, brush the appropriate type solvent cement into the fitting's socket and onto the O.D. of the pipe-end as follows:

   To the Pipe: Dip brush in cement and flow cement liberally around entire surface of pipe O.D. to a width slightly more than the equivalent socket depth of the fitting.

   To the Fitting: Dip brush into cement and brush a light but complete coating around entire depth of socket surface.

   To the Pipe: Reflow another liberal coating onto pipe O.D. The purpose of double coat to pipe end is to insure that cement is liberally applied, no "holidays" exist, and that any gap in the interference fit of the joint is thoroughly welded. There is no concern about applying too much cement on the pipe, because any excess will be beaded out at the face of the fitting where it may be easily wiped away.

8. Immediately upon finishing Cement Application and before it starts to set, insert the pipe to the full socket depth while rotating the pipe or fitting a 1/4 turn to insure complete and even distribution of the cement. (In large diameter pipe, i.e., 6-inch size and above, this twist action maybe omitted). Hold joint together for a minimum of 10 seconds to 15 seconds to make sure that pipe does not move or back out of the socket.

3.6 FLASHING

A. Flash and counterflash plumbing vents through the roof with 4-pound sheet lead. Extend flashing at least 10 inches in all directions from the pipe and at least 12 inches above the roof. Turn counterflashing down inside the vent and overlap the lower flashing by 4 inches. Prefabricated flashings may be used if permitted by code.

B. Flash floor drains (except those on grade) with 4-pound sheet lead flashing. Extend 18 inches from the drain in all directions.

C. Flash tile showers (except those on grade) with 4-pound sheet lead, the full size of the shower floor up to 36 inches by 36 inches. Turn up sides and fold corners.

D. Flash piping or ductwork, which is continuous through the roof, with 16-ounce sheet metal flashing. Extend 10 inches under the roofing and 12 inches up the pipe or duct. Counterflash

with copper lines and galvanized metal for steel lines or ductwork. Pack space between flashing and duct or pipe with fiberglass, oakum, or foam polyethylene. Solder counterflashing to make a watertight joint.

3.7 CLEANING AND PAINTING

A. Clean piping, ductwork and equipment to remove rust, plaster and dirt before insulation or painting.

B. Remove grease, oil and similar materials with solvents and clean rags.

C. Paint exterior piping with one (1) coat of primer and two (2) coats of flat latex paint in a color as selected by the Contracting Officer.

D. Repaint damaged equipment to match original factory finish.

END OF SECTION

This page intentionally blank

SECTION 15110 - EXCAVATION AND BACKFILLING

PART 1 - GENERAL

1.1 SCOPE

A. Perform excavations to depths indicated on the Drawings or as required for installation. During excavation, pile material suitable for backfilling, in an orderly manner, a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. Remove and waste excavated material not required or suitable for backfill as directed by the Contracting Officer. Keep excavated material trimmed so it causes the least inconvenience possible to the public and adjoining property owners. At street crossings, sidewalks, and other points where the Contracting Officer deems necessary, bridge trenches in a secure manner, preventing serious interruption of travel and providing access to fire hydrants and public and private premises.

1.2 EXISTING CONDITIONS

A. Verify the existence and location of underground utilities along the route of work. Omission from, or inclusion of, utility locations on the Drawings is not to be considered as the nonexistence of, or a definite location of, existing underground utilities.

B. Protect existing utilities from damage due to the operations of the Mechanical Contractor. Any damage to utilities will be repaired at the expense of the Mechanical Contractor.

C. Move minor structures and restore temporary openings in fences to their original condition. Stockpile any culverts, pipes, cables or minor structures which are moved and reset in the original locations. For construction purposes, determine the actual condition of structures and miscellaneous obstacles to move. Removal and placement of these items shall be considered as part of the Contractor's obligation, and no additional payment shall be made.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

American Association of Transportation Officials (AASTO)
Associated General Contractors (AGC)

1.4 TESTING

A. Test trench backfill where directed by the Contracting Officer.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 TRENCHING

A. Excavate by open cut except that short sections of a trench may be tunneled if, in the opinion of the Contracting Officer, pipe can be safely and properly installed and backfill properly tamped

in such tunnel sections. Trench the necessary width for the proper laying of pipe with banks as nearly vertical as practical.

Provide separate trenches for sewer, water and gas lines respectively, with a minimum of three (3) feet of undisturbed earth between trenches. In locations, such as close to buildings, where separate trenches for sewer and water lines are impractical, lay water pipe on a solid shelf at least eighteen (18) inches above the top of sewer.

B. Trench for sewers shall have a clear space between the barrel of the pipe and trench wall not exceeding eight (8) inches on either side of pipe. The width of the trench above the top of the pipe may be as wide as necessary for sheeting, bracing and proper performance of the Work.

C. Trench for water service shall provide a minimum cover of seven (7) feet over the top of the pipe from the existing ground surface or finished grade, whichever is lower, avoiding interference with other utilities.

D. Sheet and brace trenches as necessary to protect workmen and adjacent structures and in compliance with the AGC Manual of Accident Prevention in Construction. Do not remove sheeting until the trench is backfilled sufficiently to protect the pipe and prevent injurious caving.

E. Control grading in the vicinity of the trench excavation preventing surface water from flowing into trenches. If water does enter the trench, remove and dispose of the water until utility lines, fittings, manholes and other appurtenances are in place and sealed against the entrance of water. Water, earth or any foreign materials shall not be allowed to enter the utility lines.

F. Keep trenches free from water when construction is in progress. Do not lay pipe or appurtenances in water. Pump or bail water from bell holes to permit the proper jointing of pipes. Conduct the discharge from, trench dewatering to drains or natural drainage channels.

G. Perform final grading of trench bottoms with hand tools; carry machine excavation only to the depth that soil bearing for pipes is not disturbed. Grade the bottom of trenches evenly to insure uniform bearing for all pipes. Cut holes as necessary for joints and joint-making. As an alternate method, excavate trenches to at least four (4) inches below required bottom levels and refill to proper grade with sand or gravel firmly compacted.

1. In Rock, Cemented Gravel, Old Masonry or Other Hard Material, excavate to at least four (4) inches below the pipe at all points and refill to grade with sand or gravel firmly compacted.

2. In Fill Containing Refuse, Organic Matter or Similar Substances, remove such material to a depth at least six (6) inches below the pipe at all points and refill to grade with sand or gravel firmly compacted.

3.2 BACKFILLING

A. Backfill trenches only after piping is inspected and tested and the locations of pipe lines and

appurtenances are recorded. For a depth of at least three (3) pipe diameters above the top of the pipe, backfill by hand with earth or granular material free from large stones, rock fragments, roots and sod; exclude cylinders, refuse, scrap iron and unused portions of welding rods from trenches in which metal pipes are to be laid; tamp this backfill thoroughly in layers not exceeding four (4) inches in thickness, taking care not to disturb the pipe or injure pipe coating. For the remaining trench depth, backfill with material as specified in the preceding paragraph, except that the material may contain stones, rocks, concrete or masonry materials (but no cinders) with a maximum dimension of four (4) inches, providing the voids in such coarse material are completely filled with earth or granular material. In the event that sufficient suitable material specified for trench backfill is not available from trenching or other excavation for the project, supply and place the requisite additional material without an increase in the Contract Price. Thoroughly compact the backfill referred to with a heavy rammer or an approved mechanical tamper in layers not more than twelve (12) inches thick, measured loose.

B. Compact trench backfill in areas under paved roads, parking areas, sidewalks and other structures to a density of at least 95 percent of the maximum dry density. In locations where the trench will not be under paved areas, compact to a minimum of 90 percent of the maximum dry density. Backfill material shall have a moisture content in the range of 5 percent above to 5 percent below optimum moisture at the time it is placed.

C. Backfill open trenches excavated through specially treated surfaces, or other existing surfaced areas, and replace to the original grade with surfacing material, of equal type, to the same depths and limits as the material removed.

D. Re-open improperly filled trenches, or where settlement occurs, the depth required for proper compaction; then refill and compact with the surface restored to the required grade and compaction, mound over, and smooth off.

3.3 TESTING

A. Testing. The testing laboratory will take the following number of tests required to determine the specified compaction. Fill not meeting the required compaction, as determined by the Testing Laboratory, shall be removed, replaced, recompacted and retested at the expense of the Contractor. The location of each test shall be recorded and submitted with the Testing Laboratory results.

1. Fill, non-supporting - One test per 1,000 square yards per 8-inch lift.

2. Backfill adjacent to buildings, either supporting or non-supporting - One test per 50 linear feet per 8-inch lift.

3. Structural fill - Testing and inspection shall be on a full time basis when placement of fill is in operation.

4. Utility trench backfill, non-supporting - One test per 200 linear feet per alternate 8-inch lift.

5. Utility trench backfill, supporting - One test per 100 linear feet per 8-inch lift.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 15120 - VIBRATION ISOLATION

PART 1 - GENERAL

1.1 VIBRATION ISOLATION

A. Mechanical equipment and piping in the building shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution to produce reasonably uniform deflection. Deflections shall be as noted on the Vibration Mounting Schedule in this Section. The boilers and base mounted pumps in the boiler room will be floor mounted without isolators. Vibration isolators shall be of the manufacturer shown or listed in the Acceptable Manufacturers List Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping Section 15100

1.3 SUBMITTALS

A. Submit shop drawings to the Contracting Officer in accordance with the General Conditions and General Requirements for the following:

Acoustical Sealant
Hangers
Hoses
Mountings

PART 2 - PRODUCTS

2.1 MOUNTINGS

A. TYPE II. Spring isolators shall be freestanding and laterally stable without any housing, and shall be complete with one-quarter (1/4) inch neoprene acoustical friction pads between the baseplate and support. Mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to fifty (50%) percent of the rated deflection. Submittals shall include spring diameters, deflections, compressed spring height and solid spring height. Mountings shall be Series A as manufactured by Vibration Mountings and Controls, Inc., or approved alternate.

2.2 HANGERS

A. TYPE IV. Vibration hangers shall contain a spring and a double deflection neoprene element in a series. Neoprene elements shall have a minimum defection of 0.35 inch. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel-to-solid equal to fifty (50%) percent of the rated deflection.

Hangers shall be RSH as manufactured by Vibration Mountings and Controls, Inc., or approved alternate.

2.3 HOSES

A. TYPE VII. Flexible connectors shall be molded neoprene rubber with nitrile liner and flanges with control rods. Connectors shall be capable of one and one-quarter (1-1/4) inch compression, three-quarter (3/4) inch elongation, and three-quarter (3/4) inch transverse deflection. Hoses shall be suitable for 230 degree F service at 150 psi. Connectors shall be installed on the equipment side of shutoff valves. Connectors shall be Belmont Belflex or approved alternate.

B. TYPE X. Flexible bronze hoses shall be of bronze braid reinforced bellows construction with copper tube ends, suitable for 300 psi working pressure. Hose length shall be ten (10) times its nominal diameter. Hoses shall be Vibration Mountings and Controls, Inc., Type BF, or approved alternate.

PART 3 - EXECUTION

3.1 PIPE ISOLATION

A. Provide flexible connectors in piping to ground and hot water pumps and coils. Connectors shall be as described for Type VII.

B. Provide individual metal sleeves grouted in place for refrigerant pipes penetrating the mechanical room wall. Size the sleeves to provide one-quarter (1/4) inch to one-half (1/2) inch annular clearance. Pack the annular space full depth with glass fiber, oakum or foam polyethylene, and caulk on both sides with a non-hardening sealant such as Johns-Manville's "Duxseal."

3.2 DUCT ISOLATION

A. Provide individual metal sleeves grouted in place for ducts penetrating mechanical room walls or ceilings. Size sleeves to provide one-quarter (1/4) inch to one-half (1/2) inch annular clearance. Pack the annular space with ethylene and caulk on both sides with a non-hardening sealant such as Tremco's "Acoustical Sealant" or Johns-Manville's "Duxseal".

B. Isolate all duct connections to air handling units, return fans and exhaust fans with Elgin flex connector on both sides of the fan.

3.3 VIBRATION MOUNTING SCHEDULE

Type of Equipment	Location	Type Mounting	Minimum Static Deflection
Air Handling Units	All	II	1.75 Inches (Internal)
Suspended Fans	All	IV	1.75 Inches
Roof Mounted Fans	All	II	1.75 Inches

END OF SECTION

This page intentionally blank

SECTION 15130 - INSULATION

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100

1.2 SUBMITTALS

A. Submit shop drawings to the Contracting Officer in accordance with the General Conditions and General Requirements for the following:

Duct Insulation
Equipment Insulation
Fitting Covers
Pipe Insulation

1.3 SYSTEM DESCRIPTION

A. Furnish insulation and materials bearing the Manufacturer's label. Only mechanics skilled at such work shall apply materials. Insulation and materials shall be by one of the Manufacturers listed in Section 15000, Approved Manufacturers. Specialty material shall be of the Manufacturer indicated or approved equal. Fire and smoke hazard classification ratings on composition, jacket and adhesive shall conform to NFPA 255, ASTM E 84 and UL-723 as follows:

Flame Spread not exceeding 25
Fuel Contributed not exceeding 50
Smoke Developed not exceeding 50

1.4 INSULATION AND PROTECTION

A. Pipe insulation exposed in mechanical and in finished areas shall be protected with Ceel-Co 100 series jacketing covers.

B. Pipe insulation exposed to weather shall be weatherproofed with Childers Aluminum Jacketing. The Jacketing is to be manufactured from T/3003 aluminum with embossed surface, and shall have a factory attached moisture barrier. Jacketing to be 0.016 inches thick. All elbows to have similar jacketing.

1.5 CONTRACTOR'S OPTION

A. At the contractor's option, prefabricated fitting covers may be used in lieu of the fitting jacket specified below.

PART 2 - PRODUCTS

2.1 PIPE INSULATION

A. Piping insulation shall be as scheduled below:

SYSTEM	PIPE SIZE and LOCATION	INSULATION and JACKET
Domestic Hot and Cold Water	Piping in Building through 2 Inches	1-Inch 4-Pound Density Fiberglass Insulation with ASJ Vapor Barrier Jacket
Domestic Hot and Cold Water	Piping in Building 2-1/2 Inches and Larger	1-1/2 Inch 4-Pound Density Fiberglass Insulation with ASJ Vapor Barrier Jacket
Ground Water Supply and Return Piping	Piping 6 Inches and Smaller (Piping in Building)	1-Inch 4-Pound Density Fiberglass Insulation with Fire-Resistive, ASJ Vapor Barrier Jacket
Hot Water Heating Piping	Piping in Building	1-1/2-Inch 4-Pound Density Fiberglass Insulation with Fire-Resistive, ASJ Vapor Barrier Jacket

2.2 VALVE AND FITTING INSULATION

A. Valve and fitting insulation shall be as scheduled below:

SYSTEM	PIPE SIZE and LOCATION	INSULATION AND JACKET
Valves and Fittings, Domestic Hot and Cold Water	All Piping	Built-Up Valves and Fittings to Equivalent Thickness with Preformed Insulating Pads. Finish Jacket to Match Adjacent Piping.
Fittings - Heating Supply and Return Piping	3 Inches and Smaller	Built-Up Insulation with Preformed Pads, and Covered with Jacket to Match Adjoining Piping
Fitting - Heating 4 Inches and Over		Insulated with Segments of Premolded Pipe Insulated Securely Wire in Place and Finished to Match Piping.
Valves - Heating All Sizes Supply and Return and Air Separator		Insulation as Specified for Fittings for Valves with Bolted Bonnets, insulation shall Cover

		Bonnet up to Packing Gland. For Union Bonnet Valves, Insulation shall Terminate of Bottom Ring. Jacket to Match Adjacent Piping.
Valves and Fittings Ground Water System	All Sizes	Spiral Wrap with J-M Microlite 3-Pound Built-Up to Same Thickness as Adjacent Pipe Insulation, Securely Tied with Jute Twine. Vapor Seal Coat of 1/8-Inch Thickness of Benjamin Foster 60-25 or 30-35 Troweled and Reinforced with a Layer of Cement No. 352 and ASJ Vapor Barrier Jacket

2.3 EQUIPMENT INSULATION

A. Equipment insulation shall be as scheduled below:

ITEM	INSULATION
Boiler	Factory Insulated and Covered with Metal Jackets

2.4 DUCT INSULATION

A. Duct insulation shall be as scheduled below:

SYSTEM	INSULATION
Low Velocity Unlined Supply or Return Ducts, Outside Intake	1-1/2-Inch Fiberglass Flexible Insulation 3/4 PCF Density, with Heavy Duty FSK Vapor Inside Building Barrier. Apply Insulation with Edges Tightly Butted. Secure on 15-Inch Centers with Approved Adhesive and Pins. Secure Joints by Overlapping Facing or 4-Inch Wide Strips of Same Material Adhered with Benjamin Foster 85-20 Adhesives
High Velocity Supply Air Heating and Cooling Ducts Inside Building	1-1/2-Inch Fiberglass Flexible Insulation, 1 PCF Density with Heavy Duty FSK Vapor Barrier. Apply Insulation with Edges Tightly Butted. Secure on 15-Inch Centers with Approved Adhesive and Pins. Secure Joints by Overlapping Facing or 4-Inch Wide Strips of Same Material Adhered with Benjamin Foster 85-20 Adhesives.

2.5 ACOUSTICAL DUCT LINER

A. Acoustical duct liner shall be as specified in Air Duct Systems Section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Insulate piping and ductwork continuously through walls, floors and ceilings. Where a vapor barrier is specified, insulate flanges, valves, and fittings.

B. Protect vapor barriers on pipe insulation by installing pipe hangers around the outside of the insulation. Protect the insulation with sheet metal jackets to distribute the weight or install rigid insulation designed for use with pipe hangers. If rigid insulation is used, seal vapor barrier after pipe hanger is installed.

C. All exposed ends of insulation are to be sealed so as to encapsulate insulation fibers. Sealer to be Childers CP3060 or equal.

END OF SECTION

SECTION 15140 - MOTORS AND CONTROLS

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

Temperature Controls	Section 15930
Raceways and Fittings (Electrical Contract)	Section 16110
Wire and Cable (Electrical Contract)	Section 16120
Motor Controls (Electrical Contract)	Section 16480
Panelboards (Electrical Contract)	Section 16470
Disconnect Switches (Electrical Contract)	Section 16440
Fuses (Electrical Contract)	Section 16426
Fire Alarm and Smoke (Electrical Contract) Detection Systems	Section 16721

1.2 WORK FURNISHED, INSTALLED AND CONNECTED UNDER DIVISION 15

A. HVAC temperature control system components, conduit and wiring, shall be furnished and connected complete by the Mechanical Contractor.

1.3 WORK FURNISHED AND INSTALLED UNDER DIVISION 15

A. HVAC equipment, variable frequency drives, motors, temperature control equipment, plumbing equipment, heaters and associated appurtenances specified in DIVISION 15, shall be set in place by the Mechanical Contractor, including separately packaged motors and electrical materials required for the proper operation of the equipment. All exhaust fans shall be be supplied with fusible disconnects.

B. Control wiring installed in air plenums, regardless of voltage, shall be installed in conduit, or be plenum rated cable. Materials and installation shall be as specified in Division 16, Sections 16110 and 16120.

1.4 WORK FURNISHED UNDER DIVISION 15 BUT CONNECTED UNDER DIVISION 16

A. Power source wiring and overcurrent protection for equipment furnished in DIVISION 15, shall be furnished, installed and connected by the Electrical Contractor for those items shown and/or scheduled on the Electrical Drawings. The Mechanical Contractor shall be responsible for coordinating the extent of work covered in each Division prior to bidding.

1.5 SHOP DRAWINGS

A. Complete composite electrical wiring diagrams for DIVISION 15 equipment, including power requirements and temperature control wiring, shall be prepared by the Control Subcontractor, and shall be included with the specific shop drawing submittals.

1.6 SUBSTITUTIONS

A. When electrical loads are substituted by the Mechanical Contractor which differ in size and/or number other than those specified, the Contractor making the substitution shall submit complete power and control wiring diagrams showing the proposed modifications to the electrical system, and shall bear all additional electrical costs, such as additional or larger overcurrent devices, disconnect switches, power wiring, control wiring, electric service modifications, etc. Substituted loads, quantities or equipment requiring additional electrical work, other than that shown on the Drawings, shall not be installed or connected without the approval of the Contracting Officer. Proper documentation of electrical design modifications and extra costs shall be the responsibility of the Mechanical Contractor. Equipment installed without such prior documented approval shall be removed by the Mechanical Contractor, and specified items shall be installed at no additional cost.

PART 2 - PRODUCTS

2.01 MOTORS

A. GENERAL

1. All motors shall conform to the following provisions.

2. Motors in NEMA frames 143T through 445T shall be 3 phase, 60 hertz, 230/460 volts.

3. Motors shall be suitable for continuous duty in ambient temperatures from 30 degree C to 40 degree C a rated Service Factor. Altitude shall be less than 3300 feet.

4. All motors shall have a Service Factor of 1.15.

B. ELECTRICAL

1. All motors supplied shall be the manufacturer's premium efficiency design. The nominal efficiency and the minimum guaranteed efficiency shall be stamped on the nameplate of the motor. All efficiency testing and labeling shall be done in accordance with the NEMA MG1-12.53 standard.

Motor Size	Motor Efficiency Non Efficiency
0.75	80
1	84
1.5	86.5
2.0	86.5
3	89.5

5	88.5
7-1/2	91.0
10	91
15	93
20	93.6
25	93.6
30	94.1
40	94.5
50	95
60	95.4

2. All motors shall be capable of developing NEMA Design B locked rotor and pull up torque with 90% of rated voltage applied.

3. The insulation system must be Class F or better with Class B rise at Service Factor 1.15 (90 degree C).

4. Dual voltage motors 7.5 HP and larger must be capable of ATL and Wye-Delta starting on both voltages and part winding starting on the lower voltage.

C. MECHANICAL

1. Stator frame and end brackets shall be cast iron construction.

2. Bearings shall be either ball or cylindrical roller bearings.

3. Bearings shall be selected to provide a L-10 rated life of 30,000 hours with external load factors per NEMA MG1-14.42.

4. Frames 256T and smaller shall use sealed bearings. Frames 284T and larger shall be regreasable while motor is operating.

5. All hardware shall be zinc-dichromate plated.

6. Nameplates shall be 304 stainless steel.

7. All motors shall have a neoprene gasket between the conduit box and the motor frame.

8. All motors to be dynamically balanced to .6 mils peak or better.

D. APPLICABLE STANDARDS AND TEST

1. NEMA Publication MG-1.

2. Testing per NEMA MG1-12.53a (IEEE 112 Test Standard, Method B with segregated loss analysis).

3. All motors shall be given a routine test per NEMA MG-1, Section 12.51.

4. UL Recognition and CSA listings are required. The nameplate shall be stamped accordingly.

5. Frame assignments shall be per NEMA MG13.

2.02 MOTOR STARTERS

A. ~~Motor starters shall be as specified in Division 16, Section 16480.~~ Starters furnished under Division 15 shall be furnished with a suitable number of auxiliary contacts for specified control interlocks. Starters furnished under Division 16 shall have a minimum of one (1) normally-open and one (1) normally-closed auxiliary contact for control interlocks. Starters shall have individual control transformers for 120-VAC control. Starters shall be NEMA size 1 minimum.

1. Packaged, Factory-wired Equipment containing motor starters shall be furnished by the Mechanical Contractor.

2. Two-speed Motor Starters, remote mounted, shall be furnished by the Mechanical Contractor for equipment furnished by the Mechanical Contractor. The Electrical Contractor shall set and power connect.

3. Other Motor Starters and Manual Motor Switches shall be furnished, installed and power connected by the Electrical Contractor as shown on the Drawings.

PART 3 - EXECUTION

3.01 MOTORS AND CONTROLS

A. Execution of work shall be as specified in the appropriate Mechanical and Electrical Sections of these Specifications.

END OF SECTION

SECTION 15205 - GROUNDWATER WELLS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section includes ground water cooling wells (supply wells and reinjection wells), pumps, pump wiring, and related work. The extent of the work specified herein is shown on the drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Mechanical Requirements	Section 15000
Testing and Balancing	Section 15030
Pipe and Fittings	Section 15060
Valves	Section 15080
Excavation and Backfill	Section 15110
Site Utilities	Section 15210
Water Piping and Specialties	Section 15660
Temperature Controls	Section 15930

1.3 QUALITY ASSURANCE

A. The driller shall hire a consulting hydrologist to perform tests as listed herein. Selection, hiring, coordination, and payment of hydrologist are the driller's responsibility. The name of the hydrologist shall be submitted to the Contracting Officer prior to drilling. The driller shall collect and submit to the owner all required records, tests, well logs, and other materials as required herein to assure performance of the supply and reinjection wells.

B. The driller shall also hire or employ qualified tradesmen or subcontractors as required to supply, place, and wire the submersible pumps up to the top of the casing.

C. All wells shall be drilled, developed, screened, and grouted in accordance with potable water well standards as indicated in Title 37, Chapter 43, Montana Code Annotated and Title 36, Chapter 21, Administrative Rules of Montana.

PART 2 - PRODUCTS

2.1 MATERIALS FOR GROUNDWATER SUPPLY WELLS

A. Casing: STD. 8" I.D. minimum, drifted black steel pipe of a minimum weight as per ASTM-A53, with butt joints welded 3 passes minimum. Include in the bid price an amount for 200' minimum well depth; include in the unit price section of the bid unit prices for each foot of depth added or deleted in this casing size.

B. Well Screen: Similar to Johnson screen as manufactured by the Johnson Co., made of Everdur metal and sized for conditions encountered. Include in the bid price an amount for 10' minimum well screen; include in the unit price section of the bid unit prices for each additional foot of screen.

C. Sanitary Well Cap: To be screwed, flanged, or welded cap, installed to prevent either tampering with the well or the entrance of foreign matter into the well.

D. Install an access port of at least 0.50-inch diameter to allow for accurate measurements of static water level.

E. Install a flow measuring devices on the supply well.

F. Install sample taps on the supply well and on the reinjection well to allow for routine water quality sampling.

2.2 MATERIALS FOR REINJECTION WELLS

A. Pipe: Casing STD. 8" I.D. minimum, drifted black steel pipe of a minimum weight as per ASTM-A53, with butt joints welded 3 passes minimum. Include in the bid price an amount for 200' minimum well depth; include in the unit price section of the bid unit prices for each foot of depth added or deleted in this casing size.

B. Well Screen: Similar to the Johnson screen as manufactured by the Johnson Co., made of Everdur metal and sized for conditions encountered. Include in the bid price an amount for 10' minimum well screen; include in the unit price section of the bid unit prices for each additional foot of screen.

C. Sanitary Well Cap: To be screwed, flanged, or welded cap, installed to prevent either tampering with the well or the entrance of foreign matter into the well.

D. Install an access port of at least 0.50-inch diameter to allow for accurate measurements of static water level.

E. Install sample taps on the supply well and on the reinjection well to allow for routine water quality sampling.

2.3 PUMPS FOR SUPPLY WELLS

A. Pump and motor shall be Red Jacket, Goulds, Grunfos, or Jacuzzi high capacity submersible pump with check valve. Pump shall deliver a minimum of 276 gpm. Submit specifications of pump to Contracting Officer prior to purchase, but after drilling well. If water depths are different than planned, a change in pump selection will be made at this time, with an equitable change order for the contractor. In addition to selection of a pump based upon the depth of the well, the Contractor shall also size the pipe to provide for 80 foot head of pressure loss in the building for coils, filters, piping, valves, and associated appurtenances. Moreover, the Contractor shall add in additional pressure loss by calculating the loss in the piping from the well to the building, as well as that required for vertical lift from the supply well.

B. Provide submersible pump wiring for pump. See Division 16 for pump controls, protection, and wiring.

C. Pumps shall not be ordered until the wells have been drilled, test pumped, and accepted by the owner.

2.4 DOWN HOLE PIPING MATERIALS

A. Drop pipe shall be schedule 40 galvanized pipe with threaded couplings.

B. Pitless Adaptor

1. Baker-Monitor discharge outlet and wall cap.

PART 3 - EXECUTION

3.1 GENERAL

A. The water pumped from the wells is to be dumped into the storm sewer or appropriate drain outside the boundaries of the construction site. The well driller will take precautions necessary to prevent drilling mud or water from entering any surface water.

B. The driller shall take such precautions as are necessary or as may be required permanently to prevent contaminated water or water having undesirable physical or chemical characteristics from entering through the opening made by the drilling in drilling the well, the stratum from which the well is to draw its supply. He shall also take all necessary precautions during the construction period to prevent contaminated water, gasoline, etc., from entering the ground surface. All water used in drilling operations shall be clean potable water.

C. In the event that the well becomes contaminated or that water having undesirable physical or chemical characteristics does enter the well due to the neglect of the driller, he shall, at his own expense, perform such work or supply such casing, seals, or other material as may be necessary to eliminate the contamination or shut off the undesirable water.

D. The driller shall exercise extreme care in the performance of his work in order to prevent the breakdown or caving in of strata overlaying that from which the water is to be drawn.

3.2 RECORDS

A. The driller shall prepare a log of the wells showing sizes of casing, length of sections and diameter, the location of the top and bottom of each stratum penetrated including a description of material encountered, each water bearing strata encountered, depth of well, static water level, discharge capacity in gallons per minute, drawdown, hours pumped and type of screen and length. A copy shall be submitted to the Contracting Officer and such agencies as are required by law.

B. The records for all wells shall clearly show the highest level of permeable strata with accurate depth.

3.3 PROCEDURE

A. Drilling: Wells shall be drilled plumb and be free from any obstructions and may be abandoned only with the permission of the Contracting Officer.

B. Should the drilled depth reach specified depth without performance being achieved, the driller shall notify the Contracting Officer and await instructions before proceeding with the work.

C. Alignment: The hole shall be constructed and all casing and liners set round, plumb, and true to line.

D. Procedure in water bearing strata: When the water bearing strata is reached, the driller shall notify the Contracting Officer.

E. Drilling of wells shall be stopped when obtaining a supply of water which can be developed to sand-free sustained yield of 276 gallons per minute minimum for the supply well, and 276 gallons per minute for the reinjection well.

F. In the event that water is not reached at the maximum specified depth, the driller shall notify the Contracting Officer before drilling further.

G. Developing Well: The driller shall do all surging, bailing, and pumping to develop the well to its maximum capacity and to assure its being free of sand and dirt and until its turbidity is less than 5 on the silica scale described in Standard Methods of Water Analysis.

H. Blasting and chemical conditioning methods covering equipment and controls for increasing the yield of ground water structures shall be submitted for approval to the State Board of Health, Ground Water Branch of Bureau of Mines and Geology and to the owner. Such methods to increase yield will be used at no additional cost to the owner.

I. The driller shall provide all test equipment and conduct testing on the completed supply well to determine yield and drawdown by pumping at the rate of 276 gallons per minute for 8 hours (276 gpm for reinjection well), or for 6 hours after maximum drawdown is achieved.

3.4 GROUNDWATER SUPPLY WELLS

A. Furnish the drilling and placing of all necessary materials including casing, cap, and screen, developing the well to an uncontaminated, sand-free, sustained yield of no less than 276 gallons per minute at an estimated depth of not more than 200 feet as outlined below. Locate the well approximately where shown on the drawing, taking due care to verify and avoid any underground utilities or other possible obstructions. Well must be at least 100 feet from the nearest point of any drain field or other potential contaminant source.

3.5 ABANDONMENT OF GROUNDWATER SUPPLY WELLS

A. In the event the Contracting Officer determines it is undesirable to drill beyond the estimated depth and abandon the well, the driller shall pull the casing and fill the abandoned hole with clay or clay and concrete and credit the owner for the cost of the casing figured in the base bid less the cost to the driller to fill the hole.

3.6 SAMPLES - GROUNDWATER SUPPLY WELLS

A. Water test samples will be taken by the Hydrologist hired by the driller from the supply wells before water enters the heat exchange system, and after leaving the heat exchange system to

show that water entering the reinjection well is substantially undiminished in quality from what it was when diverted.

B. Water Temperature: Readings of water temperature shall be taken in the presence of the Contracting Officer who shall be on call and available on short notice.

C. Sampling for well screen sizing: The hydrologist shall verify the driller's sampling technique and recommendation for the well screen size and length required to permit development of the well at no cost to the owner. The unit prices outlined below will be used to compensate the driller for extra well screen.

