IOWA DEPARTMENT OF NATURAL RESOURCES

PROJECT MANUAL

LAKE DARLING STATE PARK

DESIGN GUIDE CABINS

WASHINGTON COUNTY, IOWA

PREPARED BY

IOWA DEPARTMENT OF NATURAL RESOURCES
ENGINEERING BUREAU
502 E. 9TH STREET, WALLACE STATE OFFICE BUILDING
DES MOINES, IOWA 50319-0034

PROJECT N0. 15-06-92-01

Obtain complete sets of contract documents including Drawings, Specification, bid documents, bidders' list in electronic format at: *www.beelineandblue.com*

DESIGN GUIDE CABINS
LAKE DARLING STATE PARK
WASHINGTON COUNTY, IOWA
PROJECT NO. 15-06-92-01

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Notice to Bidders - Iowa Department of Natural Resources

Sealed bids will be received by the Iowa Department of Natural Resources, Engineering Bureau, at the Wallace State Office Building, 502 East 9th Street, Des Moines, Iowa 50319-0034 until **11:00 A.M., OCTOBER 23, 2014** for the public improvement projects listed below, at which time they will be opened publicly. No bids shall be accepted by FAX. After the bid opening, information concerning bid results may be obtained by visiting the Department's website at www.iowadnr.gov.

> **Note:** The United States Postal Service (USPS) does not deliver mail or packages directly to the address provided above but rather to the Capitol Complex Mail Room. Extra time should be allotted for proposals sent by the USPS. The Iowa Department of Natural Resources shall not consider bids if they are not received by the Department of Natural Resources, either at its mail room or at its Fourth