D. The supply well water must not have sediment which will plug the well. If, in the opinion of the Contracting Officer, pumping and screening do not produce sufficiently clean water, then alternative filtration will be added to the system by change order. The supply injection well should be tested by hydrologist using Imhoff Cones to verify that well produces sand-free water.

3.7 REINJECTION WELL

A. Furnish the drilling and placing of all necessary materials, including casing, cap, and screen, developing the well as shown on the drawings and herein specified to a minimum depth of 40 feet below static water level. Locate the well approximately where shown on the drawing, taking due care to verify and avoid any underground utilities or other possible obstructions.

B. Drop pipe to extend minimum of 10-feet below static water level.

3.8 TESTING OF REINJECTION WELLS

A. The reinjection well shall be tested by pumping at the rate of 276 gpm for 4 hours. If the capacity of the reinjection well is inadequate, the well shall be pumped to clear sediment. If capacity is still inadequate, consult Contracting Officer. Additional wells may be required, and shall be drilled at the unit prices as indicated below.

3.9 ELECTRICAL

A. All electrical wiring in support of the supply well shall be in accordance with Division 16. The pump installer shall provide submersible cable from the pump to the top of the well casing allowing for 10' of slack.

3.10 TESTING OF SUPPLY WELL PUMPS

A. Operate supply well submersible pumps after installation but before backfilling, by pumping from the supply well pitless through the appropriate adapters, through a temporary hose, size capable of providing required flow to the hoist riser of the well. The Contracting Officer or the owner's representative shall witness the tests. Record amperage draw to approximate flow during test pumping. Record amperage.

END OF SECTION

This page intentionally left blank.

SECTION 15410 - SANITARY DRAINAGE SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install sanitary drainage and vent piping and accessories and connect fixtures and equipment where shown on the Drawings, and as required by applicable building codes.

B. Extend piping to a point five (5) feet outside the building line, and connect to the sanitary service furnished and installed by the General Contractor.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Pipe and Fittings	Section 15060
Pipe Specialties	Section 15070
Installation of Equipment and Piping	Section 15100
Excavation and Backfilling	Section 15110
Site Utilities	Section 15210

1.3 REQUIREMENTS OF REGULATORY AGENCIES

Uniform Plumbing Code

PART 2 - PRODUCTS

2.1 PIPING

A. Above ground piping shall be one (1) of the following:

Cast Iron Soil Pipe and Drainage Fittings
DWV Copper Pipe and Copper Drainage Fittings
Schedule 40 PVC Pipe and Drainage Fittings
Type L Copper Pipe and Copper Drainage Fittings

B. Pipe joints shall be as follows:

1. Cast Iron Pipe Joints shall be No Hub type with stainless steel couplings and screws.

2. Copper Pipe Joints shall be solder type using 50/50 solder.
3. PVC Pipe Joints shall be solvent weld type.

2.2 ACID WASTE PIPING

A. Drainage from Chemistry Lab area shall be one (1) of the following:

GSR "Fuseal" Pipe and Joints with Heat Sealed Joints

Enfield "Lab-Line" Pipe and Joints with Mechanical Joints
High Silicon Cast Iron Pipe and Fitting with Caulked Joints

2.3 CLEANOUT COVERS

A. Furnish cleanout covers for the following location(s):

Unfinished Floors	Josam 58040 Wade W-7010-X Zurn ZB-1415-2
Vinyl Tile Floors	Josam 58020-12 Wade W-7010-TSF Zurn ZN-1405-7
Ceramic or Quarry Tile Floors	Josam 58020 Wade W-7010-XSF Zurn ZN-1415-3
Carpeted Floors	Josam 58210-14 Wade W-7000-CM Zurn ZN-1400-14
Finished Walls	Josam 58600 Wade W-8480-R Zurn ZANB-1460-9

PART 3 - EXECUTION

3.1 PIPING

A. Run horizontal piping 4" diameter and larger at a uniform grade of not less than one-eighth (1/8) inch fall per foot of run, except that invert elevations noted at building lines shall be maintained. Piping less than 4" diameter shall be run at not less than one quarter (1/4") inch fall per foot of run.

B. Make connections to existing piping as required by the regulatory agency. Verify existing invert elevations before installing underground piping.

C. Provide properly sized and located vent piping, as required by local/national codes.

3.2 CLEANOUTS

A. Install cleanouts on vertical stacks at thirty (30) inches above finished floor, at the base of each stack, at each change of direction in a horizontal run greater than 135 degrees, and at a maximum of fifty (50) foot centers.

B. Cleanouts shall be the same size of pipe up to four (4) inches and at least four (4) inches for

larger pipe.

C. Install floor cleanouts close to walls and out of traffic paths.

3.3 TRAPS

A. Install traps at fixtures and inlets to the drainage system. No fixture shall be double trapped. Vent traps as required by code.

END OF SECTION

This page intentionally blank

SECTION 15430 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install the domestic water piping system as shown on the Drawings. Systems included in this Section are contained within the building lines.

B. RELATED WORK SPECIFIED ELSEWHERE

Pipe and Fittings	Section 15060
Pipe Specialties	Section 15070
Valves	Section 15080
Installation of Equipment and Piping	Section 15100
Excavation and Backfilling	Section 15110
Insulation	Section 15130

1.3 REQUIREMENTS OF REGULATORY AGENCIES

Uniform Plumbing Code

PART 2 - PRODUCTS

2.1 WATER PIPING

A. Above ground piping shall be Type L, hard drawn copper tubing with wrought copper or cast brass solder fittings. Pipe sizes shown on the Drawings are nominal inside diameter.

B. Underground piping shall be seamless Type K copper with no underground joints. At the direction of the Contracting Officer, install silver-solder joints at specific locations.

C. Exposed fixture supplies in finished rooms shall be chromium plated brass pipe.

D. Insulate exposed piping, as specified, and cover with Ceel Co, 100 Series jacket.

E. Solder shall be no lead type - Silver Brite or equal.

2.2 VALVES

A. Valves used on piping two (2) inches and over shall be as specified in the Valves Section.

B. Valves used on piping under two (2) inches shall be as follows:

TYPE OF VALVE	WALWORTH	NIBCO	POWELL	STOCKHAM
Gate				

2 Inches and Smaller, 125-Pound WSP	55-SJ	111	1821	B-109
Swing Check Valve 2 Inches or Less	406-SJ	413	1825	B-309
Globe Valve 2 Inches and Less	95-SJ	211	1823	B-14
Ball Valve		580		

2.3 DISINFECTING FLUID

A. Liquid chlorine shall conform to FS BB-C-120.

B. Hypochlorite shall conform to FS O-C-114, Type II, Grade B, or FS O-S-602

PART 3 - EXECUTION

3.1 PIPING

A. Furnish and install water pipe lines and risers necessary to supply fixtures and equipment of sizes specified or shown on the Drawings. Ream pipe to full inside diameter after cutting. Run piping as directly as possible, avoiding unnecessary offsets, and conceal in finished rooms, unless shown or specified otherwise. Make proper allowance for expansion. Block lines and risers as necessary to prevent noise or vibration when water is turned on or off.

B. Pitch piping as required to allow the system to be drained. Furnish and install three-quarter (3/4) inch hose and drain valves at low points of the system.

C. Separately valve each branch and riser.

D. Install air shocktrols on the end of supply branches to each fixture group. Arrange pipe lines to give ample room for pipe insulation.

3.2 TESTING

A. Test the domestic water system with compressed air before installing plumbing fixtures. Test pressure shall be 1.5 times the system operation pressure but at least 100 psig. The system shall hold within five (5%) percent of initial pressure for twelve (12) hours.

3.3 DISINFECTION

A. Accomplish disinfection as described below or by the system prescribed by the AWWA Standard C601. The amount of chlorine applied shall be such as to provide a dosage of not less than fifty (50) parts per million. Introduce chlorinating material to water lines and distribution systems in an approved manner. Thoroughly flush lines before the introduction of chlorinating materials. After a contact period of not less than sixteen (16) hours, flush system with clean

water until residual chlorine content is not greater than two (2) parts per million. Open and close valves in the lines being disinfected several times during the contact period. The testing laboratory shall verify chlorine levels during and after disinfection.

END OF SECTION

This page intentionally blank

SECTION 15440 - DOMESTIC HOT WATER EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install domestic hot water equipment as shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Pipe Specialties	Section 15070
Installation of Equipment and Piping	Section 15100
Insulation	Section 15130
Domestic Water Piping	Section 15430

1.3 REQUIREMENTS OF REGULATORY AGENCIES

American Gas Association
Metropolitan Utilities District
National Plumbing Code
National Sanitation Foundation
Uniform Plumbing Code

PART 2 - PRODUCTS

2.1 GAS-FIRED WATER HEATERS

A. Design heaters for use with natural gas. Heaters shall be approved by the AGA. Heaters shall have the capacity shown on the Drawings, and shall be complete with water, gas and vent connections. Heater shall have temperature and pressure relief valve, thermostatic controls, hose bibb drain, insulated jacket and glass lining. Heaters with inputs of 400,000 Btu/hr or greater shall bear the ASME stamp.

2.2 ELECTRIC WATER HEATERS

A. Heaters shall have the capacity shown on the Drawings, and shall be equipped with temperature and pressure relief valve, thermostatic controls, hose bibb drain, magnesium anode, insulated jacket and glass lining. Heating elements shall be medium watt density with Incoloy sheath. Control circuit shall be factory fused, and shall include a 2-pole high temperature cutoff switch and thermostat. Heater construction shall meet the applicable requirements of the ASME Heating Boiler Code.

2.3 TEMPERATURE AND PRESSURE RELIEF VALVE

A. Valve shall have a minimum thermal discharge capacity equal to the input capacity of heater, standard pressure setting of 150 psi and standard temperature setting of 210 degrees F. Locate the relief valve in the top of tank and pipe discharge to a floor drain. Discharge pipe shall be the

full size of valve outlet. Rate valve in accordance with the requirements of the ASME Heating Boiler Code.

2.4 THERMOMETERS

A. Thermometers at water heaters shall be as specified in the Pipe Specialties Section. Range shall be 30 degrees F to 240 degrees F. Provide a thermometer for each water heater.

2.5 GAS VENT (GRAVITY)

A. Water heater vents and breechings shall be Metalbestos Model QC, Type B, double wall gas vent. Installation shall meet the requirements of the manufacturer and NFPA Standard No. 54. Flash and counterflash vents at the roof line and terminate with approved type weatherproof caps.

2.6 CIRCULATING PUMP

A. Furnish and install hot water circulating pump for the domestic hot water system in lab (Admin. Building). Parts of the pump in contact with water shall be of bronze construction and installed with shutoff valves on each side of the pump and check valve in the pump discharge. Pump size and capacity shall be as indicated on the Drawings.

END OF SECTION

SECTION 15460 - PLUMBING FIXTURES AND TRIM

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install the specified plumbing fixtures and trim where shown on the Drawings.

1.2 QUALITY ASSURANCE

A. Fixtures and trim shall be free of flaws and defects in material and workmanship and when installed, shall operate as intended using the manufacturer's instructions.

B. Replace defective fixtures and trim at no additional cost.

1.3 PROTECTION

A. Protect plumbing fixtures and trim during construction to avoid damage. Replace damaged fixtures and trim at no additional cost.

1.4 MOUNTING HEIGHTS

A. Mount fixtures and trim as shown on the Architectural Drawings.

1.5 FIXTURES AND EQUIPMENT FURNISHED BY OTHERS

A. Provide rough-ins, p-traps, stops, supplies and waste, vent, gas steam, condensate and water connections as required for a complete installation of equipment "furnished by others".

B. Obtain approved equipment shop drawings prior to rough-in.

C. Set trim and connect services as required to allow the equipment to operate in its intended mode.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

National Plumbing Code
National Sanitation Foundation
Uniform Plumbing Code
U.S. Department of Commerce

1.7 RELATED WORK SPECIFIED ELSEWHERE

Sanitary Drainage System	Section 15410
Domestic Water Piping	Section 15430

1.8 FIBERGLASS FIXTURES

A. Fiberglass fixtures must comply with ANSI Z124.1 and Z124.2. Fixtures must be on the site and inspected before wall framing is complete.

PART 2 - PRODUCTS

2.1 FIXTURES AND TRIM

See Plumbing Fixture Schedule on drawings for requirements.

END OF SECTION

SECTION 15470 - FUEL PIPING SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install fuel piping from the building service entrance to the appliances shown on the Drawings.

B. System is intended to convey low pressure natural gas as shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Pipe and Fittings	Section 15060
Piping Specialties	Section 15070
Valves	Section 15080
Installation of Equipment and Piping	Section 15100
Site Utilities	Section 15210

1.3 REQUIREMENTS OF REGULATORY AGENCIES

American Gas Association
National Fuel Gas Code
NFPA Standard 54 (natural gas)

PART 2 - PRODUCTS

2.1 NATURAL GAS, PIPE AND FITTINGS

A. Above ground low pressure piping shall be Schedule 40, Type A-53, black steel pipe with threaded or welded joints.

B. Underground piping shall be same as above with addition of scotch wrap exterior covering.

C. Above ground high pressure piping (pressures exceeding 1 psig) shall be Schedule 40, Type A-53, black steel pipe with welded joints.

2.2 GAS PRESSURE REGULATORS

A. Regulators shall be as specified in the Piping Specialties Section.

B. Regulator shall be sized for an inlet pressure as provided by Montana Power Company and outlet pressure of 14" w.c.

C. Regulator downstream of boilers shall be inlet of 14" w.c. outlet of 7" w.c. vent to outdoors.

D. Regulator in shop building shall be sized at an inlet pressure as required by Montana Power

Company and outlet pressure of 14" w.c.

PART 3 - EXECUTION

3.1 PIPING AND SPECIALTIES

A. Install piping and specialties as required by the governing regulatory agency.

B. Install gas pressure regulators with vents pointed down. Vent interior regulators up through the roof.

3.2 TESTING

A. Test the entire fuel piping system at an air pressure of 25 psig.

B. Disconnect gas pressure regulators during testing to prevent damage.

END OF SECTION

SECTION 15480 - COMPRESSED AIR SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. Install compressed air piping suitable for hand equipment operation where shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Piping and Fittings	Section 15060
Pipe Specialties	Section 15070
Valves	Section 15080
Installation of Equipment and Piping	Section 15100

1.3 REQUIREMENTS OF REGULATORY AGENCIES

ANSI Standard A13.1

PART 2 - PRODUCTS

2.1 PIPE AND FITTINGS

A. Air piping shall be hard drawn Type M copper or Type 3003 aluminum tubing with a minimum wall thickness of 0.032 inch.

PART 3 - EXECUTION

3.1 PIPE AND FITTINGS

A. Install branch piping above mains, sloping towards the main.

B. Run mains true to line, without pockets, to a point where a drain cock shall be installed.

3.2 CLEANING

A. Examine fittings and lengths of pipe before assembly.

B. Wash entire system with a hot water solution of caustic soda or tri-sodium phosphate to remove grease and dirt.

C. Blow system dry with oil free air or oil free nitrogen.

3.3 TESTING

A. Test piping systems at one and one-half (1-1/2) times the maximum operating pressure.

3.4 OUTLETS

A. Close outlets not connected to equipment with malleable iron caps.

END OF SECTION

SECTION 15500 - FIRE SPRINKLERS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install an automatic sprinkler system to protect the entire facility (complex), as indicated herein and as shown on the Drawings. Connect system to a water supply of sufficient pressure to ensure full and sustained water discharge immediately from sprinkler heads when opened by fire at rated heat temperatures. Water supply shall conform to NFPA water supply requirements with considerations given to the reliability of the public water supply, taking into account probable minimum pressure conditions. The Contractor shall verify site water pressure before submitting shop drawings. Fire sprinkler contractor shall be required to conduct a flow test to determine actual water supply prior to design.

B. All portions of the systems shall be installed in accordance with the drawings, details, and specifications and as required by jurisdictional authorities and codes. Jurisdictional authorities and codes shall take precedence over plans, details and specifications in the event of a dispute between the requirements of contract documents and jurisdictional authorities or codes.

C. The intent of these specifications is to ~~describe~~ provide a general description of the ~~complete~~ systems to be installed~~, including~~. ~~minor~~Minor details of work or materials not specifically mentioned or shown, but necessary for the successful operation ~~and completion of the installation~~of the system(s) shall be provided.

D. Work to be performed under this section shall include, but not be limited to the following:

1. Excavation, backfill and compaction for the fire system supply.

2. Automatic fire sprinkler systems.

a. Wet pipe flow switch system.
   1) Pipe and fittings.
   2) Hangers and supports.
   3) Earthquake bracing.
   4) Valves.
   5) Alarms.
   6) Flow Switches.
   7) Specialties.

3. Portable fire extinguishers.

F. The following areas shall be furnished with an automatic fire protection system of type or types as required:

1. All buildings.

1.2 RELATED WORK

A. All work performed under this section of the specifications shall be subject to the requirements of both the General and Special Conditions and the Mechanical Specification.

B. Related work specified elsewhere:

Pipe and Fittings	Section 15060
Piping Specialties	Section 15070
Installation of Equipment and Piping	Section 15100
Fire Alarm	Section 16721

C. Examine the above referenced specification parts thoroughly before submitting a proposal for accomplishment of work in this section.

1.3 REGULATORY AGENCIES

A. The term jurisdictional authority used in this section of the specification shall include, as applicable, but not be limited to the following:

1. Local Building Department and Fire Department.

2. State Fire Marshall.

3. Insurance Services Office or Insuring Authority having jurisdiction.

4. Owner.

B. The design and installation of all systems of fire protection shall conform to all requirements of applicable codes and publications herein defined:

1. Uniform Building Code

2. Uniform Fire Code

3. NFPA #13

4. NFPA #10

5. All State and local ordinances

6. Underwriters' Laboratories

7. Industrial Risk Insurers/Factory Mutual

8. American Society of Testing Materials

9. American National Standards Institute

10. Occupational Safety and Health Administration

1.4 SUBMITTALS

A. The successful Contractor shall provide submittal data as required under other portions of this specification. Submittals shall conform to the instructions set forth in the General and Special Conditions of these specifications entitled Shop Drawings and Submittals.

B. Submit shop drawings (floor plans - detailed working drawings), showing dimensions, ducts, lights, or other items affecting the fire protection systems to jurisdictional agencies for review and approval. All items identified in NFPA #13 for proper working drawings shall be complied with. The Contracting Officer will reject all submittals not in compliance. Submit all necessary shop drawings to authorities having jurisdiction. Concurrently, six (6) sets shall be sent to the Contracting Officer for review. After approval from jurisdictional agencies have been returned to the Contractor, they shall be submitted to the Contracting Officer for final acceptance. These final acceptance sets shall have all agency`s stamps of review and acceptance.

C. Contracting Officer's review will be for general location only. It will be the Contractor's responsibility to check his drawings for interferences and to do shop fabrication from measurements taken at the job site.

D. Work on the project shall not begin until plans have been reviewed by the Contracting Officer.

E. Eight (8) sets of full catalog information shall be submitted for approval for all materials provided.

F. Adequately bind each submittal package. Unbound submittals will be returned without review.

1.5 JOB CONDITIONS

A. The Contractor shall investigate the structural, mechanical, electrical, and finished conditions affecting the piping, and shall arrange the equipment accordingly; furnishing required fittings, offsets and accessories. Route fire protection piping to avoid interference with ductwork and drain piping. In the event it becomes necessary to make field changes in pipe locations due to building construction, the Contractor shall consult with the Contracting Officer before making any changes. Any such changes required shall be made without added cost to the Owner.

B. The Contractor shall determine, and be responsible for, the proper locations and type of inserts for hangers, chases, sleeves, and other openings in the construction required for fire protection work, and shall obtain this information well in advance of the construction progress to avoid delay of the work.

C. The drawings indicate approximate locations of sprinkler equipment. Contractor is responsible for final locations and routing.

D. All fees and permits specifically required for fire protection work, not obtained by others as specified elsewhere shall be applied for and paid for by this Contractor.

E. All systems of fire protection shall be installed by a licensed (for the location of installation) Fire Protection Contractor, fully experienced in fire protection installation as specified herein.

F. Fire Protection Contractors may be required to provide in writing, specific information as to successfully completed projects and references to show cause as to why they should be considered acceptable to the Contracting Officer.

1.6 RECORD DRAWINGS

A. One approved set of drawings shall be maintained on the job at all times.

B. One reproducible set of As-Built drawings shall be provided to the Contracting Officer upon completion of the work.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Three (3) sets of operating and maintenance instructions shall be provided the Owner upon completion. Manuals shall include, as a minimum, the following:

1. As-Built Drawings
2. NFPA #25
3. Catalog cut sheets of all materials installed
4. Equipment maintenance manuals

1.8 TRAINING

A. The Fire Protection Contractor shall instruct the Owner in the operation of the systems. Instruction shall continue until the Owner is fully satisfied that he understands the operation of his system.

1.9 GUARANTEES AND WARRANTIES

A. The Fire Protection Contractor shall guarantee to the Owner in writing, all equipment and workmanship for a period of one (1) year after the fire protection system has been placed in continuous service and has been accepted by all authorities having jurisdiction.

B. The Fire Protection Contractor shall not be held responsible for improper or negligent maintenance by the Owner after operating and maintenance indoctrination has been given the Owner.

PART 2 - PRODUCTS

2.1 SPRINKLER HEADS

A. ACCEPTABLE MANUFACTURERS

1. Central

2. Gem
3. Firematic
4. Viking

B. Install sprinkler heads from reviewed shop drawings.

C. All sprinklers shall be of similar design and from a single manufacturer.

D. The operating temperature of sprinkler heads shall be as required by the specific location of installation.

E. Sprinkler heads shall conform to the following schedule:

1. Brass upright or pendent may be used in all attic, mechanical, storage or other non-public spaces.

2. Chrome recessed shall be used in all finished areas, offices, patient rooms, etc. Where surface mounted obstructions will not allow for recessed installation, two-piece escutcheons may be used to extend sprinklers to a maximum deflector distance as allowed by NFPA or U.L. listing.

3. Sidewall sprinklers may be used when in accordance with all jurisdictional requirements.

4. Dry pendent heads shall be used in all areas subject to freezing when the heads are supplied from a heated area wet system, dry pipe system drops, etc.

2.2 PIPE AND FITTINGS-EXTERIOR

A. ~~Piping underground shall be Class 52 ductile iron pipe or as required by the local utility company. Straight runs of pipe with no offsets may be rubber joint with bell and spigot. All fittings shall consist of mechanical joint type.~~Underground piping shall be C-900. Coordinate thrust blocking and sleeving requirements with utility installer prior to installation.

B. All buried pipe and fittings shall be installed in a sand bedded trench, 6" under pipe and filled with sand to 12" minimum above pipe.

C. Block or rod underground piping and fittings for static and surge pressures. Furnish and install concrete thrust blocks and joint ties at each change in direction of all underground piping in accordance with NFPA #13 and NFPA #24 requirements.

D. Prior to connection to existing water line, the City Water Department shall be contacted so that they can inspect the procedures used.

E. All underground pipe fittings and valves shall conform to NFPA #13 and NFPA #24 requirements.

2.3 PIPE AND FITTINGS-INTERIOR

A. Interior piping for automatic sprinkler system shall conform to NFPA #13 and as follows.

B. Sprinkler piping above ground shall be Schedule 40 black steel pipe.

C. Sprinkler piping above ground for sizes 2-1/2-inch and larger may be Schedule 10 black steel pipe.

D. Fittings for threaded and coupled pipe shall consist of cast iron or malleable threaded fittings joined with teflon tape thread sealing compound or pipe joint compound. Pressure rating of fittings shall be as required for application.

E. Fittings for grooved end pipe shall consist of Victaulic or equal couplings and fittings in accordance with NFPA #13.

F. Fittings for plain end pipe shall consist of Victaulic or equal couplings, fittings, "Fits and Snap-Lets" in accordance with NFPA #13. Threaded thinwall pipe shall not be used.

G. Alternate piping systems approved by NFPA #13 may be allowed with prior approval of the Contracting Officer.

2.4 HANGERS AND SUPPORTS

A. Space pipe hangers in accord with the requirements of NFPA. Construct hangers, hanger rods, inserts and clamps as approved by the same.

2.5 EARTHQUAKE BRACING

A. Furnish and install all earthquake bracing as required by NFPA and jurisdictional enforcing or insurance agency. The fire sprinkler system shall be seismically braced in accordance with NFPA 13, Zone 3, requirements.

2.6 VALVES

A. ACCEPTABLE MANUFACTURERS

1. Kennedy
2. Mueller
3. Stockham
4. Nibco

B. Valves shall be approved indicating type as required by the Underwriters' Laboratories and NFPA. Check valves shall be approved by NFPA. Test and drain valves shall be approved brass globe or angle valves. O.S. and Y. valves used on the fire protection system shall have provisions for padlocking. Locate sprinkler system isolation valves as shown on the drawings complete with a tamper alarm.

C. Interior

1. Interior Gate

Make:	Central
Sizes:	2-1/2", 3", 4" and 6"
Ends:	Flanged
Model:	722U

2. Interior Butterfly

Make:	Central
Sizes:	2-1/2" to 8"
Ends:	Grooved or Wafer
Model:	A

Note: Butterfly valves may be used in lieu of OS&Y valves at the Contractor's option for 2-1/2" and larger valves.

3. Ball Valve

Make:	Central
Sizes:	1/4" to 2"
Ends:	Threaded
Model:	F19

4. Check Valves

Make:	Central
Sizes:	2-1/2", 3", 4" and 6"
Ends:	Grooved
Model:	90

5. Drain Valves Interior

Make:	Central
Sizes:	1/2" through 2"
Ends:	Screwed
Model:	F15 and F16

2.7 BACKFLOW PREVENTION DEVICES

A. Install new backflow prevention devices as required by the City of Missoula, or State of Montana.

B. Devices shall be UL or FM approved.

C. Devices shall be on the State of Montana approved list of equipment.

2.8 CONNECTIONS

A. ACCEPTABLE MANUFACTURERS

1. Potter Roemer
2. Standard

B. FIRE DEPARTMENT CONNECTION

1. Furnish and install where shown on plans fire department connections, complete with clapper, caps and chains.

2. Finish shall consist of rough brass.

3. Siamese connections shall be set 2'-6" above grade.

4. Connections for sprinkler system shall be indexed "auto spklr". The indexing shall be "cast in" by the manufacturer. Required indexing shall be permanently installed directly above the connection.

5. Connection shall be complete with interior independent self-closing clapper valves, brass plugs, and chain and shall have threads to meet the local fire department requirements. Provide an automatic ball-drip.

6. Single connections are acceptable where acceptable to NFPA #13.

2.9 SPECIALTIES

A. Sleeves and Seals

1. Where piping passes through walls, floors or other building construction which by code requires a fire rating, sleeves shall be used. Proposed protection shall be submitted for approval.

B. Escutcheon Plates

1. Where exposed piping passes through finish work, chrome plated or other finish acceptable to the Contracting Officer shall be installed. Split wall plates or escutcheons shall be installed to fit snugly around piping.

2. Solid galvanized wall plates shall be used at exterior walls.

C. Valve Identification

1. All valves within the building shall have permanently marked identification signs provided in accordance with NFPA standards.

D. Spare Head Supply

1. Furnish and install a supply of extra sprinklers of each type and degree link installed in the project, complete with mountable box, mount box on wall next to sprinkler entry, provide wrenches for each type of sprinkler installed in box.

2.10 ELECTRICAL DEVICES

A. All electrical devices shall be coordinated with Electrical (Division 16) and Fire Alarm (Section 16721) requirements for compatibility of voltages and manufacturer.

B. Flow Switch

1. VSR-F

C. Pressure Alarm Switch

1. Potter PS10-2

D. Low Air Alarm

1. Potter PS40-2

E. Tamper Switch

1. Potter OSYS
2. Potter PCVS

PART 3 - EXECUTION

3.1 DESIGN CRITERIA

A. Approximate sprinkler equipment arrangement is indicated on the drawings.

B. The fire protection system supplier shall design the piping to supply the system. Piping shall be laid out so as not to interfere with the installation of other piping, ductwork or light fixtures.

C. The entire sprinkler system is not shown on plans. The intent is to provide complete sprinkler systems as required. This Contractor shall be responsible for surveying the site, existing construction, and new construction, and prepare working drawings for the total system.

D. All piping shall be run concealed wherever possible. Where piping is run exposed, special notation on Contractor's drawings to that effect shall be evident and conspicuous on the drawings. Any piping determined to be a problem shall be relocated at no cost to the Owner.

E. System piping to be hydraulically calculated including system riser and fire pumper connection in accordance with NFPA #13.

F. The preparation of all shop drawings and hydraulic calculations shall be accomplished by a

Registered Engineer, licensed in the State of Montana.

3.2 INSTALLATION

A. Furnish sprinkler system with the following components:

1. Systems shall be equipped with a supervised isolation valve and an approved flow alarm connected to the building fire alarm system.

2. A Fire Department connection shall be installed above the isolation valve complete with its own check valve and ball drip.

3. A main drain shall be installed on each riser or sectional zone control valve and shall drain to the exterior or to an adequate drain connection.

4. Auxiliary drains shall be provided when a change in piping direction prevents drainage of sections of branch lines or mains thru the main drain valve.

5. A test pipe of not less than 1" diameter terminating in an orifice equivalent to one sprinkler shall be provided for each system or sectional zone.

6. Exterior alarm shall be installed as near as practical to Fire Department connection with identification sign. Exterior horn/strobe shall be wired to alarm switch.

B. Where details of installation are not given, the installation shall be made using manufacturer's recommended practices or at the direction of the Contracting Officer.

C. Contractor shall complete the fire protection systems ready for operation, in all respects, as soon as possible. When system is complete and ready for continuous operation, activate the system for it's intended use. After system has been activated for continuous use, water charges will be paid by the Owner.

D. This Contractor shall call for inspection and obtain Certificate of Completion and Test from Fire Inspection Bureau under whose jurisdiction this installation occurs.

E. This Contractor shall remove from the building, all rubbish and unused materials due to or connected with this installation.

F. The surface of all piping shall be cleaned and left ready for painting.

3.3 TESTING

A. The entire sprinkler system shall be hydrostatically tested at not less than 200 psig pressure for a period of not less than two (2) hours with no pressure drop in the system.

B. All testing shall be witnessed by a representative of the Contracting Officer or Owner.

C. Where jurisdictional authority's standards are more stringent than the above test, they shall prevail.

END OF SECTION

This page intentionally left blank.

SECTION 15610 - BOILERS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install hot water boilers where shown on the Drawings and as specified in this Section.

B. Boilers shall be complete with controls, insulated jacket, factory finished steel cabinet and operating accessories.

C. Boilers shall be installed on 4" thick concrete pads by general contractor.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment & Piping	Section 15100
Feedwater Equipment	Section 15620
Chemical Treatment	Section 15650
Water Piping and Specialties	Section 15660

1.3 REQUIREMENTS OF REGULATORY AGENCIES

ASME
NEC
NEMA

PART 2 - PRODUCTS

2.1 MODULAR HEATING BOILER PLANT

A. GENERAL

Furnish and install as shown on plans in accordance with all codes and authorities having jurisdiction, modular boilers. Each boiler shall be UL/FM approved and have a total input of 930 mbh with a combined net I=B=R output of 800 mbh. Each module shall have an input of 930 mbh with a gross output of 800 mbh, and a net I=B=R of 842 mbh when fired with natural gas. Unit shall operate with a minimum AFUE equivalent of 86%.

B. CONSTRUCTION

Boiler module(s) shall be of natural gas fired, condensing fire tube design with a modulating power burner and positive pressure discharge. Heat exchanger/combustion chamber shall incorporate a helical fire tube design that will be self supporting, baffle free and warranted to withstand thermal shock. Heat exchanger shall be ASME stamped for a working pressure not

less than 150 PSIG. Unit shall have ASME approved relief valve with a setting of 30 PSIG. Exhaust manifold shall be of corrosion resistant enameled cast iron, with a 6" diameter flue connection. Exhaust manifold shall have a drain for elimination of condensation.

The flame monitoring system shall incorporate a UL recognized combustion safeguard system utilizing interrupted spark ignition and a rectification type flame sensor. An electro-hydraulic double seated safety shut off valve shall be an inherent part of the gas train.

Each boiler shall incorporate electric probe type low water cut off and dual over temperature protection. Remote fault alarm, sensor failure detection, and auxiliary equipment contacts shall be standard equipment. Module(s) shall operate on 120/1/60.

C. INSTALLATION

All aspects of installation of Boiler Plant shall be in strict accordance with manufacturer's instructions. Materials used shall conform with all manufacturer's recommendations and shall include porcelainized AERCO Vent for Boiler vent connector.

D. MODE OF OPERATION

Boiler manufacturer shall supply as part of boiler package a completely integrated AERCO Boiler Management System to control all operation and energy input of the modular boiler plant. The system shall be comprised of a microprocessor based control utilizing pulse width modulation for bumpless transfer of header temperature and sequential firing. The controller shall have the ability to vary each individual module input throughout its full range to maximize the condensing capability of the module and the entire plant without header temperature swings. The controller shall be PID type for accurate temperature control with excellent frequency response. BMS shall provide an automatic adjustable heat start circuit for plant activation and have contact closure for auxiliary equipment such as pumps and combustion air dampers.

The BMS will operate on an adjustable inverse ratio in response to outdoor air temperature to control the header temperature outlet to +/-2F under any load condition when activated. Control setpoints and ratio shall be fully field adjustable from .6 to 2.4 in operation. The controller shall have an LCD display for monitoring of all sensors and interlocks. Non-volatile backup of all control setpoints shall be internally provided as standard with a communication interface for monitoring by building management system computer. Control will automatically balance operating time on each module by a first on-first off mode and provide for setback and remote alarm contacts. Connection between central BMS system and individual modules shall be twisted pair low voltage wiring to internal terminal strips for easy installation.

E. WARRANTY SERVICE

Module Heat Exchanger/Combustion Chamber assemblies shall be warranteed against failure from any mechanical or thermal shock for a period of three years. Pressure vessel and exhaust manifold shall be warranteed against failure or leakage for a period of 10 years. All other components shall be unconditionally warranteed for a period of one year from date of startup.

Contractor shall provide the services of a factory authorized representative to supervise all

phases of equipment startup. A letter of compliance with all factory recommendations and installation instructions shall be submitted to the Contracting Officer with operation and maintenance instructions.

END OF SECTION

This page intentionally blank

SECTION 15650 - CHEMICAL TREATMENT

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install chemical treatment equipment where shown on the Drawings and as specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100
Boilers	Section 15610
Chillers	Section 15630
Hot and Chilled Water Piping	Section 15660

1.3 REQUIREMENTS OF REGULATORY AGENCIES

NEC
NEMA

PART 2 - PRODUCTS

2.1 GLYCOL MAKE-UP PACKAGE

A. GENERAL

1. The contractor shall supply and install, as indicated on the plans and in the specifications, a prefabricated, automatic and autonomous make-up package for each glycol system.

2. The package shall be designed to operate on a standard 110 V, 60 Hz electrical circuit, and to maintain a fill pressure in the glycol system of 12 psig.

3. It shall feature a cut-off and alarm arrangement which will stop the pump in case of excessive pressure, or a low solution level, and activate an audible (which can be silenced) and a visual alarm. A 110 V signal shall also be available for a remote alarm.

B. MATERIALS

1. A translucent polyethylene solution container, complete with lid, shall be mounted on the pumping assembly and shall include a strainer and a shut off valve. A glycol solution recovery line shall be piped in from the system relief valve outlet to the solution container, through its lid in such a way that the lid can be removed for filling and mixing.

2. The pumping assembly shall be mounted in a sturdy steel frame with legs to keep it off the floor. It shall include a duplex pump assembly with a magnetic starter, a pressure tank with a pressure control, a priming valve, a PRV, a shut-off valve and a pressure gauge. It shall be connected to the system with a ½" NPT connection.

PART 3 - EXECUTION

3.1 START UP

A. Installation supervision and start up of equipment supplied shall be provided by a qualified Representative of the Equipment Manufacturer. Provide a minimum of four (4) hours of operator training.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 15660 - WATER PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install piping systems as shown on the Drawings and as specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Pipe and Fittings	Section 15060
Piping Specialties	Section 15070
Valves	Section 15080
Installation of Equipment and Piping	Section 15100
Insulation	Section 15130

1.3 REQUIREMENTS OF REGULATORY AGENCIES

ANSI
ASME
ASTM

PART 2 - PRODUCTS

2.1 METALLIC PIPE AND FITTINGS

A. Piping shall be one of the following systems:

1. Steel pipe and fittings shall be Schedule 40 steel pipe, ASTM A 120, with 125 psi threaded cast iron fittings for piping smaller than two and one-half (2-1/2) inches and 125-pound cast iron flanged fittings, steel welded fittings, or victaulic fittings for piping two and one-half (2-1/2) inches and larger.

2. Copper pipe shall be type L hard drawn copper with wrought copper or cast brass brass solder fittings. Pipe sizes shown on the drawings are nominal inside diameter.

2.2 VALVES

A. Metallic valves shall be as specified in Valves and Specialties Section, except as follows:

1. Lubricated Plug Valves (Shutoff and Balancing). Valves shall be tapered lubricated plug valves made of semi-steel having TFE-coated plug. Valves shall be of the same working pressure as fittings for service listed. Valves shall be capable of tight shutoff in either direction and for balancing, and shall be capable of being installed in any position without the necessity of bypass piping. Supply valves for combination shutoff and throttling service with an adjustable stop or indicator and arc. For sizes two (2) inches and smaller, furnish Rockwell No. 142 or equal. For sizes two and one-half

(2-1/2) inches through six (6) inches, furnish Rockwell No. 143 or equal.

2. Non-lubricated Eccentric Valves (Shutoff and Balancing). Valves shall be of the nonlubricated eccentric type, having bodies of semi-steel with resilient faced plugs suitable for 250 degree F., and capable of being a tight shutoff in either direction. Valves shall have permanently lubricated corrosion-resistant bushing in top and bottom bearings.

3. Tap bodies with a pipe connection on downstream side of seat for pressure gauge connection on balancing services. Furnish valves with levers or with operating nuts for wrench operation for each size valve.

4. Equip Throttling Valves with a stop which can be adjusted so the valve can be closed and returned to the exact balanced position and no further. Equip valves eight (8) inches and larger with gear actuators. Make valve packing adjustment accessible without disassembly of actuators. Valves and actuators shall be as manufactured by DeZurik, Homestead or equal.

5. Butterfly Valves shall be grooved or flange type with resilient seats for tight shutoff and replaceable stem seals. Valves shall have cast iron bodies, bronze discs and nitrile rubber liners. Liners shall completely isolate body from fluid. Valves shall be continental Double R/L or approved alternate.

6. Check Valves at Pumps shall be triple duty type (shutoff, balancing, check) Bell & Gossett, TACO, or approved equal.

7. Ball valves shall be bronze, solder kinds, Milwaukee or equal.

2.3 HOT WATER PUMPS

A. Pumps shall be end suction centrifugal, as shown heavy duty type, of bronze fitted construction, with cast iron casing, bronze impeller, wear rings and trim. Pump bearings shall be heavy duty type, suitable for grease lubrication, and contained in moistureproof and dustproof bearing housings.

B. Operating conditions. Pump shall deliver required head and gpm when operating at 1,750 rpm and pumping water at temperature shown on Drawings. Shutoff head shall not be more than twenty-five (25) percent over rated head.

C. Design pump casing for 150 psi working pressure, with flanged suction and discharge connections with tapped gauge connections in both flanges. Pump design shall permit the removal of and complete servicing without disturbing pump volute or motor.

D. Impeller shall be bronze enclosed type. It shall be of the radial flow design and balanced both mechanically and hydraulically.

E. Shaft assembly. Shafts shall be made of 18-8 stainless steel, machined, and accurately ground to size, with stainless steel or bronze shaft sleeves held in place by lock nuts.

F. Shaft seals. Pumps shall have mechanical seals, John Crane or as approved. Furnish one (1) spare seal element with gaskets for replacement for each different size of pump furnished. Seals shall be ceramic or tungsten carbide on carbon.

G. Subbase for pumps shall be of welded steel construction, with intermediate ribs, closure plates, and other reinforcing to provide a rigid frame for pump and driving motor.

2.4 INLINE PUMPS

A. Pump shall be of inline, close-coupled, single stage design of bronze fitted construction with mechanical seals. Pump internals shall be capable of being serviced without disturbing piping connections.

B. Employ a replaceable shaft sleeve to completely cover the wetted area under the seal or packing.

C. Impeller shall be of the enclosed type, hydraulically and dynamically balanced, and keyed to the shaft and secured by a suitable locking capscrew.

D. Motor shall meet NEMA specifications and be up to standards required for industrial use. Furnish motor with field-serviceable (not sealed) ball bearings completely adequate for the maximum load for which the motor is designed.

E. Factory test each pump for the specified operating conditions; then thoroughly clean and paint with at least one (1) coat of high grade machinery enamel prior to shipment.

2.5 STRAINERS

A. Provide strainers ahead of pumps and automatic valves. Strainers shall be similar and equal to Paget Self-Cleaning, Iron Body, Brass Perforated Screens, one thirty-second (1/32) inch for steam and three thirty-seconds (3/32) inch for condensate and water lines.

SIZE	PATTERN	STYLE	RATING
1/2 Inch through 2 Inches Screwed	Y	B	250-Pound
2-1/2 Inches through 12 Inces Flanged	Y	A	125-Pound

2.6 UNIONS

A. Provide unions at each screwed type valve and at each piece of equipment having screwed connections.

B. Unions in steel pipe shall be heavy duty malleable screwed type with brass to iron ground joints.

C. Unions in copper tube shall be copper with solder connections and copper to copper ground joints, Nibco No. 633 or approved equal.

D. Dielectric unions shall be Epco or approved equal.

2.7 PRESSURE GAUGES

A. Furnish and install pressure gauges to read pressures in the following locations. Gauges shall be as specified in Valves and Specialties Section. Install gauges as shown on details and locate for easy reading. Equip each gauge with an integral or separate siphon and connect by means of a brass pipe and fittings containing shutoff cocks.

Hot Water Pump	0 - 60 psi
Ground Water Pump	0 - 60 psi

2.8 THERMOMETERS

A. Furnish and install thermometers to read the temperature in the following locations. Thermometers shall be as specified in Valves and Specialties Section.

Chilled Water Supply and Return at Chillers	0F-100F
Hot Water Supply Lines at Convertors	30F-240F

2.9 RELIEF VALVES

A. Valves shall be ASME rated and approved. Pipe valve discharge full size to floor drain.

2.10 COMPRESSION TANKS

A. Tanks shall be of the sizes shown on the Drawings and ASME constructed and stamped. Tank to be precharged diaphragm type which separates the air and water. Size shall be as shown on the Drawings. Tank to be as manufactured by Taco, Amtrol, Bell & Gosset or equal.

2.11 WATER PRESSURE REDUCING VALVE

A. Valve shall be Bell & Gossett No. 7, brass body, or approved alternate.

2.12 AIR SEPARATING TANK

A. Tank shall be of the tangential type, ASME construction, 125 psig rating. The unit shall be the size shown on the Drawings but not less than five (5) times the free area of the connecting pipe. Provide a blowdown with hose bibb connection. The air separator shall be equipped with a galvanized steel system strainer with three-sixteenths (3/16) inch diameter perforations. Furnish an automatic air vent equal to Bell & Gossett Model 107 with air separator.

2.13 SUCTION DIFFUSER

A. Furnish and install at each base mounted pump a suction diffuser sized to match the pump

suction connection. Unit shall consist of an angled body with inlet vanes and a combination diffuser, strainer. A disposable fine mush strainer shall be included. Strainer shall be removed after system startup. The pressure drop trough the suction diffuser shall not exceed 1 psig. Units shall be as manufacturer by Bell & Gossett, Taco or approved equal.

2.14 AUTOMATIC AIR VENTS

A. Furnish and install on each air separator an automatic air vent. air vent shall release air as fast as it is separated from the system through a float activated pressure operated valve. Automatic air vent to be amtrol Model 720. Equal equipment manufactured by Bell & Gossett or Taco acceptable.

2.15 AUTOMATIC FLOW CONTROL VALVES

A. Furnish and install on each fan coil, unit heater, VAV box, an automatic flow control valve. Control valves to be automatic pressure compensating type and are to be factory preset. Valves to be constructed of gray iron with stainless steel internal working parts. Each valve to be furnished with a valve kit consisting of 1/4" x 2" minimum size nipples, quick disconnect valves and fittings. Provide a metal identification tag with gpm noted for each valve. Valves - Furnish two (2) combination pressure/temperature plugs for each valve. Valves to be as manufactured by Griswold, Autoflo or approved equal.

2.16 BACKFLOW PREVENTER

A. A reduced pressure principle backflow preventer shall be installed at any cross connection to prevent the backflow of contaminated water into the potable water supply. It shall be a complete assembly including tight-closing shut-off valves before and after the device and also be protected by a strainer. The design shall include test cocks, a pressure-differential relief valve located between the two positive seating check valves. The device, (specified or indicated on plans) shall meet the requirements of A.S.S.E. Standard 1013. Watts Regulator Company Series 009QTS or equal.

2.17 CIRCUIT SETTER

A. Furnish and install on each AHU coil a calibrated balance valve.

B. Valves to be designed to allow installing contractor to pre-set balance points for proportional system balance prior to system start-up in accordance with pre-set balance schedule.

C. VALVE DESIGN AND CONSTRUCTION

1. All valves to be of bronze body/brass ball construction with glass and carbon filled TFE seat rings. Valves to have differential pressure read-out ports across valve seat area. Read-out ports to be fitted with internal EPT insert and check valve. Valve bodies to have 1/4" NPT tapped drain/purge port. Valves to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balance position. All valves to have calibrated nameplate to assure specific valve setting. Valves to be leak-tight at full rated working pressure.

D. DESIGN PRESSURE/TEMPERATURE

1. 1/2" - 3" NPT connections:
300 psig (2069 kPa) at 250°F (121°C)

2. 1/2" - 2" Sweat connections:
200 psig (1379 kPa) at 250°F (121°C)*
*Based on 95-5 Tin-Antimony

PART 3 - EXECUTION

3.1 INSTALLATION

A. Piping. Provide a complete piping installation, including connections to equipment and installation of automatically operated valves furnished by the Temperature Control Contractor. Install strainers ahead of pumps. Support piping at connections to pumps so there is no strain on pump flanges. Install control valves with a minimum length equivalent to ten pipe diameters of straight pipe entering valve. Pitch piping to obtain required air relief and drainage. Piping in boiler room shall be insulated metallic pipe.

B. Make an allowance for expansion in the installation of piping so the usual variation in temperature will not cause undue stress at any point. Securely anchor pipes where necessary to properly distribute expansion stresses. Support branch mains and risers in a way that will permit expansion and contraction of risers and to relieve runouts of all weight.

C. Weld joints in metallic pipe as set forth in the Standard Manual of Pipe Welding of the heating, Piping and Air Conditioning Contractors Association.

D. Joints in PVC pipe shall be as specified in the Installation of Equipment and Piping Section.

E. Provide unions at each screwed type valve and at each piece of equipment having screwed connections.

3.2 STRAINERS

A. Install a gate valve and hose end on blowoff on strainers in Mechanical Rooms.

B. Install strainers in either the air separator or pump inlet.

3.3 UNIONS

A. Install dielectric unions to separate lines of dissimilar materials.

3.4 EXPANSION JOINTS

A. Install expansion joints with anchors and guides as recommended by the manufacturer.

3.5 AIR VENTS

A. Install vents at high points of mains. Run drains to nearest interceptors.

B. Where exposed to view, Install Armstrong 1-AV automatic air vents, cast iron body, and 150 psi working pressure.

C. Concealed high points shall have air chambers with 1/4-inch copper tube vent line and stopcock carried to an accessible location.

3.6 CLEANING

A. Hot and ground water system cleaning. Thoroughly flush out water lines with an alkaline detergent solution to remove pipe dope, oil, loose mill scale, and other extraneous materials. Fill the system with clean water to which three pounds of alkaline detergent per 100 gallons of water has been added (Vulcan Pre-Clean or equal). Circulate for at least eight hours, drain and flush with clean water. Add water treatment when refilling for operation. Each system to be filled with a solution of 50% water and 50% propylene glycol with corrosion inhibitors. Antifreeze shall be Dow Chemical Dow Frost or prior approved equal.

END OF SECTION

This page intentionally blank

SECTION 15680 - COILS AND HEAT EXCHANGERS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install heating coils and cooling coils, where shown on the Drawings and as specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100
Boilers	Section 15610
Hot and Chilled Water Piping and Specialties	Section 15660

1.3 REQUIREMENTS OF REGULATORY AGENCIES

ASME
ARI

PART 2 - PRODUCTS

2.1 GROUND WATER COILS

A. Certify water coil capacities and pressure drops in accordance with ARI Standard 410. Circuit coils shall operate at design loading with water velocity within the ARI range of certified rating conditions.

B. Coils shall be constructed of 5/8 inch round seamless copper tubes expanded into full fin collars and expanded into cast iron headers. Fins shall be aluminum with full fin collars, mechanically bonded to tubes. Coil casing shall be 16 gauge (minimum) galvanized steel with 14 gauge (minimum) center and end supports.

C. Coils to be fully drainable with intermediate headers.

D. Coils to have 1" minimum drain connection.

E. Coils to have 1" minimum vent connection.

END OF SECTION

This page intentionally blank

SECTION 15690 - TERMINAL UNITS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install terminal units where shown on the Drawings and as specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping Section 15100
Hot and Chilled Water Piping Specialties Section 15660

1.2 REQUIREMENTS OF REGULATORY AGENCIES

ARI
ASME
UL

PART 2 - PRODUCTS

2.1 UNIT HEATERS

A. Units shall be UL approved and rated in accordance with ARI Industry Standard 441.

B. Fabricate chassis of 18-gauge galvanized steel. Line interior surfaces of coil section with one-half (1/2) inch coated glass fiber insulation meeting NFPA-90A requirements. The fan and motor assembly shall be easily removed for serviceability.

C. Coils shall have one-half (1/2) inch OD copper tubes with aluminum fins, mechanically bonded to the tubes. Fit coils with manual air vents. Coils shall be factory leak tested at 350 psig and suitable for working pressures to 250 psig. Coil connections shall be five-eighths (5/8) inch OD male sweat fittings.

D. Motors shall be three-speed, tap wound type with UL listed thermal overload protection and sleeve-type bearings with oil tubes and oil reservoirs. Motors shall be shaped pole type.

E. Fans shall be galvanized steel, centrifugal, forward curved type, with statically and dynamically balanced fan wheels.

2.2 FINTUBE RADIATION

A. Non-ferrous heating elements shall consist of full-hard aluminum plate fins, permanently bonded to copper seamless-drawn tube and guaranteed for working pressure at 300 degrees F., not less than 150 psi for one (1) inch tube and 200 psi for one and one-quarter (1-1/4) inch tube. Embed fins in the copper tube.

B. Enclosures and accessories shall be of style indicated on the Drawings, and shall be fabricated from electro zinc-coated, rust-resistant, bonderized steel. Enclosures shall be 16 gauge. Enclosure louvers shall be "pencil proof" type. On wall-to-wall application, furnish enclosures in one (1) piece up to a maximum of ten (10) foot enclosure length for rooms or spaces measuring a maximum of ten (10) foot ten (10) inch wall length, using a six (6) inch end trim each end. Furnish enclosures in two or more lengths for wall lengths exceeding ten (10) feet ten (10) inches.

C. Use end trims, furnished with roll-flanged edges, between ends of enclosures and walls on wall-to-wall applications. End trims shall be six (6) inch maximum length, and shall be attached without visible fasteners. Corners and end enclosures shall be furnished where indicated, shall be the same gauge as enclosures and fit flush with enclosures.

D. Support enclosures at the top by means of a 20-gauge roll-formed continuous mounting channel fabricated from electro zinc-coated, rust-resistant, bonderized steel. There shall be a minimum of eight (8) bends forming strengthening ribs running the length of the channel.

The top projection of channel shall position the enclosure seven-eighths (7/8) inch from wall to prevent "gouging" of walls as enclosure is installed or removed. Provide a sponge-rubber dirt sealer to the offset section of channel permanently anchored to wall allowing enclosure installation or removal without disturbing the sealer. Dirt sealers attached to rear flange of enclosure are not permitted.

E. Install enclosure brackets and elements hangers not farther than four (4) feet apart. Brackets shall be die-formed from three-sixteenths (3/16) inch thick stock, one and one-half (1-1/2) inch wide, and shall be lanced to support and position lower flange of enclosure. Firmly attach enclosures to brackets by set screws operated from under the enclosure. Devices which do not provide positive fastening of enclosures are not acceptable. Insert brackets in pre-punched slots in mounting channel to insure correct alignment and fasten securely to wall at bottom.

F. Sliding saddles shall support heating element and provide positive positioning of element in enclosure to insure maximum heating efficiency while preventing any possibility of fin impingement on brackets or enclosure joints during expansion or contraction. Element supports shall be a double-saddle design fabricated from 16-gauge electro zinc-coated, rust-resistant, bonderized steel. Slide saddle freely on saddle support arm bolted to support bracket. Allow support arm one and one-half (1-1/2) inch height adjustment for pitch. Allow the element support saddle one and five-eighths (1-5/8) inch lateral movement for expansion and contraction of heating element. Rod or wire hangers are not acceptable.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 15810 - AIR MOVING EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. Furnish air moving equipment designed to operate at the conditions noted on the Drawings.

B. Equip unit with disconnects and starters as required by the Electrical Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100
Air Duct Systems	Section 15830
Air Distribution Specialties	Section 15850

1.3 REQUIREMENTS OF REGULATORY AGENCIES

Air Diffusion Council (ADC)
National Electric Code (NEC)
National Electric Manufacturers Association (NEMA)

PART 2 - PRODUCTS

2.1 CENTRIFUGAL ROOF EXHAUSTER

A. Roof exhausters shall be of the type, wheel size and capacity indicated on the Drawings. Fans shall be of centrifugal or axial type, belt driven or direct driven, as shown on the Drawings. V-belt drives shall be designed for fifty (50%) percent overload, and shall have adjustable pitch motor sheave. Motors shall be mounted on an adjustable base.

1. Housing shall be of corrosion resistant aluminum alloy, fully weatherproofed. Provide outlets with removable bird screens.

2. Fan Bearings shall be ball bearing type and provided with adequate and accessible means of lubrication. Each unit shall have a disconnect located in the motor compartment. Fans shall be quiet in operation. Fan housings shall be easily removable for access to all parts.

3. Dampers shall be gravity type furnished by the Fan Manufacturer.

2.2 ROOF CURBS

A. Roof curbs shall be of prefabricated metal type and designed for mounting roof exhausters and air intakes furnished. Curb shall be of sound attenuating type with insulated lining. Design curb for flashing to roof in an approved manner. Curb shall have an adequate means for mounting dampers where dampers are specified or shown on the Drawings.

2.3 CEILING MOUNTED CENTRIFUGAL /TYPE EXHAUST FANS

A. Furnish ceiling mounted centrifugal type exhaust fans where indicated on the Drawings. Fans shall be quiet in operation and shall be of the capacity and manufacture shown on the Drawings or approved alternate. Provide galvanized duct with backdraft damper from exhaust fan to weatherproof roof cap with air outlet above roof. Flash outlet duct at roof line.

2.4 EXHAUST FANS

A. Roof mounted utility type exhaust fans shall be of the type, wheel size and capacity indicated on the Drawings. Fans shall be of the centrifugal type, belt driven, as shown on the Drawings. Design V-belt drives for fifty (50%) percent overload and with adjustable pitch motor sheave. Mount motors on an adjustable base.

2.5 INLINE DUCT FANS

A. Inline duct fans to be of all-aluminum construction designed for straight through air flow. Fan to be AMCA certified for both air and sound.

B. Unit to be designed for universal mounting at any desired angle. Orientation to be field adjustable. Furnish with support brackets.

C. Fan to be aluminum airfoil type wheel with non-overloading characteristics.

D. Straightening vanes shall be located on the discharge side of the fan.

E. A prewired disconnect switch shall be provided on all units.

F. Fan shall be capable of operation up to 200° Fahrenheit.

G. Fans shall have ball bearing with lubricating tubes extended to outside of cabinet.

H. Fan to be belt-driven type with belt safety guard.

I. Mount unit with vibration isolating pads for floor mounting or spring isolators for wall or ceiling suspended models.

J. Flexible duct connections shall be provided on inlet and outlet duct connections.

K. Units to be U.L. stamped and listed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof exhausters on factory curbs as required by the Manufacturer and as detailed on the Drawings.

B. Install duct mounted fans using vibration isolating mountings and flexible duct connectors.

3.2 START-UP

A. Following installation, check belts, motor mountings, dampers and associated equipment for proper operation.

B. Adjust fan RPM as required to provide specified air movement without excessive noise.

END OF SECTION

This page intentionally blank

SECTION 15820 - PACKAGED CENTRAL STATION AIR HANDLERS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install packaged central station air handlers where shown on the Drawings and as specified in this Section.

B. Unit performance shall be certified in accordance with ARI Standard 430-66 for fans and 410-72 for coils.

C. Air handlers shall be mounted on 4" thick concrete pads (by general contractor). Pads shall be 12" larger in all dimensions than air handler.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100
Vibration Isolation	Section 15120
Hot and Chilled Water Piping and Specialties	Section 15660
Coils and Heat Exchangers	Section 15680
Air Duct Systems	Section 15830

1.3 REQUIREMENTS OF REGULATORY AGENCIES

SMACNA
NFPA
Air Conditioning and Refrigeration Institute (ARI)

PART 2 - PRODUCTS

2.1 CENTRAL STATION AIR HANDLERS

A. Construct housing of sectionalized heavy-gauge mill galvanized steel formed panels, rigidly reinforced with external hat channels. Casing panels shall be removable for easy access to the unit.

B. All sections of the air handler shall have two (2) inch thick, three-quarter (3/4) pound density neoprene coated glass fiber insulation secured to casing with waterproof adhesive and permanent fasteners and shall meet NFPA-90A flame spread and smoke generation requirements. A double wall perforated interior metal liner shall be used in fan sections. A solid metal liner shall be used in filter and coil sections.

C. Condensate drain pan shall have double wall construction with threaded drain connections on both sides and shall extend under the complete long coil section of the horizontal, vertical

draw-thru units. On single coil horizontal, vertical draw-thru units with short coil sections, extend drain pan under complete fan and coil section.

D. Insulate condensate drain pan with zero point six (0.6) inch thick foam faced with an additional aluminum foil vapor barrier and cement between the steel outer pan and the heavy gauge steel inner pan. Coat inner pan with corrosion-resistant elastomeric based material. Insulation, adhesive and inner coating shall comply with NFPA-90A flame spread and smoke generation requirements.

E. Coil sections shall have heavy-duty coil tracks extending the full width of the unit to provide slip-in, slip-out coils for ease of service and maintenance. Where cooling coils are stacked, they are to have intermediate drain pans with drop tubes at either end to drain condensate to the main drain pan without flooding the lower coil.

F. Construct fan sections of galvanized steel and form channel base for integral mounting of fan, motor and casing panels. Mount fan scroll and bearings on an "A", or "H", frame rigidly secured to the channel base. Factory install internally mounted motor on slide rails having two (2) adjusting screws. Provide a removable panel, located on the drive side of the unit, of adequate size to permit removal of the fan wheel, motor and drive. Mount fan on internal spring vibration isolation - 1.5 inch minimum deflection.

G. Bearings shall be self-aligning, pillow block regreasable ball types selected for an average life of two-hundred-thousand (200,000) hours at design operating conditions. Bearings shall have a grease line extending to drive side of fan scroll. Shafts shall be solid steel, turned, ground and polished.

H. Key fan wheels to the shaft design for continuous operation at the maximum rated fan speed and motor horsepower. Select fans and shaft to operate at least twenty-five (25%) percent below the first critical speed. Fans wheels and shafts shall be statically and dynamically balanced as an assembly. After final assembly, give the entire unit a final vibration test.

I. Low-pressure and medium-pressure fans (for total static pressures up to five and one-half (5-1/2) inch w.g.) shall be double width, double inlet type with forward curved blades. Wheels shall be bonderized steel painted with baked-on enamel or unpainted mill galvanized steel.

J. Medium-pressure and high-pressure fans (for total static pressures to nine (9) inch w.g.) shall be double width, double inlet type with backward inclined airfoils blades. Paint wheels with a zinc-chromate primer and enamel or unpainted mill galvanized steel.

K. Drive package shall be variable pitch for drives up to 25 HP, fixed pitch for drives above 25 HP, and shall be selected with a service factor of one point four (1.4) based on brake horsepower.

L. Coils shall be as specified in the Coils and Heat Exchangers Section.

END OF SECTION

SECTION 15830 - AIR DUCT SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install all air duct systems required for the project including supply, return, exhaust, transfer, relief, and outside air intake ductwork.

B. Duct systems to be constructed in compliance with the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

The SMACNA HVAC duct construction standards as herein modified shall be utilized as the construction guide. References to tables, paragraphs, schedules, etc. are to the 1985 SMACNA HVAC duct construction standards.

Duct Construction Requirements

Type Ductwork	Velocity Level Maximum	Static Pressure	Duct Seal Classification
Variable air volume supply upstream of VAV boxes	4000 FPM	+3"B	-All transverse joints and longitudinal seams
Low velocity supply exhaust, return, outdoor air, intake, transfer, relief	2500 FPM	+(-) 1C	-All transverse joints

1.2 RELATED WORK SPECIFIED ELSEWHERE

Testing and Balancing	Section 15030
Installation of Equipment and Piping	Section 15100
Insulation	Section 15130
Air Distribution Specialties	Section 15850

1.3 REQUIREMENTS OF REGULATORY AGENCIES

SMACNA
NFPA No. 90A

PART 2 - PRODUCTS

2.1 LOW VELOCITY AIR DUCTS

A. Duct materials and installation shall meet the requirements of NFPA Standard No. 90A of the

latest issue. Construct ducts of galvanized steel. Bracing and supports shall be galvanized steel. Duct system construction shall be in accordance with SMACNA Duct Construction Standards. Ductwork shall be substantially and neatly supported so that horizontal ducts are without sag or sway, vertical ducts are without buckle, and ducts are free from the possibility of deformation, collapse or vibration.

B. Acoustical liner shall be semi-rigid mineral wool conforming with the latest revision of FS HH-I-564. Coat liner with a black high density, matte-faced, fire-resistant coating meeting the requirements of NFPA 90A and preventing air entrainment of the fibers in use. Insulation shall have an average noise reduction coefficient of not less than zero point eighty (0.80) for one (1) inch as determined by the Acoustical Material Association. Liner shall be not less than one point fifty (1.50) per cubic foot density, and shall be suitable for installation on the sheet metal prior to bending. For horizontal ducts, adhere the acoustical liner for the sides and top of the duct to the sheet in one piece and form. Liner shall be J-M Lina-Coustic or approved alternate.

2.2 FIBERGLASS DUCTWORK

A. Ductwork shall be Johns-Manville one (1) inch thick Micro-Aire round duct. System shall meet SMACNA Fibrous Glass Duct Construction Standards 1977 and UL Standard 181 for Class I duct system.

B. Tape shall be heat sensitive and SMACNA registered for use with fiberglass systems.

2.3 VOLUME DAMPERS

A. Install volume dampers where shown on the Drawings. Install volume dampers, occurring in concealed ductwork, with shafts vertical. In ducts over twelve (12) inches in larger dimension, use multi-louvered opposed blade dampers, American Warming and Ventilating Company Type DAA-P-50 or equal, with Ventlok No. 641 damper regulators and No. 609 end bearings, or approved alternate. Dampers in concealed ducts above NONREMOVABLE CEILINGS shall have Ventlok No. 666 concealed damper operators consisting of an extension operating rod for volume dampers with a removable key. Access to operating rod shall be through chrome escutcheon plate.

2.4 FIRE AND SMOKE DAMPERS

A. Install fire/smoke dampers, where shown on the Drawings, to meet the requirements of NFPA Standard 90A and as shown in SMACNA Fire Damper Guide.

B. Fire dampers shall be Type B, Air Balance No. 119UL or approved alternate. Provide installation instructions and submit with shop drawings.

C. Smoke dampers shall be as specified for fire dampers with the addition of a /115 volt stall motor /pneumatic damper motor.

D. Install access doors of not less than ten by twelve (10 x 12) on the link side of dampers for

inspection and checking of damper position. Doors in low pressure ductwork shall be Ventlok insulated doors or Airsan hinged duct ports with double glass. Access doors are not required at locations where inspection and access to the fire link is possible by removal of diffusers or grilles. Access doors shall be labelled "Fire Damper", "Smoke Damper", in compliance with Uniform Mechanical Code.

2.5 FLEXIBLE CONNECTIONS

A. Provide flexible connections between ductwork and air handling equipment. Connections shall be of fireproof material and suitable for temperatures and pressures involved. Connection material shall be Ventglas or approved equal. Connections shall be in accordance with Plate 46 of the Low Velocity Duct Standards, and shall be made as close to the fan as possible.

PART 3 - EXECUTION

3.1 GENERAL

A. Furnish and install ducts as indicated on the Drawings. If approved, the Contractor may vary run and shape of ducts and make offsets during the progress of the work if required to meet structural or other interferences. Duct sizes shown are net opening sizes. Add allowance for duct liner where required.

B. Consult with the general contractor and install ductwork to the required ceiling heights and finishes. Consult with other trades and, in conjunction with them, establish necessary space requirements for each trade to maintain required clearances.

C. Ductwork modified in size or routing shall NOT be installed without approval by the Contracting Officer.

D. Install ductwork in areas with "Exposed Structure" or "No Ceiling" with concern for appearance as well as function. Install hangers, joints, dampers, etc. in a manner suitable for viewing.

3.2 OPENINGS REQUIRED FOR DUCTWORK

A. Coordinate openings through structure required for ductwork with other trades and the General Contractor. The Contractor shall provide sleeves required for duct penetrations. Sleeves shall be of the same cross-sectional shape (round, square, rectangular) as the duct so that patching is not required. After installing duct, seal between duct and sleeve with compressible sealer, such as Tremco's Acoustical Sealant or Johns-Manville's Duxseal.

3.3 DUCT PRESSURE/VELOCITY AND SEALING

A. Each duct system shall be constructed for the specific duct pressure and sealing classifications shown.

B. Where dimensions, sizes and arrangements of elements of duct assembly and support systems are not provided herein the contractor shall select such to be suitable for the service.

C. The contractor shall follow the application recommendations of the manufacturer of all hardware and accessory items and make selections of such consistent with the duct classifications and services.

D. Sealing shall mean the following:

1. The use of adhesives, gaskets, tape systems or combinations thereof to close openings in the surface of the ductwork and field-erected plenums and casings through which air leakage would occur; or

2. The use of continuous welds;

3. The prudent selection and application of sealing methods by fabricators and installers, giving due consideration to the designated pressure class, pressure mode (positive or negative), chemical compatibility of the closure system, potential movement of mating parts, workmanship, amount and type of handling; cleanliness of surfaces, product shelf life, curing time and manufacturer-identified exposure limitation.

4. That these provisions are applicable to duct connections to equipment and to apparatus but are not for equipment and apparatus.

5. That where distinctions between seams and joints are made herein, a seam is defined as joining of two longitudinally (in the direction of airflow) oriented edges of duct surface material occurring between two joints. Helical (spiral) lock seams are exempt from sealant requirements. All other duct surface connections made on the perimeter are deemed to be joints. Joints are inclusive of but not limited to girth joints; branch and sub-branch intersections; so-called duct collar tap-ins; fitting subsections; louver and air terminal connections to ducts; access door and access panel frames and jambs; duct, plenum and casing abutments to building structures.

6. Externally insulated ducts located outside of buildings shall be sealed prior to being insulated as though they were inside.

3.4 RECTANGULAR DUCT REINFORCEMENT

A. Unless otherwise specified or allowed rectangular ductwork shall be constructed in accordance with Tables 1-3 through 1-19 and detail associated with these.

B. Unless otherwise specified, reinforcement may be uncoated steel or galvanized steel.

C. Joint spacing on unreinforced ducts is unlimited. On ducts that require reinforcement, joint spacing is unrestricted except that the joint itself must qualify for the minimum reinforce code associated with the reinforcement spacing.

D. Duct sides that are 19" and over and are 20 gauge or less with more than 10 sq ft of unbraced panel area shall be cross-broken or beaded as indicated in Figure 1-4 unless they are lined or are externally insulated. Ducts that are of heavier gauge, smaller dimension, smaller panel area and those which are lined or externally insulated are not required to have cross-breaking or beading.

E. Fittings shall be reinforced similarly to sections of straight duct. On size change fittings the greater fitting dimension determines the duct gauge. Where fitting curvature or internal member attachments provide equivalent rigidity such features may be credited as reinforcement.

F. Duct wall thickness, joints, seams and reinforcements must be related practicably to provide proper assembly.

3.5 TRANSVERSE JOINTS FOR RECTANGULAR DUCT

A. Transverse joints shall be selected and used consistent with the static pressure class, applicable sealing requirements, materials involved, duct support intervals and other provisions for proper assembly of ductwork outlined in the construction standards. The precise type, size, location, and material of fastenings use in joint assemblies are in several instances left open to prudent judgment for the specific service. Notching, bending, folding and fit up tolerances shall be appropriate for the composite assembly.

Where the installer has a choice of materials and methods he shall not use such latitude to create a deficiency in the integrity of the ductwork.

B. Where bar or angle stock is incorporated in a joint it shall be secured. Where intermediate type reinforcements are used as supplements for joints they shall be attached to the duct wall within 3" of the joint by weld, bolt, screw or blind rivet fastening within 2" of duct corners and at intervals not exceeding 12". Exception: Where the ends are tied to members on adjacent sides, the fastening to the duct within 2: may be omitted in consideration of the end restraint.

C. Fasteners shall be steel if used on steel duct. They may be zinc or cadmium coated. Standard or self-drilling sheet metal screws may be used as appropriate. Blind rivets using pull-through mandrels are not permitted if they leave holes for air leakage. Fastenings shall not project into duct interior more than 1/2". Where bolts or welds are exclusively specified other types of fastening are not allowed.

3.6 LONGITUDINAL SEAMS FOR RECTANGULAR DUCT

A. Seams shall be suitable selected for the material, pressure classification and other construction detail applicable for the service.

B. Seams shall be formed and assembled with proper dimension and proportion for tight and secure fitup. Notching shall be minimal consistent with transverse joint make-up needs.

C. Seams may be of butt weld, corner weld, plug weld or spot weld design. They may also be of spiral lockseam type.

D. Solder for watertight seam closure, when specified, should conform to ASTM Standard B32 or Federal Specification QQ-S-571.

3.7 INSTALLATION STANDARDS FOR RECTANGULAR DUCTS USING FLEXIBLE LINER

A. Flexible duct liner of the specified material, thickness, and density shall be furnished and installed where shown on the contract drawings.

B. Unless otherwise indicated, the net free area of the duct dimensions given on the contract drawings shall be maintained. The duct dimensions shall be increased as necessary to compensate for liner thickness.

C. The liner surface designated to be exposed shall face the airstream.

D. Each layer of duct liner shall be adhered with 90% coverage of adhesive at liner contact surface area.

E. All edges of liner facing in the direction of airflow and not receiving metal nosing shall be coated with adhesive. Liner shall be neatly butted without gaps a transverse joints and shall be coated with adhesive at such joints.

F. Liner shall be folded and compressed in the corners of rectangular duct sections or shall be cut and fit to assure butted edge overlapping. Longitudinal joints in duct liner shall not occur except at the corners of ducts unless the size of the duct and standard liner product dimensions make such necessary.

G. Interior widths of duct not exceeding 8" do not require mechanical fasteners in addition to adhesive.

H. Except as noted herein mechanical fasteners shall be located with respect to interior dimensions and regardless of airflow direction as follows:

Velocity	Transversely Around Perimeter	Longitudinally
2500 fpm dn	At 3" from corners and at intervals not exceeding 12"	At 3" from transverse joints and at intervals not exceeding 18"
2501 fpm to 6000 fpm	At 3" from corners at at intervals not exceeding 6"	At 3" from transverse joints and at intervals not exceeding 16"

I. Longitudinal joints in liner shall be coated with adhesive at velocities over 2500 fpm.

J. Metal nosings that are either channel or zee profile or are integrally-formed from the duct wall shall be securely installed over transversely oriented liner edges facing the airstream at fan discharge and at any interval of lined duct preceded by unlined duct. In addition, where velocities exceed 4000 fpm metal nosing shall be used on upstream edges of liner at every transverse joint.

K. Where dampers, turning vane assemblies or other devises are placed inside of lined duct or fittings, the installation must not damage the liner or cause erosion of the liner. The use of metal hat sections or other buildout means is optional; when used, buildouts shall be secured to the duct wall with bolts, screws, rivets or welds.

L. Liner shall also be installed with mechanical fastening devices that:

1. Are spaced in accordance with Figure 2-19,

2. When installed, are as corrosion resistant as G60 coated galvanized steel,

3. Will not adversely affect the fire resistance classification of liner and adhesives,

4. Do not damage the liner when applied as recommended by the manufacturer,

5. Do not cause leakage in the duct,

6. Do not project more than nominally into the airstream,

7. Will indefinitely sustain a 50 lb tensile dead load test perpendicular to the duct wall,

8. Are the correct length for the specified liner thickness.

3.8 ROUND DUCT CONSTRUCTION STANDARDS

A. Round duct shall be constructed in accordance with Tables 3-2 and 3-3.

B. Fittings shall be of wall thickness not less than that specified for longitudinal seam straight duct unless otherwise provided in Tables 3-2 and 3-3. The diameter of fittings shall be appropriate for mating with sections of straight duct, equipment and air terminals to which they connect.

C. The use of a saddle or a direct connection of a branch into a larger duct is not prohibited; where used the diameter of the branch shall not exceed two-thirds of the diameter of the main are not allowed. Direct connection of a branch into a main shall include mechanical attachment sufficient to maintain the integrity of the assembly. All saddle fittings shall be sealed at all pressures without exception.

D. Where other limitations are not provided, mitered elbows shall be based on velocity of flow and shall be constructed to comply with Table 3-1.

E. Elbows may be of the die formed, pleated or mitered types. Mitered junctions may be continuously welded, lapped and spot welded, welded standing seam, standing seam or adjustable seam type. Gages shall not be less than that for straight duct nor the minimum appropriate for forming and assembly. The illustration of 90 degree elbows in Figure 3-3 does not preclude use of shapes less than 90 degree.

F. Figure 2-9 is applicable for inline offsets.

G. Volume damper construction is provided on pages 2-15 and 2-16.

H. Ducts shall be suspended in accordance with Section IV. Additional supports shall be added if necessary to control deflection of ducts or to maintain alignment at branch intersections. The

support system shall not cause out-of-round shape.

I. The requirements of Table 1-2 for sealing are applicable.

MITERED ELBOWS

Duct Velocity	R/D Ratio Centerline Radium to Duct Diameter	Number of Mitered Pieces		
		90 Deg	60 Deg	45 Deg
Up to 1000 fpm	0.6	3	2	2
1001 to 1500 fpm	1.0	4	3	2
Above 1500 fpm	1.5	5	4	3

ROUND DUCT GAUGE SELECTION
GALVANIZED STEEL

	Maximum 2" w.g. Static Positive	
Duct Diameter in Inches	Spiral Seam Gauge	Longitudinal Seam Gauge
3 thru 8	28	28
9 thru 14	28	26
15 thru 26	26	24
27 thru 36	24	22

	Maximum 10" w.g. Static Positive	
Duct Diameter in Inches	Spiral Seam Gauge	Longitudinal Seam Gauge
3 thru 8	26	24
9 thru 14	26	24
15 thru 26	24	22
27 thru 36	22	20

	Maximum 2" w.g. Static Negative	
Duct Diameter In Inches	Spiral Seam Gauge	Longitudinal Seam Gauge
3 thru 8	28	24

9 thru 14	26	24
15 thru 26	24	22
27 thru 36	22	20

3.9 FLEXIBLE DUCT INSTALLATION STANDARDS

A. Unless otherwise designated, the term flexible air duct herein is used for all ducts classified by UL as flexible air ducts.

B. These provisions apply for ducts used for indoor comfort heating, ventilating and air conditioning service. Service for conveying particulate, handling corrosive fumes and vapors, high temperature duty, corrosive or contaminated atmosphere exposure, etc., is excluded.

C. Ducts must conform to NFPA Standard flexible ducts must be tested in accordance with Underwriters Laboratory's Standard for Factory-made Duct Materials, UL-181, and must be installed in accordance with the conditions of their listing by UL. Separate installation limitations for flexible connectors and flexible ducts are identified in NFPA Standard 90A. By UL Standard 181, a flexible connector is characterized as a flexible air duct not having flame penetration, puncture and impact tests.

D. The minimum length of flexible duct should be used.

E. Bends shall be made with not less than 1 duct diameter centerline radius. Ducts should extend a few inches beyond the end of a sheet metal connection before bending. Ducts should not be compressed.

F. Ducts shall be located away from hot equipment such as furnaces, and steam pipes to avoid access temperature exposure.

3.10 JOINING AND ATTACHING FLEXIBLE DUCT

A. The provisions for sealing ducts specified apply in addition to the requirements herein. Adhesive shall be chemically compatible with materials in contact with it.

B. The ends of ducts shall be trimmed squarely prior to installation.

C. Collars to which flexible duct is attached shall be a minimum of 2" in length. Sleeves used for joining two sections of flexible duct shall be a minimum of 4" in length.

D. Collars and sleeves shall be inserted into flexible duct a minimum of 1" before fastening.

E. Metallic flexible duct shall be attached using a minimum of three #8 sheet metal screws equally spaced around the duct's circumference; ducts larger than 12" diameter shall have a minimum of five #8 sheet metal screws. Screws shall be located at least 1/2 inch from the duct end.

F. Non-metallic flexible duct shall be secured to the sleeve or collar using a draw band. If the duct

collar exceeds 12" diameter the draw band must be positioned behind a bead on the metal collar.

G. Insulation and vapor barriers present on factory-fabricated ducts shall be fitted over the core connection and shall be supplementally secured with a draw band.

3.11 SUPPORTING FLEXIBLE DUCT

A. Flexible duct shall be supported at manufacturer's recommended intervals but at no greater distance than 10 feet. Maximum permissible sag is 1/2 inch per foot of spacing between supports. A connection to another duct or equipment is deemed a support point.

B. Hanger or saddle material in contact with the flexible duct shall be of sufficient width to prevent any restriction of the internal diameter of the duct when the weight of the supported section rests on the hanger or saddle material. In no case will the material contacting the flexible duct be less than 1 inch wide. Narrower hanger material may be used in conjunction with a sheet metal saddle which meets the aforegoing specifications. This saddle must be formed to cover one-half the circumference of the outside diameter of the flexible duct and must be rolled to fit neatly around the lower half of the duct's outer circumference.

C. Factory installed suspension systems integral to the flexible duct are an acceptable alternative hanging method when manufacturers' recommended procedures are followed.

D. Hangers shall be adequately attached to the building structure.

E. To prevent tearing of vapor barrier, do not support entire weight of flexible duct on any one hanger during installation. Avoid contact of flexible duct with sharp edges of hanger material. Damage to vapor barrier will be repaired with approved tape. If internal core is penetrated, replace flexible duct.

F. Terminal devises connected by flexible duct shall be supported independently of the flexible duct.

3.12 UNDERSLAB DUCT CONSTRUCTION STANDARDS

A. This installation standard is applicable only to ducts placed in or beneath concrete floors.

B. Materials shall conform to the project specification requirements.

C. Ducts shall be located and positioned as illustrated on the contract drawings.

D. The duct contractor shall provide:

1. Proper assembly of the duct, including connection and sealing as prescribed.

2. Verification of the undamaged condition of the duct prior to enclosure with fill or encasement.

3. Anchorage of the duct, if any.

4. Notices of requirements for successive placements of fill, if any.

5. Precautions against use of powered vibrators in placement of concrete on or around ducts.

6. Witnessing of backfill or encasement.

7. Temporary protection of openings in ducts.

3.13 HANGING AND SUPPORTING SYSTEMS

A. Rigid round, rectangular and flat oval metal ducts shall be installed with support systems indicated in Tables 3-1 to 3-3 and Figures 3-1 to 3-8 and additionally as required to maintain alignment. Horizontal ducts shall have a support within two feet of each elbow and within four feet of each branch intersection. (Upper attachments to structures shall have an allowable load not exceeding one-fourth of the failure (proof test) load but are not limited to the specific methods shown herein.

3.14 CASING AND PLENUM CONSTRUCTION STANDARDS

A. Unless details are otherwise shown on contract drawings, provide casings and plenums of the designated pressure classification as required herein.

B. Submit details selected from among the illustrated alternatives for approval of the contracting authority. When equivalent construction is proposed as substitution, clearly identify the substitution. Construction appropriate for the pressure classification shall be used.

C. All casing on the suction side of the fan shall be of 2" w.g. pressure classification. Casing on fan discharge shall be of the designated pressure class.

D. All joints, seams, connections and abutments to building structure shall be sealed with suitable compounds or gaskets.

E. Drains shall have water seals not less than 2" w.g. greater than the maximum operating pressure in the chamber.

F. Pipe penetrations shall be sealed to prevent air leakage and condensation movement through the seal.

G. Casing material shall be of the same commercial grades as for ducts except that G90 coated galvanized steel shall be used in all chambers with moisture present.

H. Metal drain pans shall be of G90 coated galvanized steel.

I. All welds on casing interiors shall be painted.

J. Close off or safing sheets and strips shall be of G90 galvanized steel of thickness of not less than that associated with duct widths and shall be securely attached. They shall not be used for

structural support of equipment.

K. Casings and plenums shall be constructed to withstand 133% of rated pressure without structural failure. Wall and roof deflection at rated pressure shall not exceed 1/8" per foot of width.

L. Casing for negative pressures greater than 3" w.g. may be constructed in accordance with the SMACNA Rectangular Industrial Duct Construction Standards.

3.15 CLEANING DUCT SYSTEMS

A. Upon complete installation of ductwork, clean ductwork of rubbish, dirt and plaster, etc., before installing any grilles outlets or registers.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 15843 - CARBON MONOXIDE EXHAUST SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install a complete carbon monoxide exhaust system as indicated on the Drawings and as specified in this Section. System to include all ductwork, flexible tubing, adaptors, reels and exhaust fans.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100
Air Moving Equipment	Section 15810
Air Duct Systems	Section 15930

1.3 REQUIREMENTS OF REGULATORY AGENCIES

NFPA
SMACNA
U.L.

PART 2 - PRODUCTS

2.1 DUCTWORK

A. Ductwork to be minimum 26 gauge galvanized lockseam construction with single longitudinal seam. Ductwork is to be supplied with bead and crimp one end, other end open for easy installation. All joints are to be secured by rivets or sheet metal screws.

B. Tee fittings are to be of an air flow design with 90° lateral take-off expanded at a 30° angle in direction of air flow, allowing for air entry to main duct with minimum turbulence. Branch duct to be welded to main duct with welds being a minimum of 1-1/2" long and proportionately spaced. The entire contact area of tee branch to the main duct branch to be sealed with a silicone sealer. Tees to be minimum 26 gauge galvanized steel, lockseam construction with bead and crimp.

2.2 EXHAUST FAN

A. The exhaust fan shall be equipped with a high efficiency, non-overloading, backward inclined wheel. Construction to be suitable for 5" static pressure and include continuously welded 12 gauge steel housing, cast steel pillow-block bearings, turned, ground and polished shaft and variable speed V-belt drive (drive rating not less than 150% of motor load). All parts in the airstream are to be coated with Heresite or approved equal to prevent acid corrosion. The exhaust fan shall be mounted on a fan platform constructed of steel angles and including vibration isolators. It shall be of all welded construction and shall be arranged for wall mounting or ceiling suspension as shown on the drawings. The inlet connection shall have flexible

neoprene coated fiberglass between the main duct and the fan. A weather cover must be provided for outside installation.

2.3 FLEXIBLE TUBING

A. The flexible tubing assembly shall be factory assembled, field assembly is not acceptable. Flexible tubing shall have length and diameter as noted on drawing and shall be Silicone: Car-Mon Type CL Silicone Tubing or approved equal fabricated of a high tensile strength weave, glass fiber cloth, fully impregnated with high temperature GREEN SILICONE. The cloth shall have a 0.020" thickness, and shall be lapped over a resilient core to form a single ply, double overlap joint, clinched within an external STAINLESS STEEL Helix. No adhesives shall be used in the tubing construction. The flexible tubing shall be capable of withstanding a temperature of 500° F, interior and exterior, and shall be both flame retardant and oil resistant.

2.4 TSR-W: CLOSED CIRCUIT WINCH

A. The tubing storage reel shall be furnished complete with a closed circuit winch system comprised of a single drum winch, 1/8" 7x19 galvanized aircraft cable and appropriate pulleys.

2.5 GENERAL

A. All components to be factory matched for on job erection and assembly and of size, length and capacity to meet job requirement. The required fan and components shall be as manufactured by Car-Mon Products, Inc., Elgin, Illinois or approved equal.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 15850 - AIR DISTRIBUTION SPECIALTIES

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install air distribution specialties as shown on the Drawings and as specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Air Duct Systems	Section 15830
Air Filtration Specialties	Section 15860
Sound Attenuators	Section 15870

1.3 REQUIREMENTS OF REGULATORY AGENCIES

Air Diffusion Council
Underwriters' Laboratories, Inc.

PART 2 - PRODUCTS

2.1 FLEXIBLE DUCTS

A. Flexible duct for connections between high pressure ducts and mixing boxes, and low pressure ducts and diffusers shall be Thermaflex M-KE listed by Underwriters' Laboratories under U.L. Standard 181 as a Class 1 flexible air duct material and complying with NFPA Standards 90A and 90B. Duct shall be a factory fabricated assembly composed of: A plymeric liner duct bonded permanently to a coated spring steel wire helix and supporting a fiberglass insulating blanket. Low permeability outer vapor barrier of fiberglass reinforced film laminate shall complete the assembly. Flexible ducts to be rated for a positive six (6) inch w.c. and negative one (1) inch operating pressure minus zero to two-hundred (-0 to 200) Degrees F., temperature and 4000 FPM maximum velocity. Maximum flexible duct length to be used is ten (10) feet.

2.2 DIFFUSERS

A. Furnish and install, where shown on the Drawings, ceiling-diffuser assemblies of the size, style and manufacturer specified. Diffuser assemblies shall include volume dampers (where scheduled), mounting frame and/or fasteners and sponge gasket for a complete and workmanlike installation. Where noted, provide equalizing grids to insure uniform air distribution.

B. Construct round or square cone type diffusers of 20-gauge (minimum) cold-rolled steel and distribute the specified air quantity in a true three-hundred sixty (360) Degree pattern. Cones shall be one-piece units, spun or stamped, without corner joint. Diffusers shall be composed of an inner and outer cone section with the inner section fastened to the outer section using a spring-lock assembly. Shop drawings for diffusers shall indicate N.C. curve, static pressure drop, material, gauge and a room-by-room take-off showing mounting (lay in or surface) and finish.

2.3 REGISTERS AND GRILLES

A. Furnish and install registers and grilles for openings as indicated on the Drawings. Furnish complete units with frames and blades (and removable key-operated dampers for registers).

2.4 SPIN INS

A. Spin ins to be scoop type with volume damper equal to air control products S-SM-D (sheetmetal) or S-DB-D (fiberglass ductwork).

2.5 TURNING VANES

A. Install in all elbows in rectangular ductwork single wall curved vanes with extended leaving edge to direct airflow and reduce fitting air pressure drop.

2.6 LOUVERS

A. Install louvers where indicated and as scheduled on the Drawings. Louvers to be fixed blade type of extruded aluminum construction. Louvers to be a minimum of 12 gauge with all joints welded. Furnish louver with an aluminum bird screen on interior surface. Louvers to be prime coated for field painting.

2.7 DAMPERS

A. Install where indicated opposed blade dampers. Outdoor air intake, relief air and exhaust dampers to be constructed of extruded aluminum with extruded vinyl blade seals. Jamb seals to be flexible metal compression type. Damper to have a maximum leakage of 3.0 CFM per square foot at a pressure differential of one (1) inch w.g. Damper to be Ruskin CD-50. Return dampers to be opposed blade galvanized steel construction equal to Ruskin Model CD-35.

END OF SECTION

SECTION 15870 - SOUND ATTENUATORS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install rectangular and tubular duct silencers where shown on the Drawings and as specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100
Packaged Air Handlers	Section 15820
Air Duct Systems	Section 15830

1.3 REQUIREMENTS OF REGULATORY AGENCIES

Air Diffusion Council (ADC)
SMACNA

PART 2 - PRODUCTS

2.1 DUCT SILENCERS

A. Construct outer casings of galvanized steel in accordance with SMACNA High Velocity Duct Standards. Interior construction shall be compatible with the outer casing.

B. Filler material shall be of inorganic mineral or glass fiber of a density sufficient to obtain the specified acoustic performance and shall be packed under not less than five (5%) percent compression to eliminate voids due to vibration and settling. Material shall be inert, vermin-proof and moisture-proof.

1. Combustion Rating for the acoustic fill shall be greater than the following when tested in accordance with ASTM E 84 or NFPA Standard 255:

Flame Spread Classification	25
Smoke Development Rating	0
Fuel Contribution	20

C. Design casings to withstand a pressure differential of eight (8") inch w.g. without structural failure.

D. Determine silencer ratings in a duct-to-reverberant room test facility which provides for airflow in both directions through the test silencer during rating. Test set-up and procedure shall be such that effects due to end reflection, directivity, flanking transmission, standing waves and test chamber sound absorption are eliminated. Acoustic ratings shall include Dynamic Insertion Loss (DIL) and Self-Noise (SN) Power Levels both for FORWARD FLOW (air and noise in

same direction) and REVERSE FLOW (air and noise in opposite directions) with airflow of at least 2,000 fpm entering face velocity.

E. Static pressure loss of silencers shall not exceed those listed in the silencer schedule as the airflow indicates. Make airflow measurements in accordance with applicable portions of ASME, AMCA and ADC airflow test codes. Report tests on the identical units for which acoustic data is presented.

F. Certified test data shall be supplied by the Manufacturer to the Contracting Officer on DIL, SN and Aerodynamic Performance for Reverse and Forward Flow test conditions. Test data shall be for a standard product. Conduct rating tests in the same facility, utilize the same silencer and make available for inspection upon request from the Contracting Officer.

END OF SECTION

SECTION 15890 - VARIABLE AIR VOLUME TERMINAL UNITS

PART 1 - GENERAL

1.1 SCOPE

A. Furnish and install terminal units where shown on the Drawings and as specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Installation of Equipment and Piping	Section 15100
Motors and Controls	Section 15140
Sequences of Operation	Section 15930

1.3 REQUIREMENT OF REGULATORY AGENCIES

Air Diffusion Council (ADC)
ARI
ASME
UL

PART 2 - PRODUCTS

2.1 VARIABLE AIR VOLUME TERMINALS

A. Boxes to be provided for field installation of temperature controls.

B. Assembly casing shall be constructed of 22 gauge galvanized steel, internally lined with one (1) inch, one and one-half (1-1/2) pound density fiberglass insulation which complies with UL-181 and NFPA-90A.

C. Damper shall have extruded aluminum blades pivoted in Delrin self-lubricating bearings. Blades shall seat against closed-cell foam gasketed stops, with less than two (2%) percent leakage at six (6) inch SP, as rated by Air Diffusion Council Standards.

D. Basic assembly and factory attenuator shall be tested as a unit in accordance with the Air Diffusion Council (ADC) Test Code 1062R4, and shall have performance data ADC certified.

E. Sound levels and minimum static pressure ratings shall be as scheduled on the Drawings.

END OF SECTION

This page intentionally blank

SECTION 15930 - TEMPERATURE CONTROLS

PART 1 - GENERAL

A. All of the work to be performed under this section of these specifications shall be subject to the requirements set forth in Section 15000 "MECHANICAL REQUIREMENTS". All of the sections described therein shall be carefully examined before submitting a proposal for the work covered in this section.

1.1 SCOPE

A. It is the intent of these specifications and the contract drawings to describe the work to be performed in order to provide a complete system of temperature controls including all materials, plans, labor and accessories necessary to the successful completion and operation of the system as intended.

B. The work to be performed shall include but not necessarily be limited to the following systems and apparatus:

New electronic direct digital control system with Standalone Digital Panel, application specific controllers, and operator's personal computer.

New electronic DDC control for all air handlers heat exchanger and VAV boxes, including all electronic controllers, sensors, control valves, and damper actuators.

New electronic DDC controls for ground water cooling system.

New electronic controls for new cabinet heaters, unit heaters and fin tube including valves, sensors.

Removal of all controls not required by new installation.

C. All air handling units and other items noted in the "Point List" shall be controlled by the digital system controllers.

D. Future expandability - the entire temperature control system shall have capacity for 100% expansion of the facility.

1.2 RELATED WORK SPECIFIED ELSEWHERE

Mechanical Requirements	Section 15000
Installation of Equipment and Piping	Section 15100
Fire Protection	Section 15500
Coils and Heat Exchanges	Section 15680
Make-Up Air Units	Section 15730
Air Moving Equipment	Section 15810

Air Duct Systems	Section 15830
Electrical Requirements	Division 16

The Field Engineer shall be in attendance to properly instruct the Owner's operating personnel in the proper operation of all control components.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

UBC	Uniform Building Code
UMC	Uniform Mechanical Code
NEC	National Electric Code
SMACNA	Sheet metal and Air Conditioning Contractors National Association

1.4 MANUFACTURER & SUPERVISION

A. The temperature control system shall be a combination pneumatic/electronic microprocessor based digital system controller (DDC) and central processing unit to form a complete building automation system.

B. All Controls shall be of one manufacturer and shall be the complete responsibility of said manufacturer acting as subcontractor for the entire temperature control system.

C. The complete system including installation, start-up, calibration and final adjustment of all control devices shall be provided under the direct supervision of a factory trained field engineer thoroughly trained in the latest application of the system type being used on the project.

D. None but the most competent mechanics and control technicians factory trained and thoroughly versed in control system installation shall be employed to install or adjust any portion of the control system components.

1.5 SHOP DRAWINGS

A. Submit shop drawings to the Contracting Officer before starting work.

B. Provide a complete description of the sequence of operation, identifying each element with the same mark shown on the Control Diagram.

C. Provide composite wiring diagrams for equipment to be controlled showing relays, control devices, wiring and points of connection. Coordinate with as-built factory wiring diagrams.

1.6 WORK FURNISHED BUT INSTALLED BY OTHERS

A. Furnish automatic control valves to the mechanical contractor for installation under the supervision of the control subcontractor.

PART 2 - PRODUCTS

2.1 CONTROL VALVES

A. Motorized valves shall have equal percentage flow characteristics for modulating control of water flow. Valve bodies shall be bronze with replaceable bronze set composition discs, stainless steel stems and adjusting teflon cone packing.

2.2 DAMPERS

Dampers shall be of the parallel or opposed blade type mounted secure and true within their own frames and equal to Johnson Control D-1300 dampers.

A. GENERAL. Mixing dampers shall be parallel blade with blades to provide the maximum mixing of the two air streams. Volume dampers shall be of the opposed blade type.

B. DAMPER CONSTRUCTION. Shall be compatible with the duty imposed with special heavy construction provided for air velocities in excess of 1000 FPM. Frames shall be constructed of 3" x 1" x 1/8" (minimum) galvanized steel channel with blade stops top and bottom. Frames shall be corner braced if over 24" x 24". Blades shall have interlocking edges with neoprene seals for tight shut off capability, particularly in outdoor air intake damper applications. Dampers shall be equipped with self-lubricating bearings and damper linkages suitable for duty imposed.

2.3 FIRE PROTECTION

A. All smoke detectors, fire stats, etc., shall be furnished under Division 16 as part of the fire alarm system.

B. Smoke dampers in return air ducts may also double as control dampers where possible to do so.

2.4 EQUIPMENT

A. Direct Digital System Controllers (DDC):

1. Overview:

The Direct Digital Control System shall be based around Johnson Controls Metasys System or approved equal with local microprocessor-based control panel networked together for information sharing and operating convenience.

It is the intent of these specifications for the Contractor to provide and install a direct digital control (DDC) system with electric or electronic controllers. All "system" type control functions, such as those used for fan systems, boilers, chillers, central plant and pumps, building pressurization, etc. shall be accomplished by using software algorithms in the respective DDC. Disregard any references within this or other specifications to pneumatically controlled devices. All controls for the VAV boxes are to be supplied by the Controls Contractor, with coordination with the VAV manufacturer.

All safety devices such as fire alarm shutdown, smoke detectors, low limit thermostats, etc., shall be hard wired to accomplish their critical functions completely independent of the DDC and shall have additional outputs as required to service as inputs to the DDC for secondary control and reporting functions.

B. Facility Management System Remote

1. The Facility Management System shall be capable of integrating multiple building functions including equipment supervision and control, alarm management and energy management.

2. The facility management system shall consist of the following:

a. Standalone Global Control Panel.

b. Stand alone application specific controllers (ASCs).

c. Operator's Personal Computer.

3. The system shall be modular in nature, and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, and Stand alone Application Specification Controller (i.e., HVAC, Lighting, Integrator).

2.5 APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

A. Each ASC shall operate as a stand alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor-based, multi-tasking, real-time digital control processor.

B. Each ASC shall have sufficient memory to support its own operating system and data bases including:

- Generic Input/Output Monitor & Control
- Control Processes
- Energy Management Applications
- Operator I/O (Portable Service Terminal)

C. Powerfail Protection: All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.

2.6 EXTENDED DIGITAL CONTROLLER

A. The extended digital controller will be capable of operating as a stand-alone direct digital controller or of being networked as part of a larger facility management system. The controller shall be a microprocessor-based, multi-tasking, real-time digital control processor.

B. The extended digital controller shall have the following features as a minimum:

1. Real time clock and minimum of 8 schedules and 2 optimal start/stop modules.

2. Built-in RS-232C and RS-485 ports.

3. **Built in operator display** showing operating parameters and input/output values. Outputs shall be capable of being manually overridden and operating parameters changed from the panel display.

4. The controller shall have as a minimum:

   8 isolated analog outputs, 6 isolated digital outputs, 8 digital inputs, and 8 high resolution (13 bit) analog inputs. The system shall be expandable with the addition of expansion modules up to a minimum of 48 input/output points.

5. All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the controller.

C. The extended digital controller shall be fully custom field programmable to meet the specified applications, but be flexible enough to accommodate future applications. Controllers using pre-configured or generic application programs are not acceptable. Points unused in the control scheme shall be capable of being used for non-critical supervisory or control applications by the rest of the network.

D. The extended digital controller shall be capable of fully proportional, PI, PID, Dual PID, on/off, or Dual on/off control.

2.7 VAV CONTROLLERS

A. VAV controllers shall support, but not be limited to, the following types of systems:

1. Single Duct
2. Dual Duct
3. Fan Powered or Assisted
4. Supply/Exhaust

B. VAV controllers shall support prewritten software configured control strategies:

1. Pressure Dependent
2. Pressure Independent
3. Constant Volume
4. Auto Zero of Flow Transducers

C. Each VAV zone controller shall be a standalone DDC controller. The controller shall include all hardware and software required for communication with the local Network Control Unit (NCU).

D. The control program shall reside in the VAV zone controller. The application program shall be maintained in ROM. The default database, i.e., setpoints and configuration information, shall be stored in EEPROM.

E. Each VAV controller shall have a provision for setback, setup, shutdown, or morning warmup and cooldown.

F. Each VAV controller shall have a provision for occupancy sensing overrides. Based upon the contact status of either a manual wall switch or an occupancy sensing device.

G. Communications over the network shall be at least 9600 baud.

H. Minimum point type and quantity shall be as follows:

1.	Analog inputs	6
2.	Binary inputs	4
3.	Analog outputs	2 or 0
4.	Binary outputs	6 or 8

I. VAV controller shall directly support the temporary use of a portable service terminal. The capabilities of the portable service terminal shall include, but not be limited to, the following:

1. Display temperatures
2. Display status
3. Display setpoints
4. Display control parameters
5. Override binary output control
6. Override analog setpoints
7. Modification of gain and offset constants
8. Modified selected HVAC configuration programs and down load modifications

2.8 FIELD DEVICES

A. Positive Feedback Indicators, Pumps, fans and chillers run indication shall be by current sensing relay.

B. SENSORS

1. Provide averaging sensors of at least 8 feet in length for temperature points in air ducts of more than 8 square feet cross sectional area.

2. All temperature sensors shall be the RTD type. Thermal couples and/or thermistor sensors are not acceptable.

3. All temperature sensors shall have an end to end accuracy of 1.0 degree F.

4. 4 to 20 milliamp transmitters may be substituted for sensors if they are equal in accuracy, and in the case of averaging elements have at least an 8 foot sensor length.

5. All sensors and transmitters shall operate on a single pair of 18 gauge twisted shielded wire between them and the DSC. Any transmitter power supplies or source shall be located in a field gear panel with interconnecting wiring to the DSC.

2.9 FIELD PANELS

A. Mount all transducers, power supplies, relays and auxiliary devices in a fully enclosed panel. All tubing and wiring exiting the panel shall be individually tagged with a Brady marker to match the record drawings. All wiring shall e brought to screw terminals with captive wire lugs marked to match the record drawings.

B. All panels containing electrical devices or wiring shall be UL Listed, and factory assembled. All tubing and wiring in panels shall be neatly bundled and where practical, run in a Panduit type trough with removable cover. Panels without troughing or with tubing or wiring tied together will not be acceptable.

C. All wiring that must flex such as that crossing the panel's hinged cover shall be stranded and protected by a wiring harness.

2.10 TEMPERATURE CONTROL WIRING

A. All wiring for temperature controls, motor control interlocks and motor starter controls shall be the responsibility of the ~~Electrical~~ Mechanical Contractor.

B. The Electrical Contractor shall be responsible for the line and load side wiring of motor starters and shall provide all required coils and auxiliary contacts required for interlocking duty as an integral part any starters furnished under the electrical contract.

C. Wiring as used herein shall be construed as all wire, conduit, hangers, etc., required for successful operation of the system. All wiring shall be in strict accordance with the N.E.C. and shall comply with all of the provisions of Section 16 "Electrical" of these specifications.

D. Control circuit voltage shall not be in excess of 120 volts and all control circuits shall be served from a single phase of the three phase power source only if a neutral (not ground) conductor is connected to prevent the possibility of feedback into any control circuit. Unless otherwise approved the energy for all control circuits shall be served from phase one, (L-1) of the three phase power source, or from a control power transformer.

2.11 VARIABLE SPEED DRIVES - AHU 1

A. The Temperature Control Contractor shall furnish all variable speed drives required. Electrical Contractor will install and provide all load side wiring. Temperature Control Contractor shall furnish and install all control wiring.

B. PERFORMANCE CAPABILITIES

1. The Invertor voltage/frequency ratio shall be selectable for reduced torque loads.

2. The Invertor acceleration/deceleration time shall be adjustable from 1 to 120 seconds.

3. The Invertor frequency setting signal choices shall include 0-5 VDC, 0-10 VDC, 4-20 mA.

4. The Invertor shall have a minimum of the following protective features with an alarm display indication:

   a. Overcurrent Shut-off
   b. Regenerative Overvoltage
   c. Electronic Thermal Protector
   d. Heatsink Overheat
   e. Instantaneous Power Failure
   f. Ground Fault

5. The following operator controls shall be provided as a minimum:

   a. Hand/Off/Auto Switch
   b. Local/Remote Switch
   c. Frequency Setting Speed Pot
   d. Frequency Indication Meter Calibrated in % Speed
   e. Amp Meter
   f. Elapsed Time Meter
   g. Power On Light
   h. VFD Enable Light
   i. VFD Fault Light

C. ADDITIONAL OPTIONS REQUIRED

1. INPUT DISCONNECT: The Invertor shall be supplied with a door interlocked input disconnect motor circuit protector. The MCP shall allow trip adjustment sufficient to start the motor across the line in the bypass mode and normally be set at a minimum setting for maximum protection in the VFD mode.

2. BYPASS OPTION: The Invertor shall be supplied with a manual bypass contactor arrangement for transfer to the utility line to operate at constant speed. This option shall be pre-wired in the same enclosure, including contactors, motor overload VFD/Bypass selector switch and Bypass On light.

3. AUTO RESTART: The Invertor shall initiate an automatic time delayed restart after recovering from undervoltage or loss of power. The Invertor shall not automatically restart after overcurrent, overvoltage, overtemperature, or any other damaging conditions but shall require manual restart.

4. FREQUENCY JUMP: The drive shall be supplied with the capability of being field retrofitted with a frequency jump control to avoid operating at a point of resonance with the natural frequency of the machine.

5. RADIO INTERFERENCE FILTER; The drive shall be supplied with the capability of being field retrofitted with a radio interference filter to reduce radio interference noise.

D. MANUFACTURER QUALIFICATIONS

1. The drive manufacturer shall have a minimum of 5 years experience in producing Adjustable Frequency Motor Drives of the horsepower and voltage range required.

2. The drive supplier shall have a local authorized service center with spare parts stock. The Service Center shall be able to demonstrate capability of assuring quality service and repair with quick turn-around based on local parts stock and technical expertise.

3. The Supplier of the VFD equipment shall be an authorized local dealer or representative of the manufacturer located within 500 miles of the job.

4. Approved Manufacturer are Graham 2001, EMC/Mitsubishi FRF2 Series or prior approved equal.

2.12 SHOP DRAWINGS & SUBMITTALS

A. Provide shop drawings, wiring diagrams including wiring connections to individual pieces of equipment, control diagrams, detailed English language source code for DSC programs, graphic layouts on each device and control system in accordance with the provisions of Division 15000 "Mechanical Requirements".

PART 3 - SEQUENCE OF OPERATION

3.1 AHU-1

A. The AHU is programmed through the DDC controller to run continuously during the occupied cycle, and be off during the unoccupied cycle.

B. The outside air damper is positioned to admit 20% minimum fresh air when the fan is operating. A mixed air temperature sensor allows the DDC controller to modulate the mixing dampers to control the mixed air temperature at 55 deg. F. On fan shut down, the outside air damper closes.

C. The fan discharge temperature is controlled at 55 deg. F (adjustable). The discharge temperature is controlled by modulating the mixing dampers, a 3-way heating valve, or the ground water cooling valve. When the outside air can no longer control the discharge temperature, the ground water cooling system shall be activated, and the 3 way control valve shall modulate. All heating shall be provided at the VAV terminals or with fin tube.

D. The system static pressure is controlled through the DDC controller by a static pressure transmitter located just prior to the last box in the longest duct run. The DDC controller is programmed to control the static pressure at 1 in. w.g. by adjusting the supply fan speed

through a variable speed drive. A static pressure high limit in the supply plenum fan discharge prevents the static pressure from exceeding 3 in w.g.

E. On indication of smoke in the supply duct, or a fire alarm in the space served by this unit, the supply fan is stopped and the outside air damper and return air damper closes. They will act as smoke dampers. Other smoke dampers in the supply, return, and relief ducts shall close.

F. A manual reset freeze protection thermostat located downstream of the heating coil stops the fan, closes the outdoor air damper, and alarms at the DDC controller if any part of the 16 foot sensing element senses air below its setpoint of 40 deg. (adj).

G. Two relief dampers, one on each floor, shall modulate based on space static on that floor, (with outdoor air reference) and shall close when the AHU is off.

3.2 VAV BOXES WITH REHEAT COILS

A. A wall mounted sensor, with adjustment, allows the digital VAV controller to modulate the reheat coil valve, with the box damper at 50% minimum air flow to provide heating to the space and satisfy the space setpoint. As the space temperature rises, the coil valve is modulated closed, and the box damper modulates open beyond its minimum position. The VAV controller shall be accessed through the hand held device at the temperature sensor.

B. VAV Box Override

Classroom wing/ Textile Lab Wing/ Chem Lab Wing: The room temperature sensors shall be supplied with override pushbuttons. During unoccupied periods, pushing the override button shall allow the wing to be brought to occupied setpoints for up to 3 hours (adj). The AHU shall run continuously during this time. All other zones shall remain at unoccupied setpoints with the VAV boxes in a shutdown mode to air flow unless supplementary heat is required.

3.3 FUME HOOD/VAV BOX CONTROL

A. The fume hoods EH-1,2,3 are controlled by local on/off switches. When the hoods are off, the VAV boxes shall modulate as necessary to maintain room temperature setpoint. When the hood(s) are energized, VAV box 50 shall increase in air flow to offset the increased exhaust. The Chemistry lab shall be kept at a negative pressure relative to the remainder of the building at all times by introducing 10% less supply than exhaust.

3.5 BOILERS AND PRIMARY HEATING PUMPS

A. A factory boiler control panel shall be mounted, wiring, and calibrated by this contractor. Line voltage to the panel shall be provided under Division 16 "Electrical".

B. DDC control system shall interface with boilers and control panel to monitor any fault conditions and alarm them at the operator's workstation.

C. The pumps shall be programmed by the DDC control system to run continuously in a lead/lag/alternator manner. The lead pump shall run for 200 hours (adjustable) before alternating

with lag pump. On a loss of flow, the lag pump shall start immediately and an alarm shall be generated at the operator's workstation. Pumps shall be locked out when outside temperature exceeds 60°F.

D. See point list for required input and output points to the system.

3.6 GROUND WATER COOLING

A. The ground water cooling pump shall be programmed by the DDC system to run. When the outside air temperature is below 60 degrees, the ground water pumps shall be off. When AHU-1 calls for ground water cooling, the pump shall start. A control valve, mounted in the reinjection piping, shall modulate to maintain 10 psi upstream of the valve.

3.7 FINTUBE RADIATION

A. The fintube radiation valve shall modulate in sequence with the VAV box terminal heat valve serving that space.

3.8 CABINET/UNIT HEATERS

A. A return air electric thermostat opens the 2-way heating valve upon a call for heat. A strap-on aquastat located downstream of the heating valve cycles the unit fan when heat is sensed in the line downstream of the valve.

3.9 EXHAUST FAN CONTROLS

NOTE: The Electrical Contractor is responsible for the installation of the necessary controls for the exhaust systems described below.

A. RESTROOM (EXCEPT SHOP), JANITOR ROOM, & BREAKROOM EXHAUST

These fans shall be controlled in conjunction with the light switch.

B. FUME HOODS EF-3, EF-4, and EF-5

The exhaust fans serving these hoods shall be controlled by an on/off switch located on or near the hood.

C. EXHAUST FAN

For server room (Room 237), computer office/servers (Room 239), and elevator equipment room (Room 108), clean room (Room 114), and shop bathrooms to run continuously.

D. EXHAUST FAN

For electronic instrument room (Room 108), chain saw test area (Room T111), paint mix room (Room 127), sandblasting (Room 129), EF-8, and darkroom (Room 114) to be controlled independently.

E. SHOP EXHAUST FAN EF-9 AND INTAKE LOUVERS

The fan and louver are controlled by a local on/off switch. Upon actuation, the damper in the outside air louver shall open.

END OF SECTION

SECTION 15960 - INFRARED HEATING SYSTEMS

PART 1 - GENERAL

PART 2 - PRODUCTS

2.1 INFRARED EQUIPMENT (VENTED)

A. Heater Parameters/Specifications

1. Gas-fired vented infra-red space heaters shall be furnished and installed in accordance with governing codes and as shown per drawing(s).

2. Heaters shall be Design Certified by the American Gas Association (A.G.A.) and comply with current Occupational Safety and Health Act (OSHA) Requirements. The supplier shall provide A.G.A. certificate numbers and heaters shall bear the A.G.A. Seal of Certification.

3. The supplier shall provide a manufacturer's published warranty covering the heater's radiant tube element assembly for a period of three (3) years, and all components utilized in the heater's control assembly for a period of one (1) year.

4. Heaters shall operate satisfactorily in any position from horizontal to forty-five (45) degrees from horizontal.

5. Heaters shall be so designed to satisfactorily operate at a minimum inlet gas pressure of 7 inches W.C. to a maximum inlet gas pressure of 11 inches W.C.

6. Heaters shall be so designed to operate without any adjustments when burning natural gas having a heat value of 1000 BTU per cubic foot.

7. No condensation shall form from the products of combustion in the combustion chamber or heat exchanger while at operating temperature.

8. The Installation Operation and Maintenance Manual shall be provided with each unit.

B. Heater Control System

1. Heater shall be equipped with a direct silicon carbide glo-bar ignition control system. Power supplied to each heater shall be 120 VAC, 60 Hz, 1 0.

2. The heater's control system shall be designed to shut off the gas flow to the main burner in the event either a main gas supply line or power supply line interruption or failure occurs.

3. Control assembly shall be Certified by A.G.A., shall provide main burner regulations, and shall be of the redundant dual solenoid type.

4. Heater controls shall include two (2) different pressure switches; one to monitor exhaust back pressure and one to monitor air intake flow so as to provide complete unit shut off in the event of insufficient combustion air or flue blockage.

5. Pre-purge of tubes for 45 seconds prior to firing sequence.

C. Heater Construction

1. The material used in the heater's combustion chamber shall be 16 gauge titanium alloy aluminized steel, 4" O.D., and/or 16 gauge aluminized steel for 4" O.D. for models below 100,000 BTUH, coated with Pyromark series 1200 high temperature corrosion resistant black paint with an emissivity rating of .95.

2. The radiant tube emitter shall be 16 gauge aluminized steel, 4" O.D., coated with Pyromark series 1200 high temperature corrosion resistant black paint with an emissivity rating of .95.

3. The reflectors shall be .025 bright aluminum designed to provide uniform irradiance levels and be adjustable.

4. The fan blower motor shall be protected by a thermal overload switch.

5. The design of the heater shall be such that the components utilized in the heater's control assembly shall be interchangeable from one model to another and easily removed.

6. Heater shall be vented in accordance with manufacturer's recommendations and NFPA 74.1984 and provide for venting of products of combustion without the use of a draft hood.

7. Heater shall be equipped with a sight glass for visual inspection of silicon carbide ignitor operation and burner flame.

8. Vent caps shall be UL approved and A.G.A. Certified for use with heater. Breidert or Mastervent vent caps only for sidewall venting.

9. The heaters shall be designed such that, at customer option, outside combustion air may be supplied in accordance with the National Fuel Gas Code ANS Z223.1 latest edition, without the use of additional supply fans. Provide as shown on heating plan.

10. An air intake collar and termination fitting A.G.A. approved for use with the heater shall be provided where outside air intake for combustion is specified.

3.0 EXECUTION

3.1 INSTALLATION

A. Installation of equipment and material shall conform to the practices of good workmanship in accordance with applicable requirements. Combustion chambers, pipe work, gas lines and electrical conduit shall be attached to, or suspended from, the building structure in a manner suitable to meet standards of durability and safety.

B. Hanging of the system piping shall be supported in accordance with acceptable practices, local codes, and applicable standards, and pipe shall pitch down one-quarter (1/4) inch in twenty (20) feet toward the vacuum pump.

END OF SECTION

This page intentionally blank

SECTION 16000 - ELECTRICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 ELECTRICAL REQUIREMENTS

A. The electrical requirements are supplemental to the General and Supplementary Conditions and the General Requirements of these Specifications. The Electrical Sections shall apply to phases of the work specified, shown on the Drawings, or required to provide for the complete installation of Electrical Systems for this project.

B. The work shall include all items, articles, materials, operations and methods listed, mentioned or scheduled in these specifications and the accompanying drawings. All material, equipment and labor shall be furnished together with all incidental items required by good practice to provide the complete systems described.

C. Examine and refer to all Architectural, Structural, Utility, Landscape and Mechanical drawings and specifications for construction conditions which may affect the electrical work. Inspect the building site and existing facilities for verification of present conditions. Make proper provisions for these conditions in performance of the work and cost thereof.

D. See general requirements for listed Alternate Bids. Note alternates listed and include any changes in work and price required to meet the requirements of the respective alternate.

1.2 CODES AND STANDARDS

A. Work shall meet the requirements of the plans and specifications and shall not be less than the minimum requirements of applicable sections of the latest Codes and Standards of the following organizations:

American National Standards Institute (ANSI)
Americans with Disabilities Act (ADA)
Certified Ballast Manufacturers (CBM)
Electrical Testing Laboratories (ETL)
Independent Testing Laboratories (ITL)
National Electrical Code (NEC) Latest Edition
National Electrical Manufacturers Association (NEMA)
National Fire Protection Association (NFPA)
Occupational Safety & Health Act (OSHA)
Underwriters Laboratories (UL)
Uniform Building Code (UBC)
Rules and Regulations of the State Fire Marshal
Requirements of the Serving Utility Company
Local and State Codes and Ordinances

1.3 FEES AND PERMITS

A. The electrical contractor shall pay all fees and arrange for all permits required for work done under his contract and under his supervision by subcontract.

B. Cost of primary work noted to be by Utility Company not to be included in Contractor's Bid. All charges made by the Utility Company for their part of the primary work will be billed directly to the Owner and paid for by the Owner.

1.4 MATERIALS AND EQUIPMENT

A. Manufacturer's trade names and catalog numbers listed are intended to indicate the quality of equipment or materials desired. Submittals must indicate the specific item or items to be furnished in lieu of those specified, together with complete technical and comparative data on specified items and proposed items.

B. Electrical equipment may be installed with manufacturers standard finish and color except where specific color, finish or choice is indicated. If the manufacturer has no standard finish, equipment shall have a prime coat and two finish coats of gray enamel.

C. This contractor shall be responsible for materials and equipment installed under this contract. Contractor shall also be responsible for the protection of materials and equipment of others from damage as a result of his work.

D. Manufactured material and equipment applied, installed, connected, erected, used, cleaned and conditioned as directed by manufacturer unless herein specified to the contrary.

E. This contractor shall make the required arrangement with General Contractor for the introduction into the building of equipment too large to pass through finished openings.

F. Store materials and equipment indoors at the job site or, if this is not possible, store on raised platforms and protect from the weather by means of waterproof covers. Coverings shall permit circulation of air around the materials to prevent condensation of moisture. Screen or cap openings in equipment to prevent the entry of vermin.

G. Lighting fixtures proposed as substitutes to those specified must have prior approval by Contracting Officer as noted above. Approval will not be considered unless the request has all of the following information:

1. Manufacturers data showing catalog number.

2. Construction details.

3. Photometrics.

4. Recommended maintenance factor.

1.5 INTENT OF DRAWINGS

A. The drawings are partly diagrammatic and do not necessarily show exact location of conduit

unless specifically dimensioned. Riser and other diagrams are schematic and do not necessarily show the physical arrangement of the equipment. They shall not be used for obtaining quantities or lineal runs of conduit. Discrepancies shown on different plans, or between plans and actual field conditions shall be brought to the attention of the Contracting Officer for resolution.

1.6 RESPONSIBILITY

A. Be responsible for the installation of a satisfactory and complete system in accordance with the intent of the drawing and specifications. Provide, at no extra cost, all incidental items required for completion of the work even though they are not specifically mentioned or indicated on the drawings or in the specifications.

B. The drawings do not attempt to show complete details of the building construction which affect the electrical installation; and reference is therefore required to the Architectural, Structural, Landscape and Mechanical drawings and specifications and to shop drawings of all trades for additional details which affect the installation of the work covered under this Division of the Contract.

C. Location of electrical system components shall be checked for conflicts with openings, structural members and components of other systems having fixed locations.

D. Determine, and be responsible for, the proper location and character of inserts for hangers, chases, sleeves and other openings in the construction required for the work, and obtain this information well in advance of the construction progress so work will not be delayed. Roughing-in fixtures, etc., must be laid out accurately. Connections to equipment of the same class shall be equal heights, plumb, and at right angles to the wall, unless otherwise directed.

E. Final location of inserts, hangers, etc., required for each installation, must be coordinated with facilities required for other installations to prevent interference.

F. Take extreme caution not to install work that connects to equipment until such time as complete Shop Drawings of such equipment have been approved by the Contracting Officer. Any work installed by the Contractor, prior to approval of Shop Drawings, will be at the Contractor's risk.

G. At all times during the performance of this Contract, properly protect work from damage and protect the Owner's property from injury of loss. Make good any damage, injury or loss, except such as may be directly due to errors in the Bidding Documents or caused by Agents or Employees of the Owner. Adequately protect adjacent property as provided by law and the Bidding Documents. Provide and maintain passageways, guard fences, lights and other facilities for protection required by Public Authority or Local conditions.

H. Circuiting and switching shall be exactly as shown on drawings. Combining of home runs, except as shown, is not acceptable. Contractor shall refer to NEC Article 310.8 and adjust accordingly. Combining of wiring of various systems in conduit runs is not acceptable unless otherwise specified herein or noted on drawings.

1.7 INSPECTION

A. All work and material is subject to inspection at any time by the Contracting Officer or his representative. If the Contracting Officer or his representative finds material that does not conform with these specifications or that is not properly installed or finished, correct the deficiencies in a manner satisfactory to the Contracting Officer at no additional expense to the Owner.

1.8 WORKMANSHIP

A. GENERAL

1. Work under this contract shall be performed by workmen skilled in the particular trade including work necessary to properly complete the installation in a workmanlike manner to present a neat and finished appearance.

B. EXCAVATION AND BACKFILL

1. Provide all excavating and backfilling as required, with backfilling only after approval of the Contracting Officer. Backfill to be free of all debris and decayable matter. See Excavation and Backfill requirements in DIVISION 1 -- GENERAL REQUIREMENTS.

C. CUTTING, PATCHING AND FRAMING

1. Obtain Contracting Officer's approval before performing any cutting on structural members or patching of building surfaces. Any damage to the building or equipment by this Contractor shall be the responsibility of this Contractor and shall be repaired by skilled craftsmen of the trades involved at no additional expense to the Owner.

2. Chases, openings, sleeves, hangers, anchors, recesses, equipment pads, framing for equipment, provided by others only if so noted on the drawings. Otherwise, they will be provided by this contractor for his work. Whether chases, etc., are provided by this contractor or others, this contractor is responsible for correct size and locations.

1.9 COORDINATION

A. This contractor shall plan his work to proceed with a minimum interference with other trades and it shall be his responsibility to inform the General Contractor of all openings required in the building structure for installation of work, and to provide sleeves as required. Dimensions of equipment installed and/or provided by others shall be checked in order that correct clearances and connections may be made.

1.10 CLEAN UP

A. Keep the premises free from accumulation of waste material or rubbish caused by his work or employees.

B. Upon completion of work, remove materials, scraps and debris relative to his work and leave the premises, including tunnels, crawl spaces, and pipe chases in clean and orderly condition.

Remove all dirt and debris from the interior and exterior of all devices and equipment. After construction is completed, wash all light fixtures and lamps, remove all labels from fixture lenses.

1.11 DUST PROTECTION

A. Contractor will provide suitable dust protection for all existing areas prior to beginning of cutting or demolition. Contractor will obtain approval of partition from Owner before proceeding with work involved in these rooms.

1.12 TEMPORARY FACILITIES

A. OFFICES

1. Contractor shall provide temporary offices for himself including lights, heat and telephone, if required.

B. REMOVAL

1. Contractor shall completely remove his temporary installations when no longer needed and the premises shall be completely clean, disinfected, patched, and refinished to match adjacent areas.

C. LADDERS AND SCAFFOLDS

1. The contractor shall provide their own ladders, scaffolds, etc. of substantial construction for access to their work in various portions of the building as may be required. When no longer needed, they shall be removed by the contractor.

D. PROTECTION DEVICES

1. The contractor shall provide and maintain his own necessary barricades, fences, signal lights, etc. required by all governing authorities or shown on the drawings. When no longer needed, they shall be removed by the contractor. The contractor shall assume all responsibility for which the owner may be held responsible because of lack of above items.

E. TEMPORARY WATER

1. The contractor shall provide all water required by his trade for construction. Temporary drinking water shall be provided by contractor from a proven safe source dispensed by single service containers, until such time as the construction water outlet has been install, disinfected and approved for drinking purposes.

F. TEMPORARY FIRE PROTECTION

1. The contractor shall provide all necessary first-aid hand fire extinguishers for Class A, B, C and special hazards as may exist in his own work area only in accordance with good and safe practice and as required by jurisdictional safety authority. The contractor shall provide general area fire extinguishers only.

1.13 TEMPORARY ELECTRICAL FACILITIES

A. DESCRIPTION OF SYSTEM

1. Service required- The contractor shall provide and connect six (6) movable temporary panels to the temporary distribution board. The temporary panels shall be located as directed by the Contracting Officer. Each panel shall have provisions for 100A, 3 phase, 4 wire service at voltage available.

2. Provide temporary electric power for items listed, throughout the construction period, so that power can be secured at any desired point from temporary service panel within building proper.

   a. Power centers for miscellaneous tools and equipment used in the construction period, so that power can be secured at any desired point from temporary service panel within building proper.

   b. Lighting for safe and adequate working conditions throughout the buildings, stairways, and crawl spaces. Provide at least 1/2 watt of incandescent lighting per square foot of floor area. Maintain a socket voltage of at least 110 volts. Use a minimum of 100 watt bulbs.

   c. Power for construction site offices and for other temporary storage and construction buildings.

   d. Power to maintain continuous construction during changeover of electrical equipment.

   e. Power for testing and checking equipment.

B. CAPACITY

1. Provide and maintain adequate electrical power for construction use by all trades during the construction period at the locations necessary.

2. Notify the Serving Utility Company when unusually heavy loads will be connected.

C. POWER COSTS

1. The contractor shall pay all cost of setting and removing temporary service.

D. USE OF PERMANENT SYSTEM

1. Regulate any part of the permanent electrical system which is used for construction purposes to prevent interference with safety and orderly progress of the work.

2. Leave permanent electrical services in a condition as good as new.

3. The permanent heating system is to be connected to the permanent power supply as soon as possible to provide heat to complete construction at no additional cost to Owner or Contracting Officer.

1.14 SHOP DRAWINGS

A. Provide eight (8) copies of manufacturer's literature and/or certified prints as soon as possible but within thirty (30) days after awarding of Contract, for items of materials, equipment, or systems where called for in specifications. Shop drawings and literature complete showing item used, size, dimensions, capacity, rough-in, etc., as required for complete check and installation. Manufacturers literature showing more than one item shall be clearly marked as to which item is being furnished or it will be rejected and returned without review.

B. Each copy of each item submitted must be clearly marked as follows for purposes of identification and record. Submittals not marked as described below will be rejected and returned without review.

Date:
Name of Project:
Branch of Work:
Submitted by:
Specification or Plan Reference:

C. Prior to their submission, each submittal shall be thoroughly checked by the contractor for compliance with the Contract Document requirements, accuracy of dimensions, relationship to the work of other trades, and conformance with sound, safe practices as to erection and installation. Each submittal shall then bear a stamp evidencing such checking and shall show corrections made, if any. Submittals requiring extensive corrections shall be revised before submission. Each submittal not stamped and signed by the contractor evidencing such checking will be rejected and returned without review.

D. All submittals will be examined when submitted in proper form for compliance. Such review shall not relieve the contractor of responsibility for errors, for deviation from the contract Documents, nor for violation of sound safety practices.

E. The contractor shall keep in the field office one print of each submittal which has been reviewed and stamped by the Architect or Engineer.

F. Submittals will be required for each item of material and equipment furnished as noted in specifications.

G. Submittals which are incomplete relative to quality requirements, capacity, engineering data, dimensional data or detailed list of specialty or control equipment will be rejected. Lists shall include descriptive coding as specified or shown on drawings.

H. Schedule of Shop Drawings.

ITEM	MFG LIT	SHOP DWG	WIRING DIAG.	O&M BOOK
RACEWAYS AND FITTINGS	X			
SURFACE RACEWAYS	X			
WIRE AND CABLE	X			
OUTLET BOXES	X			
FLOOR BOXES	X			
WIRING DEVICES	X			
SUPPORTING DEVICES	X			
UNDERGROUND ELEC. SERV	X			
FUSES	X			
DISCONNECT SWITCHES	X			
SECONDARY GROUNDING	X			
TRANSFORMERS	X			
PANELBOARDS	X	X		
CONTACTORS	X			
LIGHTING FIXTURES	X			
EMERG. LIGHTING EQUIP.	X	X	X	X
LIGHTNING PROT. SYSTEM	X	X		
FIRE ALARM & SMOKE DET. SYSTEMS	X	X	X	X
TELEPHONE SYSTEM	X	X	X	X

1.15 OPERATION AND MAINTENANCE MANUALS

A. At the time orders are placed for any item of equipment requiring service or operating maintenance, the contractor shall request the manufacturer furnish three (3) copies of OPERATION AND MAINTENANCE INSTRUCTIONS for each piece of equipment. These shall be included in the brochure of equipment.

1.16 BROCHURE OF EQUIPMENT

A. Upon completion of work, prepare a "Brochure of Equipment" containing data pertinent to equipment and systems on job. Binders containing materials shall be one or more three ring binders of sufficient number to hold all literature. Contained in binders shall be: Installation, maintenance, and operating instructions for each piece of equipment; parts lists; wiring diagrams; one copy of each shop drawing and literature submittal; record drawings, etc.

B. All literature shall be clean, unused and filed under divider headings corresponding to the specifications.

C. These brochures shall be submitted to the Contracting Officer and approved by him before authorization of final payment.

1.17 "AS-BUILT" DRAWINGS

A. The contractor shall furnish to the Owner and Contracting Officer a red line marked print set of drawings, each sheet stamped as the "As-Built" drawing and bearing the contractor's name, date and signature. The As-Built drawing shall show the location of all concealed or underground conduit runs and other equipment, devices, outlets, etc., installed other than as shown on the drawings. Dimension underground lines from established building lines. As-Built drawings to be developed from a job site record drawing set and shall be clean, neat and all changes legible and shown in the same format and symbols used on the contract drawings. The As-Built drawing set shall be submitted to the Contracting Officer for approval, and any deficiencies noted by the Contracting Officer corrected and resubmitted until approved by the Contracting Officer at no cost to Contracting Officer or owner.

1.18 PLACING SYSTEMS IN OPERATION

A. At the completion of the work and at such time as the Owner shall direct, prior to final acceptance, the contractor performing this work shall put into satisfactory operation the various systems installed under the specifications. At no additional cost to the Owner, furnish the services of a person completely familiar with the installations performed under this specification, to instruct the Owners operating personnel in the proper operation and servicing of the equipment and systems. These services shall be available for a period of no less than one (1) day.

1.19 GUARANTY-WARRANTY

A. This contractor shall and hereby does warrant and guarantee that all work executed under this Division will be free from defects of materials and workmanship for a period of one year from the date of final acceptance of this work and that he will, at his own expense, repair and/or replace all such defective materials and work and all other work damaged thereby which becomes defective during the term of warranty, except that lamps and tubes shall be his responsibility only for normal lamp life or one year, whichever occurs first.

END OF SECTION

SECTION 16030 - ELECTRICAL SYSTEMS SCHEDULE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. The contractor shall furnished all labor and materials to complete all electrical work as shown on the drawings, herein specified, or both but not limited to the following:

A complete light and power system
Raceways and Fittings
Boxes
Wire and Cable
Supporting Devices
Electric Service
Disconnect Switches
Panelboards
Secondary Grounding
Wiring Devices
Lighting Fixtures
Transformers
Lightning Protection System
Fire Alarm and Smoke Detection System
Telephone System (Conduit System Only)

1.2 WORK EXCLUDED

A. Public telephone system except backboards, conduit, junction boxes, boxes and cover plates.

B. Security system except conduit, junction boxes, boxes and cover plates.

C. Broadband system except backboards, conduit, junction boxes, boxes and coverplates.

1.3 MATERIALS CONNECTED BUT FURNISHED AND INSTALLED BY OTHERS

A. Electric motors and mechanical equipment.
Heating and ventilating (HVAC) controls.
Kitchen Equipment.
Laboratory Equipment.

1.4 MATERIALS INSTALLED AND CONNECTED BUT FURNISHED BY OTHERS

A. Electric Thermostats.

B. Refer to Mechanical Drawings and Specifications for all requirements for temperature and humidity control.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 WORKMANSHIP

A. Install work using procedures defined in NECA Standard of Installation.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 16035 - RFI/EMI SHIELDING ENCLOSURE

PART 1 - WORK INCLUDED

A. Provide and install a modular shielded enclosure conforming to the contract documents and specification guidelines. The enclosure will be a standard size available from the manufacturer, approximately 8'x8'x8' and will have a manually operated RFI door supplied with enclosure package. The enclosure will be of a type that can be assembled by non-specialized persons.

B. Electrical penetrations will require dielectric isolation from the enclosure. Electric feed-throughs will be purchased as part of the enclosure.

C. Duct penetrations of the enclosure will require dielectric isolation from the enclosure and the installation of a Honeycomb type air vent waveguide. Dielectric isolation may be provided by a rubber boot or similar insulating connection. Honeycomb air vents will be purchased as part of the enclosure package.

PART 2 - PERFORMANCE

A. Enclosure must meet the following attenuation requirements:

1. Magnetic fields - 60dB at 10kHz increasing to 100dB at 500kHz.
2. Electric Fields – 100 dB at 10kHz to 50 MHZ.
3. Plane Waves – 100dB at 50MHz to 10 GHz.

PART 3 - PRODUCTS

A. Lindgren RF Enclosures, Inc. - DEI Series.

B. Shielding Resource Group, Inc. – MPCG Series.

C. Any approved equal.

PART 4 - TESTING

A. Testing will be at owner's request. Results will be sent to Contracting Officer.

END OF SECTION

This page intentionally blank

SECTION 16050 - EMI/RFI SHIELDING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. This project includes areas that require shielding from radio frequency interference (RFI) and electromagnetic interference (EMI). The general contractor shall make provisions to supply and install all components for this purpose.

B. All shielded areas indicated on the contract drawings shall be totally enclosed within a shielding medium. This includes all walls, floors, and ceilings, excluding windows and doors.

C. The shielding medium will be held in place and protected from exposure by installing it between two layers of surface material (e.g. plywood, gypsum wallboard, etc.). Refer to architectural wall, ceiling, and floor types.

1.2 PERFORMANCE

A. Target effectiveness for shielding to be 40-60 dB from 10kHz to 10 GHz.

PART 2 - PRODUCTS

A. 3 oz. Copper foil.

B. Flectron 40 metalized nonwoven fabric.

PART 3 - EXECUTION

A. All seams in the shielding medium will be have a min. 2” overlap. Seams will be secured by 2 oz. copper adhesive tape if copper foil is used as shielding material. No adhesive will be used on seams if Flectron material is used.

B. Grounding will be accomplished by soldering a #6 braided copper conductor to a 12” X 12” copper plate which will be attached to shielding medium at a location as close as possible to the panel supplying power to the shielded area. The plate will be soldered in place if copper foil is used and will be mechanically attached for Flectron. The grounding conductor will be connected to the panel’s grounding lug.

3.1 OPENINGS

A. Shielding material will be exposed at all window and door openings. A 2” reveal will be left by wrapping the material around the surface finish and will be trimmed after door or window installation.

B. A window screen with solid metal frame and a 22 x 22 x .015 copper screen will be required

for each window. The screen will be sized to attach to the reveal of the shielding material. Screen frame must have bare metal exposed where it makes contact with shielding.

C. All doors to shielded area will be steel with steel frame. Door frame must have bare metal exposed where it makes contact with shielding material.

PART 4 - TESTING

A. Testing will be at owner's request. Results will be sent to Contracting Officer.

END OF SECTION

SECTION 16110 - RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Rigid metal conduit and fittings.

B. Intermediate metal conduit and fittings.

C. Electrical Metallic tubing and fittings.

D. Flexible metal conduit and fittings.

E. Liquid tight flexible conduit and fittings.

F. Nonmetallic conduit and fittings.

G. Metal wire ways.

1.2 RELATED WORK

Outlet Boxes	Section 16130
Supporting Devices	Section 16190
Secondary Grounding	Section 16450
Telephone System	Section 16740

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. National Electrical Code (NEC). Raceways shall be approved for the intended application, and shall meet the requirements of the NEC.

1.4 REFERENCES

A. ANSI C80.1 - Rigid Steel Conduit. Zinc coated.

B. ANSI C80.3 - Electrical Metallic Tubing. Zinc coated.

C. ANSI/NEMA FB 1 - Fittings and supports for Conduit and Cable Assemblies.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT AND FITTINGS

A. Rigid Steel Conduit: ANSI C80.1.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1: Threaded type, material to match conduit. Per NEC Article 346.

2.2 INTERMEDIATE METAL CONDUIT (IMC) AND FITTINGS

A. Conduit: Galvanized steel.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1: use fittings and conduit bodies specified above for rigid steel conduit. Per NEC Article 345.

2.3 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS

A. EMT: ANSI C80.3 galvanized tubing.

B. For embedded in concrete and in wet or damp areas:

Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel compression. Rain tight and concrete tight. Per NEC Article 348.

C. For exposed use, dry areas:

Steel connectors with set screws (not die-cast).

2.4 FLEXIBLE METAL CONDUIT AND FITTINGS

A. Conduit: steel

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1. Per NEC Article 350.

C. Internal ground conductor required in all flexible conduit.

2.5 LIQUID TIGHT FLEXIBLE CONDUIT AND FITTINGS

A. Conduit: Flexible metal conduit with PVC jacket.

B. Fittings and Conduit Bodies: ANSI/NEMA FB 1. Per NEC Article 351.

C. Internal ground conductor required in all flexible conduit.

2.6 PLASTIC (PVC) CONDUIT AND FITTINGS

A. Conduit: NEMA TC 2; Schedule 40 and 80 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3. Per NEC Article 347.

C. Internal ground conductor required in PVC conduit.

2.7 CONDUIT SUPPORTS

A. Conduit clamps, straps and supports: Steel or malleable iron.

2.8 WIRE WAYS

A. Sheet metal troughs with hinged or removable covers for full channel access, UL listed for exposed work. All parts shall be coated with a rust inhibitor and finished with a baked enamel.

B. Wire ways for outdoor use shall be of rain tight construction.

C. Close dead ends of wire ways.

D. Wire ways shall have provisions for extensions of circular conduits.

2.9 ACCEPTABLE MANUFACTURERS

A.1 Jones and Laughlin
A.2 National
A.3 Republic Steel
A.4 Youngstown
A.5 Carlon
A.6 Barrett

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT AND SUPPORT

A. Arrange conduit to maintain head room and present a neat appearance.

B. Route exposed conduit parallel and perpendicular to walls and adjacent piping.

C. Maintain minimum 6 inch clearance between conduit and piping. Maintain 12 inch clearance between conduit and heat sources such as flues, steam pipes and heating appliances.

D. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay in adjustable hangers, clevis hangers or bolted split stamped galvanized hangers.

E. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps. Provide space for 25 percent additional conduit.

F. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction before conductors are pulled.

G. Support conduit and wire ways in accordance with NEC.

H. All conduit to be metallic unless otherwise noted.

3.2 CONDUIT AND WIRE WAYS INSTALLATION

A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.

B. Bring conduit to the shoulder of fittings and couplings and fasten securely.

C. Use conduit hubs or sealing locknuts for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp or wet locations.

D. Install no more than the equivalent of three 90 degree bends between boxes.

E. Use conduit bodies to make sharp changes in direction, as around beams.

F. Use hydraulic one shot conduit bender or factory elbows for bends in conduit larger than 1 1/4 inches in size. Heating of conduit to facilitate bending is prohibited.

G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.

H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

I. Provide suitable pull string in all empty conduit except sleeves and nipples.

J. Install expansion joints where conduit crosses building expansion or seismic joints.

K. Route conduit through roof openings for piping and ductwork where possible; otherwise route through roof jack with pitch pocket.

L. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

M. No conduit, including rigid, may be run under floor slabs resting directly on soil. All conduit in slabs shall be encased with 2 inches minimum thickness of concrete.

N. Number of conductors per conduit or wire way shall conform to the latest National Electric Code (NEC) requirements.

O. All metal conduit installed underground shall be covered as indicated but in no case less than 18 inches minimum below grade. PVC conduit shall be minimum 36 inches below grade except under vehicular traffic which shall be minimum 48 inches below grade.

P. Sleeves for conduits passing through walls or floors shall be of such size and in such a location so as not to impair the strength of the construction. Sleeves shall be of a maximum diameter of 4 inches, minimum spacing of three diameters or unless approved in writing by the Architect/Engineer. No reinforcing bars shall be displaced or cut.

Q. Install flexible and liquid tight flexible conduit for motors, transformers and mechanical equipment where subject to movement and vibration. Curve to a minimum 90 degrees to

minimize sound transmission.

R. Fire Seal Fittings, for installation where conduit penetrate fire-rated walls, floors, etc., as required by NEC Article 300-21. Fire seal shall be equal to International Protective Coating Corp. #FSC or #FS series or Chase Technology Corp. #PR-855 Fire Stop.

END OF SECTION

This page intentionally blank

SECTION 16112 - SURFACE RACEWAYS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Surface Metal Raceways

B. Multi-Outlet Assemblies

1.2 RELATED WORK

A. Wiring Devices Section 16140

1.3 REFERENCES

A. FS W-C-582 - Conduit, Raceway, Metal and Fittings; Surface.

1.4 SHOP DRAWING SUBMITTALS

A. Submit product data as required.

B. Include product data for surface metal raceways, multi-outlet assemblies, auxiliary gutters and accessories.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 Wiremold - 4000 Metal Raceway

2.2 TYPE

A. Surface, baseboard or multi-outlet type. Raceway, elbows, fittings and outlets shall be of the same manufacture and designed for use together, of size and color as noted on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION - SURFACE METAL RACEWAY AND MULTI-OUTLET ASSEMBLY

A. Use flat-head screws to fasten channel to surfaces. Mount plumb and level.

B. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.

C. Maintain grounding continuity between raceway components to provide a continuous grounding path.

D. Fastener Option: Use clips and straps suitable for the purpose.

END OF SECTION

SECTION 16120 - WIRE AND CABLE

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Building wire.

B. Cable.

C. Wiring connections and terminations.

1.2 RELATED WORK

Raceways and Fittings	Section 16110
Secondary Grounding	Section 16450
Fire Alarm and Smoke Detection System	Section 16721
Telephone System (conduit only)	Section 16740

1.3 WORK BY OTHERS

A. Primary power cable for primary feeders over 600 volts shall be furnished, installed and connected by the serving Utility Company.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. National Electrical Code (NEC). Wiring methods, conductor applications and insulations shall meet the requirements of the NEC.

B. Standards. Conductors shall conform to IPCEA and NEMA specifications for manufacturing, cable identification and testing and shall be listed and labeled by the Underwriters Laboratories, Inc.

1.5 REFERENCES

A. NEMA WC 3 - Rubber-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

B. NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

1.6 SHOP DRAWING SUBMITTAL

A. Submit product data as required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 AIWC
A.2 Carol
A.3 Royal
A.4 Southwire
A.5 Triangle

2.2 CONDUCTOR MATERIAL, SIZES AND INSULATION

A. Conductor material shall be copper. Aluminum conductors will not be permitted.

B. Minimum conductor size shall be No. 12 AWG or larger, unless otherwise specified herein and permitted in NEC Article 310-5. Signal and pilot control circuits may be No. 14 AWG minimum.

C. Stranded conductors. Conductors No. 8 AWG and larger shall be stranded.

D. Insulation. Rate insulated conductors for 600 volts for electrical systems up to 600 volts, unless otherwise specified. Color code insulation as hereinafter specified.

2.3 BUILDING WIRE AND CABLE 600 VOLTS, NOMINAL OR LESS

A. Secondary feeders shall be installed in conduit.

B. Secondary feeders and subfeeders shall be Type RHW, RUW, THW, THWN, OR XHHW rated 75C.

C. Power branch circuits shall be sized as shown on the drawings, and shall be of the following types:

RHW,RUW	Dry and wet locations
THW, THWN, XHHW	Dry and wet locations
RH, RHH, RUH	Dry locations
THHN	Dry locations

D. Lighting and receptacle circuits shall be of the following types:

THW, THWN, XHHW	Dry and wet locations
THHN	Dry locations and where run through lighting fixtures.
TW	Dry and wet locations, No. 10 AWG and smaller.

E. Electric heating circuits shall be sized as shown on the drawings, and shall be of the following types:

THW, THWN, XHHW	Dry and wet locations
THHN	Dry locations
THHN or XHHW 90C	Through electric heating wireway

F. Pull cord shall be Jet Line Polyolefin #232 or equal in all empty conduits, including power, telephone and special systems.

G. Conductor ampacities: Conductors of No. 14 to No. 1 AWG, the conductors must be applied at their 60 degree C ampacities, and for conductors No. 1/0 AWG and larger, the conductors must be applied to their 75 degree C ampacities, unless both the equipment, panelboard and enclosures are marked otherwise.

2.4 WIRE CONNECTORS

A. Hand-applied wire connectors for circuit and fixture conductors from No. 8 AWG through No. 14 AWG shall be UL listed for AL/CU, AL/AL and CU/CU, 600 volt insulated, pressure type, 105C, and shall have an integral self-locking spring grip.

B. Pressure connectors and splices for No. 8 AWG through No. 500 MCM shall be mechanical screw or compression type as follows:

1. Use mechanical connectors for copper conductors only. Connectors shall be copper or bronze bodied, and shall be UL listed configurations for taps, tees or crossover-tees-parallel tap.

2.5 TERMINALS AND SPLICES

A. Small terminals (wire size No. 22 to 10). Connectors and splices for miscellaneous terminal block connections shall be Thomas and Betts (or approved equal) STA-KON LOCKING FORK TERMINAL, insulated brazed seam sleeve type, of the proper size to accommodate the conductor.

B. Ground connections for No. 1/0 AWG and larger shall be Cadweld or Burndy THERMOWELD, fusible-metal process, or Thomas and Betts COPPERWELD connectors, SERIES 53000 or approved equal.

2.6 MISCELLANEOUS WIRING MATERIAL

A. Miscellaneous connecting and splicing devices. Miscellaneous products, such as heat shrink tubing, electrical insulation, plug caps, splices and kits, tapes, terminal blocks, and terminations, shall be approved for the specific application.

B. Joint compounds shall be approved for the specific type metal joint to be prepared.

C. Wire pulling lubricants shall be neutral and be equal to Ideal YELLOW or Dow Corning COMPOUND #4. No pulling compound will be allowed on secondary side of isolated systems.

D. Cable ties, clamps and identification shall be nylon, self-locking.

E. Underground tape warning system shall be yellow, color coded, polyethylene tape reading "CAUTION - ELECTRIC LINES BELOW".

PART 3 - EXECUTION

3.1 WIRING METHODS

A. Install conductors in conduit unless noted otherwise.

B. Provide No. 10 AWG minimum wire size from panelboard to first lighting fixtures and first receptacle for runs of 50 feet or more.

3.2 INSTALLATION

A. Install conductors to conform to the applicable requirements of NEC Article 300, Wiring Methods.

B. Run feeder cables continuous from origin to termination without splices. Unless otherwise noted, each conduit raceway shall contain only those conductors constituting a single feeder circuit.

C. Join both ends of paralleled conductors electrically to form a single conductor. Parallel conductors shall meet the requirements of NEC Article 310-4. All conductor lengths for parallel circuits shall be equal.

D. Three phase wiring. Install one common neutral with each three A, B, C phase conductor and a maximum of three circuits per conduit home run, except where otherwise shown on the drawings. Derating factors for additional number of conductors in conduits shall be applied per NEC Table 310, Note No. 8.

E. Install separate neutral conductor for all single phase circuits, i.e., no common neutrals.

F. Install separate grounding conductor in all conduit, i.e., do not rely on conduit for ground.

G. Emergency circuit wiring shall comply with NEC Article 700.

H. Install cable in a neat and substantial manner with necessary hangers, racks, cable cleats and supports.

I. Cable terminals, taps and splices.

1. Pressure-type solderless connectors shall be used, unless otherwise noted or specified.

2. Install compression-type connectors with approved hydraulic tools to assure a permanent, mechanically secure, high-conductivity joint.

3. Soldered joints, where noted or specified, shall be made to mechanically strong cable joints. Apply solder carefully without the use of acid. Wrap soldered connections with insulating plastic tape in a manner approved for circuit voltage.

4. Make splices, taps and terminations to carry full ampacity of conductors without

perceptible temperature rise.

5. Terminate spare conductors with electrical tape.

J. Bury underground tape warning system one foot below the surface before final backfilling of trenches.

K. Identification

1. Identify feeder and branch circuit conductors by the following color coded system:

Phase	120/208 Volts	277/480 Volts
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
Neutral	White	Gray
Equipment Ground	Green	Green Stripe

2. Exit light circuits shall be Yellow phase conductor, White neutral conductor.

3. All wiring for control systems to be installed in conjunction with mechanical and/or miscellaneous equipment shall be color coded in accordance with the wiring diagrams furnished with the equipment.

L. Splice only in accessible junction boxes.

3.3 FIELD QUALITY CONTROL

A. Inspect wire and cable for physical damage and proper connection.

B. Torque test conductor connections and terminations to manufacturers recommended values.

C. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

END OF SECTION

This page intentionally blank

SECTION 16130 - OUTLET BOXES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Wall and ceiling outlet boxes.

B. Pull and junction boxes.

1.2 RELATED WORK

Raceway and Fittings	Section 16110
Wiring Devices	Section 16140
Supporting Devices	Section 16190

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Outlet boxes shall be UL listed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 Appleton
A.2 Bowers
A.3 Steel City
A.4 Raco

2.2 OUTLET BOXES

A. Location. All boxes placed with edge of box flush with finished surface in concealed locations, including masonry walls.

B. Symbols, unless dimensioned, show approximate locations only and care shall be used to locate all fixture outlets in center of spaces and bays and all switches on lock side of door.

C. Unless exact locations are shown in detail on drawings consult Contracting Officer concerning locations before installing boxes.

D. Shall be of hot-dipped galvanized steel except gasketed cast metal with threaded hubs for outdoors or in damp locations.

2.3 TYPE

A. Standard with knockouts of minimum size as follows:

Fixture Outlets	2-1/8" x 4" octagonal
Convenience Outlets	2-1/8" x 4" square
Switch Boxes	2-1/8" x 4" square
Junction Boxes	2-1/8" x 4" square
Thermostats	2-1/8" x 4" square

B. Junction box of same material as outlet box. All fittings and accessories for boxes made by the box manufacturer and provided as required. No through the wall boxes will be allowed.

PART 3 - EXECUTION

3.1 COORDINATION OF BOX LOCATIONS

A. Provide electrical boxes as shown on drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

B. Electrical box locations shown on contract drawings are approximate unless dimensioned. Verify location of floor boxes and outlets in offices and work areas prior to rough-in.

C. Locate and install boxes to allow access, maintain headroom and to present a neat appearance.

D. Do not install boxes back to back in walls. Provide minimum 6 inch separation in non-rated walls. Provide minimum 24 inch horizontal separation in fire rated walls.

3.2 OUTLET BOX INSTALLATION

A. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.

B. Provide knockout closures for unused openings.

C. Support boxes independently of conduit.

D. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.

E. Install boxes in walls without damaging wall insulation.

F. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

G. Install extension rings where required.

H. Provide cast and gasketed outlet boxes in exterior locations exposed to the weather and wet locations. Receptacle shall be installed with a hinged cover/enclosure clearly marked "**Suitable For Wet Locations While In Use**" and "**UL Listed**". There must be a gasket between the

enclosure and the mounting surface, and between the hinged cover and mounting plate/base to assure proper seal. TayMac; Specification Grade or engineer approved equal.

3.3 PULL AND JUNCTION BOX INSTALLATION

A. Locate pull boxes and junction boxes above accessible ceilings or in unfinished areas.

B. Support pull and junction boxes independent of conduit.

END OF SECTION

This page intentionally blank

SECTION 16132 - FLOOR BOXES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Floor box - Power

B. Floor box - Communication

C. Floor box - Computer Data

1.2 RELATED WORK

Raceways and Fittings	Section 16110
Wiring Devices	Section 16140
Supporting Devices	Section 16190
Telephone System	Section 16740

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Floor boxes shall be UL listed.

1.4 SHOP DRAWING SUBMITTALS

A. Submit shop drawings and product data as required.

B. Include manufacturers literature depicting dimensions and mounting methods.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 Hubbell
A.2 Square D
A.3 Raceway Components, Inc.

2.2 TYPE

A. Floor boxes and fittings shall be as follows:

Box - Ground Floor	Hubbell No. B-2536
Upper Floors	Hubbell No. B-2537
Power Fittings	Hubbell No. S-3925
Telephone/Computer Fittings	Hubbell No. S-2525

PART 3 - EXECUTION

3.1 FLOOR BOXES

A. Install floor boxes as shown on drawings. Floor boxes shall be flush with finish floor.

B. Install carpet flanges on floor boxes installed in carpeted areas.

END OF SECTION

SECTION 16140 - WIRING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Wall Switches.

B. Receptacles.

C. Device Plates and Box Covers.

D. Hand Dryers.

E. Incandescent Dimmers.

1.2 RELATED WORK

Wire and Cable	Section 16120
Outlet Boxes	Section 16130
Floor Boxes	Section 16132
Lighting	Section 16500

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. All devices shall be UL listed.

1.4 SHOP DRAWING SUBMITTALS

A. Submit product data as required.

B. Provide product data showing configurations, finishes, dimensions, and manufacturers instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 Hubbell
A.2 Leviton
A.3 Bryant
A.4 General Electric
A.5 Prescolite
A.6 Appleton
A.7 Edwards

2.2 WALL SWITCHES

A. Quiet type, 20 ampere, 277 volt, clamp type, screw terminal, side or backwired, specification grade. Standard color of White only will be selected by the Contracting Officer.

Single Pole, 20 ampere	Hubbell No. 1221
Double Pole, 20 ampere	Hubbell No. 1222
Three-way, 20 ampere	Hubbell No. 1223
Four-way, 20 ampere	Hubbell No. 1224
SPST, 20 ampere, 120V 120V, w/ pilot light	Hubbell No. 1221PL

2.3 RECEPTACLES

A. Convenience, side-wired with screws, backwired with clamps, high impact nylon face, heavy duty specification grade meeting NEMA performance test (WDI-4.02). Standard color of white only will be selected by the Contracting Officer.

Duplex, 20 ampere, 125V (NEMA 5-20)	Hubbell NO. 5362
Dryer, 30 ampere (NEMA 14-30)	Hubbell No. 9430
Duplex, ground fault interrupter, 20 ampere, 125V (NEMA 5-20)	Hubbell GF 5362 Series
Isolated Ground Receptacle, 20 ampere, 125V (NEMA 5-20)	Hubbell No IG5362

REFER TO THE DRAWINGS FOR OTHER OUTLETS REQUIRED FOR THIS PROJECT.

2.4 ACCEPTABLE MANUFACTURERS - DEVICE PLATES AND BOX COVERS

A.1 Hubbell
A.2 Sierra
A.3 Steel City
A.4 Leviton

2.5 DEVICE PLATES AND BOX COVERS

Smooth High-Impact nylon (color selected by Architect)	Hubbell P-Series
Switch Plate, 4" square Steel, single switch	Hubbell 800
Recept Plate, brushed finish stainless steel	Hubbell No. S-8
Recept Plate, 4" square Steel, one duplex receptacle	Hubbell 902
Recept Plate, weatherproof	Hubbell No. 5205
Telephone Plate, brushed finish stainless steel	Hubbell No. S-12

Television Plate, brushed finish stainless steel	Hubbell No. S-8

A. Note special plates specified herein or on the drawing. Substitute materials must have sample submitted for approval.

B. Device plates for thirty ampere and larger outlets shall be No. 302 /No. 430 stainless steel and suitable for the wiring device used.

2.6 HAND DRYER

A. Product of Excel or approved equal.

1. Reinforced die-cast cover protecting mechanism with 1/8 HP motor, dustproof, completely-sealed timer and 1700 watt heating element. White finish, surface mounted:

MODEL NO. DW-120V

2.7 DIMMERS

A. Dimmers shall be as follows:

1. Incandescent: Leviton High Watt series Architectural slide electronic dimmers with RFI filter. Derate by 25%, i.e., 750 watt maximum connected to a 1000 watt dimmer. Color: Ivory.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Furnish and install wiring devices as shown on the contract drawings and as specified herein.

B. Install wiring devices plumb with walls so that device plates are tight to finish surfaces.

C. Device plates in finished areas and on painted walls shall be /satin finish stainless steel, P-Line smooth high impact nylon.

D. Device plates in mechanical and electrical rooms, mounted on exposed boxes shall be galvanized steel.

E. Mount wiring devices at heights above finished floor as noted below or as shown on the contract drawings:

Convenience Receptacles	15 inches to center
Convenience Receptacles above counters	48 inches to center (field verify height of backsplash.)

Switches/Dimmers	42 inches to center
Telephone/Data/Broadband (wall mounted)	15 inches to center
Telephone (wall mounted or pay phone)	48 inches to center
Fire Alarm Horns	12 inches below ceiling
Fire Alarm Pull Stations	42 inches to center
Thermostats	48 inches to center

F. Dimmers shall not be ganged. Install with a minimum of 6 inches between dimmers. Do not remove cooling fins. Do not connect dimmers to loads in excess of 75 percent of the rated load of the dimmer.

G. Run equipment grounding wire from isolated receptacle ground terminal to main service panel ground. Isolate this conductor from all other interim grounding points.

H. Wiring devices shall be minimum 20 ampere in all areas, unless noted otherwise herein or on the contract drawings.

END OF SECTION

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Conduit and equipment supports.

B. Fastening hardware.

1.2 RELATED WORK

Raceways and Fittings	Section 16110
Outlet Boxes	Section 16130
Lighting Fixtures	Section 16500

1.3 COORDINATION

A. Coordinate all supports with associated trades as to location, weights, etc.

1.4 QUALITY ASSURANCE

A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 MATERIAL

A. Support channel: painted steel.

B. Hardware: corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten hanger rods, conduit clamps, outlet and junction boxes to building structure using beam clamps.

B. Do not fasten supports to piping, ductwork, mechanical equipment or conduit.

C. Do not use powder-actuated anchors.

D. Do not drill structural steel members.

E. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a

neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

F. Install surface mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.

G. Bridge studs top bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

H. Install raceway supports within 12 inches of junction boxes and conduit couplings.

I. Electrical equipment shall be fastened in place with bolts and/or screws. Welding in place will not be allowed.

J. Install free-standing electrical equipment on concrete housekeeping pads. Pads to be furnished and installed by others.

END OF SECTION

SECTION 16420 - UNDERGROUND ELECTRIC SERVICE

PART 1 - GENERAL

1.1 WORK INCLUDED - PRIMARY

A. Arrange with serving utility company for permanent electric service including all charges or fees levied by the Serving Utility Company relative to this project.

B. Underground service entrance.

C. Items furnished by serving utility company:

1. Pole mounted transformers./Pad mounted transformer.

2. Secondary conductors to current transformer cabinet.

3. Current transformers.

4. Meter and conductors.

5. Splice connections between utility company furnished secondary conductors and contractor furnished secondary conductors in current transformer (CT) cabinet.

6. Primary cable and installation.

1.2 WORK INCLUDED - SECONDARY

A. Items furnished by contractor:

1. Current transformer (CT) cabinet. Verify size required with Utility Company.

2. Rigid metal conduit from CT cabinet to 18 inches below grade, as indicated on contract drawings. Verify requirements with Utility.

3. Meter base. Verify requirements with Utility Company.

4. 1 inch conduit from CT cabinet to the meter base with six (6) #12 AWG, type TW (solid) conductors in the following colors: Red, Black, Blue, Yellow, Orange, White.

5. Transformer pad.

6. Secondary conduit.

7. Secondary conductors. Size and quantity as shown on the contract drawings.

8. Transtector apex 4-277W or approved equal surge arrestors.

1.3 RELATED WORK

Panelboards	Section 16470

1.4 SYSTEM DESCRIPTION

A. System voltage: / 480Y/277 volts, three phase, four wire, 60 hertz. / 208Y/120 volts, three phase, four wire, 60 hertz. /120/240 volts, three phase, four wire, 60 hertz. / 120/240 volts, single phase, three wire, 60 hertz.

1.5 QUALITY ASSURANCE

A. Utility company: Montana Power Company.

B. Install service entrance in accordance with Utility Company's rules and regulations.

1.6 SHOP DRAWING SUBMITTALS

A. Submit manufacturers published literature on surge arresters showing performance characteristics, connection and installation diagrams and instructions.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 INSTALLATION

A. Make arrangements with utility company to obtain permanent electric service to the project.

B. Coordinate all work relative to the electrical service with the serving Utility Company prior to bidding and construction.

END OF SECTION

SECTION 16426 - FUSES

PART 1 - GENERAL

1.1 RELATED WORK

Disconnect Switches	Section 16440
Transformers	Section 16460
Panelboards	Section 16470
Lighting Fixtures	Section 16500

1.2 REQUIREMENTS OF REGULATORY AGENCIES

A. Fuses shall be UL listed.

1.3 SHOP DRAWINGS SUBMITTALS

A. Submit product data as required.

B. Provide catalog data sheets indicating melting time, let through characteristic curves, dimensions, mounting requirements and test data for each type of fuse specified or required.

C. Provide catalog data sheet on fuse cabinet.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 Bussmann
A.2 Reliance Electric
A.3 Gould-Shawmut

2.2 FUSES (UNLESS SPECIFIED OTHERWISE)

A. Main switch, panelboard, feeders and branch circuits:

0 - 600A 250VAC	Bussmann LPN-RK
0 - 600A 600VAC	Bussmann LPS-RK
601 - 6000A 600VAC	Bussmann KRP-C

B. Motors, welders, transformers capacitor banks:

0 - 600A 250VAC	Bussmann FRN-R
0 - 600A 600VAC	Bussmann FRS-R
601 - 6000A 600VAC	Bussmann KLU

C. Control transformer circuits:

0 - 30A 600VAC	Bussmann KTK-R

D. Ballasts:

Fluorescent Fixture High Intensity Discharge Fixture 0 - 480 volts	Bussmann GLR fuse w/HLR fuseholder Bussmann KTK with HPC, HEB, or HPF fuseholder

2.3 SPARE STOCK

A. Furnish three spare fuses for each size of fuse specified or used on this project.

2.4 SPARE FUSE CABINET

A. Spare fuse cabinet shall be Bussmann Type SFC with Q-14 lock and four keys.

PART 3 - EXECUTION

3.1 FUSES

A. Install fuses as shown on the contract drawings. Do not install fuses until the equipment has been finally installed, protected and ready to be energized.

3.2 SPARE FUSE CABINET

A. Install spare fuse cabinet as near to the Main (Main Distribution Panel) as possible or as indicated on the drawings. Install spare fuses in the cabinet and attach an engraved plastic identifier label to the outside of the cabinet denoting "SPARE FUSES". Provide and attach a typewritten directory of all spare fuses provided for the project to the inside of the door.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 16450 - SECONDARY GROUNDING

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Power system grounding.

B. Electrical equipment and raceway grounding and bonding.

1.2 RELATED WORK

Wire and Cable	Section 16120
Transformers	Section 16460
Panelboards	Section 16470
Generator System	Section 16622

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Grounding shall comply with Articles 250 and 680 of the NEC, and state and local codes. Grounding electrodes and bonding equipment shall comply with NEMA Standards, and shall be UL listed.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. Grounding conductors shall be insulated. Insulation type shall be identical with the circuit conductors serving the load. Insulation shall be colored green.

2.2 GROUND ELECTRODES

A. Ground electrodes shall be copper clad steel, 3/4 inch in diameter, and a minimum of 10 feet long.

2.3 GROUNDING CLAMPS

A. Grounding clamps shall be Thomas and Betts Series No. 390 or equal for connection to copper water pipes and Thomas and Betts No. 3846 or equal for connection to grounding electrodes.

2.4 GROUNDING LUGS

A. Ground lugs shall be Ilsco No. SLR35 or equal.

PART 3 - EXECUTION

3.1 SYSTEM GROUNDING

A. Bond the grounding electrode conductors to the neutral service entrance conductor(s) and to the metal frame of the main service entrance equipment.

B. Bond the grounding electrode conductors to the driven grounding electrodes, to the main cold water service pipe, and to both sides of the main service water metering equipment.

C. Bond the grounding electrode conductors to the grounded metal rebar of the building.

3.2 EQUIPMENT GROUNDING

A. Bond the equipment grounding bus in the main service entrance equipment to the grounding electrode conductor.

3.3 GROUNDING CONDUCTORS

A. Install equipment grounding conductors on [all] circuits [as shown on the contract drawings]. Run equipment grounding conductors in the same raceway as the circuit conductors serving each load.

B. Install equipment grounding conductors on transformers, motor starters, disconnect switches and other non-current carrying parts per NEC.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 16460 - DRY TYPE TRANSFORMERS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Dry type transformers.

1.2 RELATED WORK

Wire and Cable	Section 16120
Disconnect Switches	Section 16440
Secondary Grounding	Section 16450

1.3 REFERENCES

A. ANSI/NEMA ST20 - Dry Type Transformers for General Applications.

1.4 SHOP DRAWING SUBMITTAL

A. Submit product data as required.

B. Include outline and support point dimensions of enclosures and accessories, unit weight, primary and secondary voltage, KVA, and impedance ratings and characteristics, loss data, efficiency at 25, 50, 75 and 100 percent rated load, sound level, tap configurations, insulation system type, and rated temperature rise.

1.5 DELIVERY, STORAGE AND HANDLING

A. Store and protect products as required.

B. Store in a warm, dry location with uniform temperature. Cover ventilating openings to keep out dust.

C. Handle transformers using only lifting eyes and brackets provided for that purpose. Protect units against entrance of rain, sleet or snow if handled in inclement weather.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 Westinghouse
A.2 Sorgel

A.3 Acme
A.4 General Electric
A.5 Cutler-Hammer
A.6 Square D

2.2 DRY TYPE TRANSFORMERS

A. Provide dry type transformers of ratings indicated on Transformer Schedule on contract drawings, built in accordance with latest IEEE, USA, UL and NEMA Standards, sound rating to be equal to or less than latest USA Standard, transformers 10 KVA and above. Minimum of four 2-1/2% taps, two above and two below rated voltage. Minimum design temperature rise not exceeding 80 degrees C. Nameplate shall specify rated KVA, frequency, primary and secondary voltages, percent impedance and decibel rating.

2.3 ISOLATING TRANSFORMERS

A. Shall be totally isolated from primary power source.

B. Shall have electrostatic shield.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set transformer plumb and level. Bolt floor mounted transformers to floor.

B. Use flexible conduit, 24 inch minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.

C. Install vibration isolators on transformers per manufacturers recommendations.

D. Install transformer with manufacturers recommended spacing on wall and sides and NEC clear working space.

3.2 FIELD QUALITY CONTROL

A. Check for damage and tight connections prior to energizing transformer.

B. Measure primary and secondary voltages and make appropriate tap adjustments.

END OF SECTION

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Service and distribution panelboards.

B. Lighting and appliance branch circuit panelboards.

C. Load centers.

1.2 RELATED WORK

Switchboards	Section 16425
Fuses	Section 16426

1.3 REFERENCES

A. NEMA AB 1 - Molded Case Circuit Breakers.

B. NEMA KS 1 - Enclosed Switches.

C. NEMA PB 1 - Panelboards.

D. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

E. NEMA PB 1.2 - Application Guide for Ground Fault Protective Devices for Equipment.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Panelboards shall comply with NEMA Standards, shall be UL listed, and shall have an Integrated Equipment Rating.

1.5 SHOP DRAWING SUBMITTALS

A. Submit shop drawings for equipment and component devices as required.

B. Submit dimensioned drawings of installed panelboards and enclosures showing accurately scaled layout of enclosures and required individual panelboard devices, including but not necessarily limited to circuit breakers and accessories. Submit manufacturers literature on enclosures, bussing, fronts, surge arrestors, etc.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 Square D
A.2 General Electric
A.3 Cutler-Hammer
A.4 ITE/Siemen-Allis

2.2 MAIN DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1; circuit breaker type.

B. Enclosure: NEMA PB 1; Type 1.

C. Provide cabinet front with screw cover, and hinged door with flush lock. All panelboard doors to open 180 degrees. Finish in manufacturers standard gray enamel.

D. Provide panelboards with copper bus, ratings as scheduled on Panel Schedule on contract drawings. Provide copper ground bus in all panelboards.

E. Minimum integrated short circuit rating: 22,000 amperes RMS symmetrical for 480 Volt panelboards and 10,000 amperes RMS symmetrical for <208> <240> Volt panelboards.

F. All panelboards shall be of the dead-front safety type equipped with thermal-magnetic circuit breaker branches.

G. All panelboards shall be of the combination switch and fuse type with dead-front safety construction.

H. Provide three phase surge arrestor prior to Main Switch.

I. Provide bonded grounding lug.

J. Shall be UL labeled for Service Entrance Equipment.

2.3 BRANCH CIRCUIT PANELBOARDS

A. Lighting and appliance branch circuit panelboards: NEMA PB 1 ; circuit breaker type,. FS W-P-115; Type I, Class 1.

B. Enclosure: NEMA PB 1 ; Type 1.

C. Cabinet size: 6 inches deep; 20 inches wide for 240 Volt and less panelboards, 20 inches for 480 Volt panelboards. The contractor shall pay all costs incurred for using a panelboard with a greater depth than indicated on the Panel Schedule on the contract drawings.

D. Provide cabinet front with concealed trim clamps, concealed hinge and flush lock all keyed alike.

All panelboard doors to open 180 degrees. Finish in manufacturers standard gray enamel. See panel schedule on contract drawings for surface or flush mounting requirements.

E. Provide panelboards with copper bus, ratings as scheduled on the Panel Schedule on the contract drawings. Provide copper ground bus in all panelboards.

F. Minimum integrated short circuit rating: 10,000 amperes RMS symmetrical for <208> <240> Volt panelboards; 22,000 amperes RMS symmetrical for 480 Volt panelboards.

G. Molded case circuit breakers: NEMA AB 1, FS W-C-375; bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles.

H. All panelboards shall be of the dead-front safety type equipped with thermal magnetic circuit breaker branches.

I. Provide equipment grounding bar in all panelboards.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1.

B. Height: 5 feet - 6 inches to handle of highest circuit breaker.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard. Directory shall consist of a metal frame, clear plastic cover and directory.

E. Provide plastic laminated nameplates attached to front of panelboard door showing panel designation and voltage. White letters on red background for emergency panelboards and white letters on black background for all other panelboards.

EXAMPLE: PANEL HL
100A 480Y/277V 3P 4W

F. All panelboards shall be keyed alike. Furnish each panelboard with two keys for each lock.

G. All panelboards provided for this project shall be the product of one manufacturer.

H. Mount freestanding panelboards on 4 inch concrete housekeeping pads. Pads by General Contractor.

3.2 FIELD QUALITY CONTROL

A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance

the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.

B. Visual and mechanical inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for main feeders, circuit breakers, fusible switches and fuses.

3.3 PANELBOARD SCHEDULE

A. See PANEL SCHEDULE on contract drawings.

END OF SECTION

SECTION 16500 - LIGHTING FIXTURES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Interior luminaires and accessories.

B. Exterior building luminaires and accessories.

C. Lamps.

D. Ballasts.

1.2 RELATED WORK

Fuses	Section 16426
Emergency Lighting Equipment	Section 16535

1.3 REFERENCES

A. ANSI C82.1 - Specification for Fluorescent Lamp Ballasts.

B. ANSI C82.4 - Specification for High-Intensity-Discharge (HID) Lamp Ballasts (Multiple Supply Type.)

C. FS W-F-414 - Fixture, Lighting (Fluorescent, Alternating-Current, Pendant Mounting.)

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. All lighting fixtures shall be UL listed.

1.5 SHOP DRAWING SUBMITTALS

A. Submit product data as required.

B. Include outline drawings, lamp and ballast data, support points, weights and accessory information for each luminaire type.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site as required.

B. Store and protect products as required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - LIGHTING FIXTURES

A. As shown on the LIGHTING FIXTURE SCHEDULE on the contract drawings or approved equal.

2.2 INTERIOR LUMINAIRES AND ACCESSORIES

A. Furnish with complete hardware for a complete installation of lighting fixtures complete with lamps as indicated on the LIGHTING FIXTURE SCHEDULE on the contract drawings, including all mounting accessories, canopies, pendants, hangers, ballasts, diffusing materials, plaster frames, recessing boxes, sockets, hold-down clips, etc.

B. All plastic diffusers used in lighting fixtures shall conform to State Fire Codes.

C. All fluorescent fixtures shall be prewired at the factory. All lenses shall be virgin acrylic, .125 inches minimum thickness. Prime and paint all fixtures on interior and exterior.

D. All incandescent fixtures shall be prewired at the factory. Recessed fixtures shall be UL listed for insulated ceilings if required.

E. All high-intensity-discharge fixtures shall be prewired at the factory. All Metal Halide fixtures shall be totally enclosed.

F. Provide slope adaptors for fixtures to hold lamp perpendicular to the work plane.

G. Conform to exact ceiling construction and order correct accessories for ceiling being installed.

H. Care must be taken in the placement of outlets, surface mounted, recessed or semi-recessed fixtures to maintain the alignment, spacings, layout and general arrangements shown on the Plans. Any changes in the arrangement must be approved by the Contracting Officer.

2.3 EXTERIOR BUILDING LUMINAIRES AND ACCESSORIES

A. Furnish with complete hardware for a complete installation of lighting fixtures, complete with lamps as indicated on the LIGHTING FIXTURE SCHEDULE on the Contract Drawings, including all mounting accessories, wiring, conduit, aiming of fixtures, grounding, testing, etc.

2.4 ACCEPTABLE MANUFACTURERS - LAMPS

A.1 General Electric
A.2 North American Phillips
A.3 Osram/Sylvania

2.5 LAMPS

A. Fluorescent lamps: shall be F 32T8 or as indicated on the LIGHTING FIXTURE SCHEDULE on the Contract Drawings.

B. High Intensity Discharge Lamps: Universal operating position, coated bulb finish, mogul base, at wattage as indicated on the light fixture schedule on the contract drawings.

C. Incandescent lamps: shall be rated at 130 Volts and wattage as indicated on the LIGHTING FIXTURE SCHEDULE on the contract drawings.

2.6 ACCEPTABLE MANUFACTURERS OR EQUAL - FLUORESCENT BALLASTS - ELECTRONIC - Or approved equal

A.1	Osram	A.5	Triad/Utrad
A.2	Advance	A.6	Motorola
A.3	Valmont	A.7	EBT
A.4	MagnaTek		

2.7 BALLASTS - ELECTRONIC

A. General - Electronic fluorescent ballasts for fluorescent fixtures shall be suitable for the electrical characteristics of the supply circuits to which they are to be connected and shall be suitable for operating the specified lamps. All ballasts for each fixture type shall be of the same type and shall be the product of one manufacturer.

B. Fluorescent Ballasts

1. Unless otherwise indicated in the lighting fixture schedule, ballasts shall be electronic, high-frequency, full-output-type for use on 265mA, rapid start T-8 lamps.

2. All ballasts shall be UL listed, ETL certified, Class "P", high power factor (minimum 0.90).

3. Electronic ballasts for 1-, 2-, 3-, or 4-lamp combinations shall be used, as required by the fixture described in the lighting fixture schedule.

4. Ballasts shall be series wire type and designed to operate the number and length of lamp specified.

5. Ballasts shall produce audible noise level lower than quietest CBM-certified ballast for the same application.

6. All ballasts used in exterior or refrigeration applications shall have a minimum starting temperature of minus 20 degrees F unless otherwise specified. All interior ballasts shall have a minimum starting temperature of 50 degrees F.

7. All electronic ballasts shall have less than 10 percent total harmonic distortion, and a third-harmonic distortion less than 10 percent.

8. Ballasts shall comply with FCC rules, Part 18, 15.

9. All ballasts shall comply with ANSI 62.41-1994.

10. Ballast shall provide normal rated life for the lamp specified.

11. All electronic ballasts shall be warranted for parts and replacement labor for at least three (3) years from the date of final acceptance.

2.8 ACCEPTABLE MANUFACTURERS - FLUORESCENT BALLASTS - ELECTROMAGNETIC - Or approved equal

A.1 General Electric
A.2 Advance
A.3 Universal

2.9 BALLASTS - ELECTROMAGNETIC

A. Furnish with complete hardware for complete installation of ballasts, including all mounting accessories, etc., for voltages shown on the Lighting Fixture Schedule and Drawings.

B. All fluorescent ballasts shall be Class "P" rated, high power factory CBM certified by ETL, UL listed, and resetting thermostatically controlled and energy saving type.

C. Wherever possible, all ballasts shall have a Class "A" sound rating; for those ballasts not available with Class "A" rating, the lowest noise level available shall be furnished.

D. All ballasts for H.I.D., and fluorescent fixtures shall be furnished with an in-line fuse, Bussmann or equal.

E. Ballasts for exterior fixtures shall be low temperature starting. Minus 20 (-20) Degree for fluorescent fixtures.

F. H.I.D. ballasts to be constant wattage, or regulated type with starting current no larger than normal running. All ballast for exterior fixtures shall be low temperature starting.

2.10 SPARE LAMPS AND BALLASTS

A. Furnish spare lamps identical to those installed in each fixture. Quantity: [20%] of total lamps used or a minimum of [three (3)] lamps of each type, whichever is greater.

B. Furnish spare ballasts identical to those used in each fixture. Quantity: 1 ballast [or 6%] of each fixture type, whichever is greater.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install lamps in luminaires and lampholders.

B. Support surface-mounted luminaires directly from building structure.

3.2 RELAMPING

A. Relamp all luminaires used for construction purposes at completion of Project for final acceptance.

3.3 ADJUSTING AND CLEANING

A. Align luminaires and clean lenses and diffusers at completion of Project. Clean paint splatters, dirt and debris from installed luminaires.

B. Touch up luminaires at completion of work.

3.4 LIGHTING FIXTURE SCHEDULE

A. As shown on the Contract Drawings.

END OF SECTION

This page intentionally blank

SECTION 16535 - EMERGENCY LIGHTING EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Emergency exit signs.

B. Emergency lighting ballast - Fluorescent.

1.2 RELATED WORK

Lighting Fixtures Section 16500

1.3 REFERENCES

A. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.

B. NEMA WD 1 - General-Purpose Wiring Devices.

1.4 REQUIREMENTS OF REGULATORY AGENCIES

A. Conform to local and state building code NFPA 101 for installation requirements.

1.5 SHOP DRAWING SUBMITTAL

A. Submit product data as required.

B. Provide product data on emergency lighting units, exit signs and emergency fluorescent lamp power supply units.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - EXIT LIGHTS

A. As listed on the LIGHTING FIXTURE SCHEDULE on the contract drawings or approved equal. Sure-lites is a prior approved equal.

2.2 ACCEPTABLE MANUFACTURERS - EMERGENCY BATTERY BALLAST PACKS or Approved Equal

A.1 Bodine B50, specification grade, 1100 - 1200 lumen output, operates one (1) 2' - 4' lamps.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units plumb and level.

B. Aim directional lampheads as directed.

END OF SECTION

USDA Forest Service
Missoula, Montana

Construction Specifications
October 20, 1999

SECTION 16440 - DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Disconnect Switches

B. Fuses

C. Enclosures

1.2 RELATED WORK

Fuses Section 16426

1.3 REQUIREMENTS OF REGULATORY AGENCIES

A. Motor and disconnect switches shall be NEMA rated and UL listed, and shall meet the requirements of NEC.

1.4 SHOP DRAWING SUBMITTALS

A. Submit product data as required.

B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 Square D
A.2 General Electric
A.3 Cutler-Hammer
A.4 Siemens

2.2 DISCONNECT SWITCHES

A. Provide heavy duty, 240 volt or 600 volt, fusible and non-fusible disconnects as noted on the contract drawings or as required by NEC. Disconnects for motor circuits shall be horsepower rated. Provide engraved, laminated plastic nameplates, white letters on red background for emergency loads and white letters on black background for all other loads, indicating items controlled or served and source of power.

EXAMPLE: HOT WATER PUMP-1
HL-24,26,28

B. Service disconnect switch shall be rated for service entrance equipment.

C. Disconnect switch enclosures shall be NEMA 1 for interior use unless specified otherwise and NEMA 3R for exterior use. Enclosures shall be galvanized, prime painted and finished in manufacturers standard color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches where indicated on contract drawings.

B. Install fuses in fusible disconnect switches per Section 16426.

C. Make line side connections to disconnect switches furnished with pre-wired Mechanical Equipment.

END OF SECTION

SECTION 16670 - LIGHTNING PROTECTION SYSTEM

THIS SECTION DELETED IN ITS ENTIRETY BY AMENDMENT 0001.

This page intentionally left blank.

THIS SECTION IS REISSUED IN ITS ENTIRETY BY AMENDMENT 0001

SECTION 16721 - FIRE ALARM

PART 1 - GENERAL

1.1 SCOPE

A. The Contractor shall furnish and install, complete and ready for operation, a Fire Alarm System, including alarm panels, detectors, pull stations, devices, door holders, local alarms, wiring, graphic annunciators, any and all other equipment necessary for a complete operational system, as shown on the drawings and indicated herein.

Furnish and install fire protection supervision.

Furnish and install integrated signal appliances, and controls for safe and orderly evacuation of building.

Work will include all devices to accomplish HVAC equipment shutdown and duct damper activation.

Work will include all interfaces required for elevator recall and shutdown. Provide all materials and labor to interface with shunt trip breaker and elevator car cycle complete signal.

Work will include all signal transmission to Remote Alarm Panels or Central Stations.

Provide for proper sealing of openings, cracks and penetrations.

B. All portions of the systems shall be installed in accordance with the drawings, details, and specifications or as required by jurisdictional authorities and codes. Jurisdictional authorities and codes shall take precedence over plans, details and specifications in the event of a dispute between the requirements of contract documents and jurisdictional authorities or codes.

C. The position is taken that the Owner is entitled to a project which meets or exceeds the minimum requirements of nationally recognized fire protection standards. All efforts and installations shall be directed toward this end. All deficiencies as noted by fire rating bureaus, insurance service offices or jurisdictional authorities shall be corrected. No extra charges will be allowed on this account.

D. The intent of these specifications is to describe the complete systems to be installed, including such minor details of work or materials not specifically mentioned or shown, but necessary for the successful operation and completion of the installation.

E. The fire alarm subcontractor shall coordinate all requirements with the electrical, sprinkler, fire protection, elevator, temperature control and/or other subcontractors. Any additional requirements or detail not shown on the drawings, but required for a complete working integrated system will be the responsibility of the fire alarm subcontractor.

F. Sprinkler contractor will provide and install all pressure, flow and tamper switches. Fire alarm contractor shall insure compatibility with proposed equipment.

G. Temperature control contractor shall connect to appropriate devices or modules provided and installed by fire alarm subcontractor to accomplish HVAC control and shutdown.

H. Elevator contractor shall connect to appropriate devices or modules provided and installed by fire alarm subcontractor to accomplish elevator control and shutdown.

I. Work to be performed under this section shall include, but not be limited to the following:

1. Fire Alarm System

a. Alarm Panel
b. Battery Supplies
c. Annunciator Panels
d. Audible/Visual Alarm Devices
e. Pull Stations
f. Smoke/Heat/Duct Detectors
g. Door Holders
h. Wiring
i. Dialer and monitoring by UL listed fire alarm central station.

1.2 RELATED WORK

A. All work performed under this section of the specifications shall be subject to the requirements of both the General and Special Conditions and the Mechanical and Electrical Specification.

B. Related work specified elsewhere:

Elevators	Section 14240
Fire Sprinklers	Section 15500
Temperature Controls	Section 15950
Raceways and Fittings	Section 16110
Wire and Cable	Section 16120
Outlet Boxes	Section 16130

C. Examine the above referenced specification parts thoroughly before submitting a proposal for accomplishment of work in this section.

1.3 REGULATORY AGENCIES

A. The term jurisdictional authority used in this section of the specification shall include, as applicable, but not be limited to the following:

1. Local Building Department and Fire Department.

2. State Fire Marshall.

3. Insurance Services Office or Insuring Authority having jurisdiction.

4. Owner.

B. The design and installation of all systems of fire protection shall conform to all requirements of applicable codes and publications herein defined:

1. Uniform Building Code

2. Uniform Fire Code

3. NFPA #72 – 1996 Edition

4. NFPA #70

5. All State and local ordinances

6. Underwriters Laboratories.

7. Factory Mutual.

8. American Society of Testing Materials.

9. American National Standards Institute.

10. Occupational Safety and Health Administration.

11. Americans with Disabilities Act.

1.4 SUBMITTALS

A. The successful Contractor shall provide submittal data as required under other portions of this specification. Submittals shall conform to the instructions set forth in the General and Special Conditions of these specifications entitled Shop Drawings and Submittals. Drawings shall be prepared using Auto Cadd™ or equivalent design software.

B. Submit detailed shop drawings (floor plans) showing all dimensions, ducts, lights, or other items affecting the fire alarm systems to jurisdictional agencies for review and approval. All items identified in NFPA for plans shall be complied with. The Contracting Officer will reject all submittals not in compliance. Submit all necessary shop drawings to authorities having jurisdiction. Concurrently, six (6) sets shall be sent to the Contracting Officer for review. After approval from jurisdictional agencies have been returned to the Contractor, they shall be submitted to the Contracting Officer for final acceptance. These final acceptance sets shall have all agency`s stamps of review and acceptance. Where there is conflict between the Contract Drawings and/or Specifications, and the recommendations of the jurisdictional authorities, the conflict shall be brought to the attention of the Contracting Officer at least ten (10) days prior to bidding or be resolved at no cost to the Owner.

C. Full catalog information shall be provided for all materials intended for use on this project. Catalog information indicating more than one item shall be highlighted to clearly indicate the proposed equipment.

D. Manufacturer's certificate of direct dealership of the installing Contractor to install, test and maintain the manufacturer's equipment shall be submitted. Provide Nicet level 4 person in shop to oversee system design and layout. Include copy of certificate in shop drawing package.

E. Detailed sequences of operation, electrical schematics and connection diagrams shall be provided to completely describe the operation of the fire alarm system controls.

F. Standby battery calculations shall be submitted. (60 hour stand by and 15 minutes alarm).

G. Contracting Officer’s review will be for general location only. It will be the Contractor's responsibility to check his drawings for interferences and to do shop fabrication from measurements taken at the job site.

H. Work on the project shall not begin until plans have been reviewed by the Contracting Officer.

1.5 JOB CONDITIONS

A. The Contractor shall investigate the structural, architectural, mechanical, electrical, and finished conditions affecting the conduit and devices, and shall arrange the equipment accordingly; furnishing required fittings, offsets and accessories. Route conduit to avoid interference with ductwork and drain piping. In the event it becomes necessary to make field changes in locations due to building construction, the Contractor shall consult with the Contracting Officer before making any changes. Any such changes required shall be made without added cost to the Owner.

B. The Contractor shall determine, and be responsible for, the proper locations and character of inserts for hangers, chases, sleeves, and other openings in the construction required for fire alarm system work, and shall obtain this information well in advance of the construction progress to avoid delay of the work.

C. All fees and permits specifically required for fire alarm work, not obtained by others as specified elsewhere shall be applied for and paid for by this Contractor.

D. All fire alarm systems shall be installed by a licensed (for the location of installation) Fire Alarm Contractor, fully experienced in fire protection installation as specified herein. Fire Alarm Contractors may be required to provide in writing, specific information as to successfully completed projects and references to show cause as to why they should be considered acceptable to the Contracting Officer.

E. The system shall be installed by an experienced firm with full time personnel who are factory certified and are regularly engaged in the installation of fire alarm systems in strict accordance with NFPA Standards. The installing contractor shall be an authorized stocking distributor of the manufacturer for the equipment included in the system so that immediate replacement parts can be made from inventory and, if needed, on an emergency basis. The contractor shall provide service personnel who shall be available for emergency service at all times, twenty-four (24) hours a day.

1.6 RECORD DRAWINGS

A. One approved set of drawings shall be maintained on the job at all times.

B. One full size reproducible set of As-Built drawings generated with Auto Cadd™ shall be provided to the Contracting Officer upon completion of the work.

1.7 OPERATION AND MAINTENANCE MANUALS

A. Three (3) sets of operating and maintenance instructions shall be provided the Owner upon completion. Manuals shall include, as a minimum, the following:

1. As-Built Drawings showing location of all devices and panels, all routing including conduit size, wire, wire color codes.
2. Catalog cut sheets of all materials installed.
3. Operational sequences.
4. Manufacturer's operations and maintenance manuals.
5. Electrical schematics of all circuiting (wiring diagrams).
6. Final approval of all jurisdictional agencies.
7. Final test certificates.
8. Written certification by the fire alarm equipment manufacturer, stating that the system and it's component parts are as listed and approved by the State Fire Marshall, and that the installation conforms in all respects to requirements of applicable codes.

1.8 TRAINING

A. The fire alarm contractor shall supply on-site training at the owner's facility. The training shall continue until the Owner is fully satisfied that he understands the operation of his system and shall be conducted by a full time employee of the fire alarm system manufacturer. The training shall cover installation, operation, maintenance, and troubleshooting of the fire alarm system. A training manual shall be provided for the owner's representatives and that manual shall include control system as well as field device specification sheets, system schematics, operation and installation instructions, and applicable service bulletins.

1.9 GUARANTEES AND WARRANTIES

A. The Fire Alarm Contractor shall guarantee to the Owner in writing, all equipment and workmanship for a period of one (1) year after the fire alarm system has been placed in continuous service and has been accepted by all authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Approved Manufacturers

1. Simplex
2. Pyrotronics
4. Notifier

B. Other manufacturers are acceptable with prior approval.

C. The system and components shall be produced by one (1) manufacturer of established reputation and experience who shall have produced similar apparatus for a period of at least ten (10) years.

D. All references to model numbers and other pertinent information herein is intended to establish standards of performance and quality and not to limit manufacturer.

2.2 GENERAL

A. The system is Style 6 to utilize signal line circuiting with intelligent addressable devices. All notification appliance circuits shall be style.

B. The contractor shall supply and install an intelligent addressable, electronically supervised microprocessor based multi-processing Fire Alarm System. The system shall utilize a standard bus architecture for local input/output for data acquisition, distribution and control.

Individually identified sensors, device(s) and notification appliance circuits shall be supported within a single control panel.

There shall be no limit to the number of detectors or Zone Adaptor Modules which may be activated or "in alarm" simultaneously.

C. Communication with addressable devices: The system must provide communication with all initiating and control devices individually. All of these devices are to be individually annunciated at the control panel. Annunciation shall include the following conditions for each point:

1. Alarm
2. Trouble
3. Open
4. Short
5. Ground
6. Device fail to respond/device not programmed.

All addressable devices are to have the capability of being disabled or enabled individually.

D. Each addressable device must be uniquely identified by an address code entered on each device at time of installation.

2.3 FIRE ALARM CONTROL PANEL

A. The fire alarm control panel shall allow for loading or editing special instructions and operating sequences as required. The system is to be capable of on-site programming to accommodate facility expansion, building parameter changes, or changes as required by local codes. All software operations are to be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.

The ability for selective input/output control functions based on ANDing, ORing, NOTing, timing and special coded operations is to also be incorporated in the resident software programming of the system.

B. Access Levels

1. There shall be a minimum of three (3) access levels. Passcodes shall consist of up to ten (10) digits. Changes to passcodes shall only be made by authorized personnel.

2. When a correct passcode is entered, an "ACCESS GRANTED" message shall be displayed. The new access level shall be in effect until the operator leaves the keypad inactive for ten (10) minutes or manually logs out.

3. Passcode access shall be entered into the system history log and shall be available for review with passcodes of proper authorization.

4. Should an invalid code be entered, the operator shall be notified with a message and shall be allowed up to three chances to enter a valid code. After three unsuccessful tries, an "ACCESS DENIED" message shall be displayed.

5. Access to a level will only allow the operator to perform all actions within that level and all actions of lower levels, not higher levels.

6. The following keys/switches shall have access levels associated with them:

   - Alarm Silence
   - System Reset
   - Set Time/Date
   - Manual Control
   - On/Off/Auto Control
   - Disable/Enable
   - Clear Historical Alarm Log
   - Clear Historical Trouble Log
   - Walk Test
   - Change Alarm Verification

7. Acknowledge keys shall also require privileged access to acknowledge points. If the operator presses an acknowledge key with insufficient access, an error message will be displayed. The points will scroll with each key press to view the points on the list, but the points will not get acknowledged in the database.

C. Operation

1. Under normal condition, the front panel shall display a "SYSTEM NORMAL" message and the current time and date.

2. Should an abnormal condition be detected, the appropriate LED (Alarm, Supervisory, or Trouble) shall flash. The panel audible signal shall pulse for alarm conditions and sound steadily for trouble and supervisory conditions.

3. The panel shall display the following information relative to the abnormal condition of a point in the system:

   a. Custom location label (40 characters minimum).
   b. Type of device (i.e., smoke, pull station, waterflow).
   c. Point status (i.e., alarm, trouble).
   d. Time of day and date of event.
   e. Device location (SLC and point number).

   These three characteristics relative to an abnormal condition of a point shall be displayed simultaneously in alphanumerical format.

4. Pressing the appropriate acknowledge button shall acknowledge the alarm or trouble condition. After all the points have been acknowledged, the LEDs shall glow steady and the panel audible signal will be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be indicated.

5. Alarm Silencing

   a. Should the "Alarm Silence" button be pressed, all notification appliances shall be deactivated.

   b. Notification appliances shall not be deactivated during alarm silence inhibit mode.

6. System Reset

   a. The "System Reset" button shall be used to return the system to its normal state after an alarm condition has been remedied. The display shall step the user through the reset process with simple English language messages.

   b. Should an alarm condition continue to exist, the system will remain in an abnormal state. System control relays shall not reset. The panel audible signal and the Alarm LED shall be on. The display will indicate the total number of

alarms and troubles present in the system along with a prompting to review the points. These points will not require acknowledgement if they were previously acknowledged.

c. Should the Alarm Silence Inhibit function be active, the "System Reset" key press will be ignored and a "RESET INHIBITED" message will be displayed for a short time to indicate the action was not taken.

7. Function Keys, Display of System Detail Information

a. Additional function keys shall be provided to access status data for all system points. As a minimum, the status data shall include Disable/Enable Status, Verification Tallies of Initiating Devices, Acknowledge Status, etc.

b. Operation of the function keys shall be capable of displaying system voltages and currents on the front panel display. These values will include those for notification appliance circuits, and battery charging. These values will be displayed digitally and in real time.

D. History Logging

1. The control panel shall have the ability to store a minimum of three hundred (300) events in an alarm log plus a minimum of three hundred (300) events in a separate trouble log. These events shall be stored in a battery protected random access memory (RAM). Real time and date shall accompany all history event recording.

E. Walk Test with History Logging

1. The system shall be capable of being tested by one person. While in testing mode, the alarm activation of an initiating device circuit shall be silently logged as an alarm condition in the historical data file. The panel shall automatically reset itself after logging of the alarm.

2. The momentary disconnection of an initiating or notification appliance circuit shall be silently logged as a trouble condition in the historical data file. The panel shall automatically reset itself after logging of the trouble condition.

3. The walk test sequence will have the capability of activating the alarm notification appliances. Any momentary opening of an initiating or notification appliance circuit wiring shall cause the alarm notification appliances to sound for 4 seconds to indicate the trouble condition.

4. Should the walk test feature be on for an inappropriate [programmable] amount of time, it shall revert to the normal mode automatically.

5. The control panel shall be capable of supporting up to eight (8) separate testing groups whereby one group of points may be in a testing mode and the other (non-testing) groups may be active and operate as programmed per normal system operation. After testing is considered complete, testing data may be retrieved from the system in chronological order to ensure device/circuit activation.

6. Should an alarm condition occur from an active point, not in walk test mode, it shall perform all standard programmed alarmed sequences.

F. LED Supervision

1. All slave module LEDs shall be supervised for burnout or disarrangement. Should a problem occur, the panel shall display the module and the LED location numbers to facilitate location of that LED.

G. System Trouble Reminder

1. Should a trouble condition be present within the system and the audible trouble signal silenced, the trouble signal shall resound at preprogrammed time intervals to act as a reminder that the fire alarm system is not 100% operational. Both the time interval and the trouble reminder signal shall be programmable to suit the owner's application.

H. Supervision

1. The system shall contain up to 10 independent signal line circuits supervised so that a fault in any one circuit shall not affect any other circuit. Each signal line circuit shall be wired and supervised as a style 6 “dual” pipe circuit. At no time shall the incoming SLC to a device be in the same conduit as the outgoing wire to the next device or panel return. The alarm activation of any initiation point shall not prevent the subsequent alarm operation of any other initiation point. All initiation zones shall be software definable. Hard wired initiation zones shall not be allowed. Provide 99 software zones. See zoning requirements shown on plans.

2. There shall be up to 99 independently supervised and independently fused notification appliance circuits for alarm devices. Disarrangement conditions of any circuit shall not affect the operation of other circuits.

3. The incoming power to the system shall be supervised so that any power failure must be audibly and visibly indicated at the control panel and any remote annunciator in system. A green "power on" LED shall be displayed continuously while incoming power is present.

4. The system batteries shall be supervised so that a low battery condition or disconnection of the battery shall be audibly and visibly indicated at the control panel and the remote annunciator.

5. The System Expansion Boards shall be electrically supervised for board placement. Should a board become disconnected from the controls, the system trouble indicator must illuminate and audible trouble signal must sound.

6. The system shall have provisions for disabling and enabling all points individually for maintenance or testing purposes.

I. Power supplies

1. The control panel shall receive 120 VAC power (as noted on the plans) via a dedicated circuit.

2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of sixty (60) hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to the standby batteries upon power failure. All battery charging and recharging operations shall be automatic.

3. All circuits requiring system operating power shall be 24VDC and shall be individually fused at the control panel.

J. Cabinets

1. The system controls shall be housed in a locked surface mounted painted cabinet painted. Provide red or gray as requested by architect.

2. All controls, indicators and operating instructions shall be clearly visible through a viewing window.

2.4 REMOTE ANNUNCIATOR

A. The serial annunciator shall also provide an alphanumeric, 80 Character Liquid Crystal Display (LCD) that provides clear English language alpha-numeric information as to the addressable device status (alarm, trouble, etc.), type of alarm (smoke detector, pull station, etc.), number of alarms on the system, and a custom location label.

B. Manual Control Switches shall be provided for the following functions:

- System Reset
- Alarm Silence

- Trouble Silence
- Manual Evacuation

2.5 ADDRESSABLE SENSOR AND BASES – GENERAL

A. Each sensor base or detector shall contain an LED that will flash each time it is scanned by the control panel (once every 4 seconds minimum). When the control panel determines that a sensor is in the alarm or a trouble condition, the control panel shall command the LED(s) on that sensor to turn on steady indicating the abnormal condition.

B. Sensor bases may be provided with a relay driver output. Provide device bases with relay where shown on plans.

C. Each sensor shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.

D. Each sensor shall be scanned by the control panel for its type identification to prevent inadvertent substitution of another sensor type. The control panel signal line circuit shall operate with the installed device but shall initiate a "Wrong Device" trouble condition until the proper type is installed or the programmed sensor type is changed.

E. The sensor base and mounted sensor electronics shall be immune from false alarms caused by EMI and RFI.

F. Each smoke detector shall individually communicate its sensitivity value to the control panel each time poling occurs. That value is recorded in the system memory until the next poling occurs. The new value is then recorded. Panel and smoke detectors not providing this feature are not acceptable.

G. Detectors used shall be U.L. listed and FM approved for their intended applications. Detectors shall be installed and maintained per the manufacturer's instructions.

H. The detectors shall obtain their operating power from the fire alarm panel supervised detection loop. The operating voltage shall be 24VDC (nominal). Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal to be generated at the control panel.

I. To minimize nuisance alarms, voltage and RF transient suppression techniques shall be employed, as well as a smoke verification circuit and an insect screen. The detector design shall provide full solid-state construction and compatibility with other normally open fire alarm detection loop devices, (heat detectors, pull stations, etc.). The detector head shall be easily disassembled to facilitate cleaning.

J. The detector shall fit into a base that is common with both the heat detector and photoelectric type detector and shall be compatible with other addressable detectors, addressable manual stations, and addressable Zone Adaptor Modules on the same circuit.

2.5 ADDRESSABLE SENSOR TYPES

At no time will smoke detectors be installed prior to the final clean up of all trades on the project. See NFPA 72 Chapter 5-3.6.1.3 for exact code requirements. Detector type shall be chosen based on the expected conditions of the hazard. In general, photoelectric detectors shall be used on the ceilings of rooms, offices and corridors. Ionization detectors shall be placed in laboratories.

A. Ionization detectors will be dual chamber: one chamber for sampling and one chamber for reference. They will be sealed against rear air flow entry.

B. Photoelectric detectors shall be of the solid state type and shall contain no radioactive materials. They will use a pulsed infrared LED light source and be sealed against rear air flow entry.

2.7 SMOKE DETECTORS - DUCT TYPE FACTORY ASSEMBLED

A. The detector shall be non-polarized 24VDC addressable photoelectric type of the solid state type and shall operate on the light scattering, photodiode principle. To minimize nuisance alarms, detectors shall have an insect screen and be designed to ignore invisible particles or smoke densities that are below the factory set point. No radioactive material shall be used.

B. The installation shall include an enclosure suitable for mounting on duct, and air sampling tubes that extend into the duct air stream. Seal tightly at point of duct penetration and repair insulation as required.

C. Provide 24V wiring from detector to Fire Alarm Panel. Temperature Control Contractor will provide wiring from auxiliary contacts provided in detector to its respective supply fan to stop fan when the presence of smoke is detected. At the contractor option, a dry contact relay module may be used instead of a relay in the detector base.

D. Sensitivity of the detector shall be field adjustable, and a check of sensitivity shall be possible while the detector is installed and operating. Variation in duct air velocity between 400 and 4000 FPM shall not cause any false alarms.

E. Auxiliary alarm operated contacts shall be provided to provide supplementary alarm functions such as fan shutdown.

F. An accessible key operated test station and alarm/power LED indicator shall be provided for all duct detectors when shown on plan.

2.8 HEAT DETECTORS

A. Furnish and install addressable heat detectors.

B. Heat detectors shall be combination rate-of-rise and fixed-temperature type. When the fixed-temperature portion is activated, the units shall be non-restorable and give visual evidence of such operation.

C. Detectors shall be fixed temperature rated for 135 degree F.

2.9 MANUAL PULL STATIONS

A. Furnish and install addressable non-coded manual station(s). Stations shall be a dual action. The stations shall have S.P.N.O. alarm contacts. The station shall mount in a standard single gang box. Station shall not require replaceable parts such as tubes, glass or plastic rods or glass or plastic plates. Provide an individual address module for each station.

B. The station shall be constructed of red Lexan, with white raised letters reading "FIRE" and simple, concise instructions for activation of station by the general public.

C. When the station is activated, the handle shall lock in a protruding manner to provide visual identification. Reset of station shall require special key or wrench.

2.10 MODULES

A. Modules shall be used for monitoring of waterflow, valve tamper, Halon Control Panels, non-addressable detectors, and for control of notification appliances and AHU systems.

1. An addressable interface module shall be provided for interfacing normally open direct contact devices to an addressable signaling line circuit.

2. Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their 24VDC power from a separate two wires running from the fire alarm control panel. They shall communicate over the signal line circuit.

3. Monitor Module

a. For conventional 2-wire smoke detector and/or contact device monitoring with Style B or Style D (NFPA-72 initiating device circuit) wiring supervision.

This type of addressable device module will provide power to, and monitor the status of, a zone consisting of conventional 2-wire smoke detectors and/or N/O contact devices. The supervision of the initiating device circuit wiring will be dual conduit Style D. These modules will communicate the zone's

status (normal, alarm, trouble) to the control panel. Provide 24 VDC resetable power to the module and a power sensing unit for smoke detector supervision when required.

b. For conventional 4-wire smoke detector and/or contact device monitoring with Style D wiring supervision.
This type of addressable device module will provide power to and monitor the status of a zone consisting of conventional 4-wire smoke detectors and/or N/O contact devices. The supervision of the initiating device circuit wiring will be dual conduit Style D. These modules will communicate the zone's status (normal, alarm, trouble) to the control panel.

4. Control Modules

a. For alarm notification appliances, and other device control with dual conduit Style Z wiring supervision.

This type of addressable device will provide a circuit of alarm notification appliances to a power source; or activate a variety of controlled devices. In the Style Z version, the wiring will be looped back and connected to the module to allow continual operation of the controlled devices even if the wiring sustains a single break. Style Z addressable devices will be provided. These modules will communicate the supervised wiring status (normal, trouble,) to the fire alarm control panel and will receive a command to change state of the relay from the fire alarm control panel.

b. For non-supervised control.

This type of addressable device will provide double pole double throw relay switching for loads up to 120VAC. It will contain easily replaceable 2 amp fuse, one on each common leg of the relay.

5. The modules shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions. Should the modules become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be transmitted to, and annunciated at, the control panel.

6. The module shall be capable of being programmed for its "address" location on the addressable device signaling line circuit. The module shall be compatible with addressable manual stations and addressable detectors on the same addressable circuit.

7. All devices will be supervised for trouble conditions. The system control panel will be capable of indicating the type of trouble condition (open, short, device missing/failed). Should a device fail, it will not hinder the operation of other system devices.

2.11 WATERFLOW SWITCHES

A. Waterflow switches shall be provided by the fire sprinkler subcontractor. Provide a monitor module to connect this device to the fire alarm panel.

2.12 SPRINKLER VALVE TAMPER SWITCHES

A. Sprinkler valve tamper switches shall be provided by the fire sprinkler subcontractor. Provide a monitor module to connect this device to the fire alarm panel.

2.13 ALARM DEVICES

A. Visual Flashing Lamps (Xenon Strobe)

1. Visual indicating appliances shall be comprised of a Xenon flashtube and be entirely solid state. These devices shall be capable of either ceiling or wall mounting. The lens shall be pyramidal in shape to allow better visibility. Visual units shall be of the stand alone type or be incorporated as part of the audio/visual unit.
2. The color shall be clear or nominal white.
3. The intensity shall be a minimum 15 candela. Provide candela rated for application.
4. The flash rate shall be between 1 and 3 flashes per second.
5. Mounting height shall be not less than 90” above floor or 6" below ceiling.
6. Maximum spacing shall be 100 feet. Maximum spacing in corridors shall be 50 feet.

B. Horns

1. Alarm horns shall be polarized and shall be operated by 24VDC. Each horn assembly shall include separate wire leads for in/out wiring for each leg of the associated signal circuit. The alarm horns shall be suitable for rear mounting.

2. The horn shall produce a sound level 15 dbA above the ambient and 5 dbA above any maximum sound which may exist for 60 seconds or longer.

3. Mounting height shall be not less than 90” above floor or 6" below ceiling.

4. Maximum spacing shall be 100 feet. Maximum spacing in corridors shall be 50 feet.

C. Audio/Visual Alarm Indicating Appliances

1. Audio/Visual units shall provide a common enclosure for the fire alarm audible and visual alarm devices. The housing shall be designed to accommodate either horns, bells, or chimes. The unit shall be complete with a tamper resistant, Pyramidal shaped lens with "Fire" lettering visible from a 180° field of view. Integral Xenon strobe shall provide a minimum light output of 4.5 candela at 24VDC at a 45 flashes per minute rate. Xenon strobes shall provide a 4-wire connection to insure properly supervised in/out system connection. Unit shall be complete with all mounting hardware including backbox.

2.14 REMOTE SIGNAL TRANSMISSION

A. Provide remote signal transmission devices for transmission of alarm and trouble signals over telephone lines. Provided by owner.

B. Provide for battery back-up capabilities.

C. Provide 3 years of U.L. Listed fire alarm monitoring in the contract bid price.

2.15 FIRE DOOR RELEASE

A. Furnish and install door holders where indicated on the contract drawings. Holders to have a brushed zinc or stainless steel finish with a contact plate that has a shock absorbing nylon swivel ball which allows the plated to adjust to any door angle. Holders to be 24VDC. The door holder is to have a holder force of 25 lbs. The device is to hold the door open until signaled by the fire alarm panel.

B. Furnish door hold power supply separate from fire alarm panel. Size and fuse supply as required by load. Add 25% safety factor to supply size.

2.16 REMOTE RELAYS

A. Furnish and install fire alarm remote relays. Relays to control devices such as fans, dampers, door releases, sprinkler valves, etc. Relays to have one each form "C" contact and one each form "A" contact, rated at 5A 24VDC or 115VAC resistive load.

2.17 WIRE AND CONDUIT

A. All wiring shall be installed in accordance with NFPA #70 (NEC).

B. The initiating circuit and interconnect wire is to be stranded 16 AWG THHN or equal. Horn circuit, relay circuit and door holder circuit wire to be stranded 12 AWG THHN. Color code circuits for easy identification.

C. All wiring to speakers shall be twisted pair, from the wire manufacturer, sized to carry the speaker load in each zone. Observe polarity to ensure all speakers are in phase.

D. All telephone wiring shall be twisted, jacketed pair YTD and not run with other wiring. Minimum wire gauge shall be No. 22 AWG.

E. All wiring shall be in conduit. The fire alarm contractor shall be responsible for the supply and installation of the conduit, wire, wire pulling, junction boxes, electrical boxes, and terminal cabinets in accordance with the manufacturer's recommendations. All junction boxes shall be painted red and labelled "Fire Alarm".

F. The fire alarm contractor shall inform the electrical contractor of the requirements of a dual conduit riser system.

G. No wiring other than detector and alarm circuits shall be permitted in fire alarm conduits. Wire shall conform to manufacturer’s required specifications. Wiring splices are to be avoided to the extent possible, and if needed, they must be made only in junction boxes and shall be properly connected. Transposing or changing color-coding of wires shall not be permitted or accepted.

2.18 SPECIALTIES

A. Sleeves and Seals

1. Where piping passes through walls, floors or other building construction which by code requires a fire rating, sleeves shall be used. Proposed protection shall be submitted for approval. Fire alarm contractor shall provide engineer with a list of penetrations and how sealing was performed.

2.19 PRODUCT DELIVERY AND HANDLING

A. Deliver materials to project site and store in one location as directed. Maintain storage area in a clean, neat condition. Provide heated storage when required. No material will be allowed at the project site until approved submittals are delivered to the general contractor.

B. Store new materials and those removed during demolition in such manner as to protect from damage. Immediately replace damaged materials with new undamaged materials without additional cost.

PART 3 - EXECUTION

3.1 DESIGN CRITERIA

A. Approximate fire alarm devices, alarm panel, horn, and detector arrangement is indicated on the drawings. Contractor is responsible for all required devices and locations whether shown or not if code required.

B. The fire alarm system supplier shall design the system and detection to activate the system. Conduit shall be laid out so as not to interfere with the installation of other piping, ductwork or light fixtures.

C. The entire fire alarm system is not shown on plans. The intent is to provide complete fire alarm systems as required. This Contractor shall be responsible for surveying the site, existing construction, and new construction, and prepare working drawings for the total system. Contractor shall provide additional devices as required. Do not bid a parts list. Bid a complete system only.

D. All conduit shall be run concealed wherever possible. Where conduit is run exposed, special notation on Contractor's drawings to that effect shall be evident and conspicuous on the drawings. Any conduit determined to be a problem shall be relocated at no cost to the Owner.

3.2 SYSTEM ALARM SEQUENCE OPERATION

A. The system alarm operation upon alarm activation of any manual station, automatic detection device, or sprinkler flow switch is to be as follows:

1. All audible/visual alarm notification appliances shall sound a continuous fire alarm signal until silenced by the alarm silence switch at the control panel.

2. Audible/Visual alarms shall operate selectively by floor zone(s) area when so programmed.

3. Alarm [and control] functions shall not operate until two, 2 software zones have been initiated, thus providing "Cross Zoning" of two or more zones. Provide this feature when shown on plan.

4. All doors normally held open by door control devices shall release.

5. A supervised signal to an approved central station shall notify the local fire department. To accommodate and facilitate job site changes, the type of "city connection circuit" is to be on-site configurable to provide either a "reverse polarity", "local energy", "shunt" or "dry contact connection".

6. The fire alarm mechanical controls shall activate the air handling systems. Provide U.M.C. 97 Edition compliance

7. An alarm is to be displayed on the panel display. The alarm LED shall flash on the control panel [and the remote annunciator] until the alarm has been acknowledged at the control panel. Once acknowledged, this same LED shall latch on. A subsequent alarm received from another point after acknowledged shall flash the alarm LED on the control panel and the panel display shall show the new alarm information. A pulsing alarm tone shall occur within the control panel until acknowledged.

8. Event shall log in history log.

B. The alarm activation of any elevator lobby, shaft or equipment room smoke detector, shall, in addition to the operations listed above, cause the elevator cabs to be recalled according to the following sequence:

1. If the alarmed detector is on any floor other than the main level of egress, the elevator cabs shall be recalled to the main level of egress.

2. If the alarmed detector is on the main egress level, the elevator cabs shall be recalled to the pre-determined alternate recall level as determined by the local authority having jurisdiction.

C. The alarm activation of any elevator heat detector in a sprinklered building shall immediately initiate elevator shut down.

D. The system shall be capable of being actuated by manual stations located at each normal egress exit. The manual station shall be of the electrical actuation type and be supervised at the control panel.

E. If trouble develops, the system functions as follows:

1. A visual and audible indication is activated at the main control panel. The visual signal indicates the zone of the trouble condition. Local audible and visual alarms shall sound at the Control Panel and Remote Annunciator Panel.

2. Removal of any plug-in detection device shall cause a trouble condition to exist.

3. All doors normally held open by door control devices shall release upon AC power failure.

4. Event shall log in history log.

3.3 INSTALLATION

A. Final connections between the equipment and the wiring system shall be made by the direct employee of an authorized dealer of the system manufacturer.

B. Where details of installation are not given, the installation shall be made using manufacturer's recommended practices or at the direction of the Contracting Officer.

C. Contractor shall make the fire alarm system ready for operation, in all respects, as soon as possible. When system is complete and ready for continuous operation, activate the system for its intended use. The entire system shall be in service fourteen days prior to the final inspection by the authority having jurisdiction.

D. This contractor shall remove from the building, all rubbish and unused materials due to or connected with this installation prior to installation of any smoke detector.

E. The surface of all exposed conduit shall be cleaned and left ready for painting.

3.4 FINAL TESTS AND REPORT

A. Notify the Contracting Officer in writing, when the system is completely installed and ready for final inspection and approval.

B. The contractor shall submit a "Test Plan" which shall describe how the system will be tested. This shall include a step-by-step description of all tests and shall indicate type and location of test apparatus to be employed. The tests shall demonstrate that the operating and installation requirements of this specification have been met. All tests shall be conducted in the presence of the Owner.

C. This contractor shall call for inspection and obtain Certificate of Completion and Test from Fire Inspection Bureau under whose jurisdiction this installation occurs.

D. These tests are in addition to those specified elsewhere. Manufacturers Representative shall test all equipment and demonstrate the operation of the system to the Owner or his Representative. After completion and test, a Representative of the Manufacturer shall meet with the code enforcing authorities, demonstrate the system and obtain written approval of the local Fire Marshall.

. All wiring shall be checked and tested by the installing Contractor to insure that it is free of grounds or shorts. The minimum allowance resistance between any two conductors or between conductors and ground is ten (10) megohms, as checked with a megger. This test shall be made after all conduit, wire, detector bases, etc., are installed.

F. Tests shall demonstrate that the entire control system functions as intended. All circuits shall be tested, including automatic and manual activation equipment shut-down, alarm devices and battery backup. In addition, supervision of each device shall be tested.

G. If test results indicate that design intent was not achieved, the Contractor shall determine and correct cause of failure. The Contractor shall then conduct a retest at no additional cost to the Owner. Contractor shall continue testing until all requirements have been met.

H. Upon completion of the installation and system tests, the certified test technician shall submit to the Contracting Officer three copies of a written report on forms provided by the manufacturer, to indicate the system has been fully tested in supervision, trouble and alarm modes and is fully operational conforming to the letter of these Specifications. Provide computer generated printed reports for sensitivity tested device, etc.

The test report shall contain, but is not limited to, the following:

1. A complete list of equipment installed and wired.

2. Indication that all equipment is properly installed.

3. Tests of individual zones as applicable.

4. Technician's name and date of certification.

5. A signed written statement substantially in the form as follows:

The undersigned, having been engaged as the Contractor for the Fire Alarm System in the construction of the _____ hereby confirms that the fire alarm equipment was installed in accordance with the wiring diagrams, instructions and directions provided to the undersigned by the Fire Alarm Manufacturer. It has been completely tested, demonstrated to the Owner or his Representative and accepted by the appropriate code enforcing Authority.

I. The Owner's representative and the Fire Inspection representative shall be present at all tests. Contractor to notify Owner 5 days prior to testing.

3.6 SYSTEM INSPECTIONS

A. The contractor shall provide two inspections of each system under this Contract during the one (1) year warranty period. The first inspection shall be at the six month interval after system acceptance and the second at the 12 month interval. Inspections shall include that the system is in proper working order. Inspection shall also include a complete checkout of the control and alarm system. Documents certifying satisfactory system conditions shall be submitted to the Owner's technical representative upon completion of each inspection.

END OF SECTION

This page intentionally left blank.

SECTION 16740A - TELEPHONE/DATA SYSTEM/CONDUIT ONLY

PART 1 - GENERAL

1.1 SCOPE

A. The Electrical Contractor shall furnish and install an empty raceway system, junction boxes, outlet boxes and plywood backboard[s] as shown on the contract drawings.

1.2 RELATED WORK

A. All work performed under this section of the specifications shall be subject to the requirements of both the General and Special Conditions and the Electrical Specification.

B. Related work specified elsewhere:

Raceway and Fittings	Section 16110
Outlet Boxes	Section 16130
Supporting Devices	Section 16190

1.3 WORK BY OTHERS

A. The complete telephone/data system including installation, telephone equipment, telephone cable, cover plates, telephones, data equipment, data cable, etc., shall be furnished and installed by others.

1.4 JOB CONDITIONS

A. The Contractor shall investigate the structural and finished conditions affecting the work, and shall arrange the equipment accordingly; furnishing required fittings, offsets and accessories.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1 INSTALLATION

A. Furnish and install an empty conduit system and junction boxes as shown on the contract drawings. Minimum size conduit shall be 3/4 inch diameter. Conduit shall be stubbed 90 degrees into accessible ceiling space with end of conduit bushed. Provide a separate nylon pull-string in all empty conduit for each outlet to the terminal board.

B. Furnish and install 3/4 INCH, AC plywood backboards, painted with two coats of white enamel, size as indicated on the contract drawings.

C. Provide and install a #6 AWG ground wire connected to the utility service entrance ground at all telephone backboards.

END OF SECTION

THIS ENTIRE SECTION IS ADDED BY AMENDMENT 0001

SECTION 16770 - PUBLIC ADDRESS SPEAKER SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. Design, provide and install a public address system for all areas, interior and exterior shown on drawings and consisting of:

1. Installation of a new public address speaker system; including speakers, wire, conduits.

2. Owner will provide head unit, amplifiers, microphones, racks, cabinets, etc.

3. All necessary conduit, pullwires, boxes, speaker backboxes, etc. shall be provided by the electrical subcontractor.

4. The public address subcontractor shall coordinate all requirements with the electrical subcontractor. Any additional requirements or detail not shown on the drawings, but required for a complete public address system will be the responsibility of the public address subcontractor.

1.2 RELATED WORK

A. All work performed under this section of the specifications shall be subject to the requirements of both the General and Special Conditions and the Electrical Specification.

B. Related work specified elsewhere:

Raceway and Fittings	Section 16110
Outlet Boxes	Section 16130
Supporting Devices	Section 16190

C. Examine the above referenced specification parts thoroughly before submitting a proposal for accomplishment of work in this section.

1.3 REGULATORY AGENCIES

A. Meet requirements of the following:

1. National Electrical Code (NFPA 70).

2. Underwriters Laboratories.

3. Factory Mutual.

4. American Society of Testing Materials.

5. American National Standards Institute.

6. Occupational Safety and Health Administration.

7. Uniform Building Code.

1.4 SUBMITTALS

A. Within five (5) days after award of contract, Contractor shall submit for approval, twelve (12) copies of product information and shop drawings with the following minimum data for all materials, equipment and appurtenances required under this section and shall include job name, locations and governing specification paragraph or subparagraphs, and/or governing drawing numbers.

B. All items of material and equipment required shall be submitted in a prepared complete single package, in indexed brochure form, for each system in this section, and shall bear the approval of the Contractor, the Owner, and the Architect, prior to ordering or installing of any equipment and/or work.

C. Submittal items shall include but not be limited to:

1. Public Address System

a. Speakers

b. Wire

1.5 JOB CONDITIONS

A. Contractor will familiarize himself with the project site including architectural, structural, electrical and mechanical field conditions. Drawings and specifications will also be used to plan installation of work in coordination with other trades.

B. No additional costs will be paid by the owner for runs of conduit, equipment, materials or other

items which must be relocated due to conflicts with work of other Sections.

C. Coordinate equipment in area with ductwork, electrical conduit, plumbing, and HVAC piping, fire sprinklers, etc.

D. Become familiar with electrical, air conditioning, heating and ventilating, architectural, structural, plumbing, drawings and specifications to plan the installation of public address system work, in coordination with other sections to provide the best assembly of combined work.

E. Make changes in work required because of substitutions of equipment by other sections without additional cost to the owner.

F. The drawings indicate approximate locations of equipment.

G. All fees and permits specifically required for public address system work, not obtained by others as specified elsewhere shall be applied for and paid for by this contractor.

H. All systems of public address shall be installed by a licensed (for the location of installation) Fire Protection Contractor, fully experienced in fire protection installation as specified herein.

I. Public Address Contractor may be required to provide in writing, specific information as to successfully completed projects and references to show cause as to why they should be considered acceptable to the Architect.

1.6 RECORD DRAWINGS

A. Maintain at the job site one set of up to date Record Drawings, upon which all deviations and changes are to be noted.

B. At the completion of the job, transfer all notations on these Record Drawings, to a set of transparency tracings, which will be furnished by the Owner at Contractor's expense, on request, so as to provide an accurate record of the installation.

C. These transparencies shall then be turned over to Owner or their designated representative for their records, prior to the request for final payment. Submit as-builts in accordance with Section 01300.

D. Certification: Submit one (1) copy of each interim test or inspection certification, except submit six (6) copies of final inspection and acceptance reports.

1.7 GUARANTEES AND WARRANTIES

A. The contractor shall furnish in writing a guarantee for one (1) year from date of final acceptance of his complete scope of work. He shall replace promptly and without charge for any material, service, or transportation of any item proving defective. This Contractor shall also restore any of the existing work damaged in the course of repairing defective materials or workmanship. Warranty shall include two (2) periodic inspections of the Systems at the six month intervals specified under Testing.

B. This written guarantee along with all necessary maintenance manuals, parts list, certificates of approval and/or acceptance of the complete installation by local, state or other authorities having jurisdiction and any applicable warranties, shall be furnished to the owner by the Contractor as set forth in Section 01700, Contract Closeout.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A.1 Rauland
A.2 Soundolier
A.3 Bogen
A.4 Dukane
A.5 Other manufacturers with prioir approval

2.2 PUBLIC ADDRESS SPEAKER SYSTEM shall be as follows:

1. The amplifier shall be connected to the speakers with a 70.7 volt line. The speakers shall be connected using tapped matching transformers to allow for individual power adjustment to each speaker. Room and hall speakers shall be rated at least 5 watts RMS and may be wall or ceiling mount as appropriate. The speakers in the fabrication shop and any exterior building speaker to the courtyard shall be horn style and rated for at least 10 watts RMS.

2. Speaker wire will be shielded #18 AWG minimum.

2.3 PRODUCT DELIVERY AND HANDLING

A. Deliver Materials to project site and store in one location as directed. Maintain storage area in a clean, neat condition.

B. Store new materials and those removed during demolition in such manner as to protect from damage. Immediately replace damaged materials with new undamaged materials without additional cost to the owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Number of wires and size of conduit as required. Limit conduit fill to 40 percent. Size of wire shall be as required to limit "db" loss to 1 db or less at full power. Type of wire as recommended by Public Address System manufacturer. Coordinate conduit size and rating with electrical subcontractor.

B. Installation shall be by a qualified full time stocking sound equipment dealer and contractor for installation and service of sound equipment.

C. Provide and install all items for a complete and operable P/A speaker system even if they are not specifically called out.

END OF SECTION

This page intentionally left blank.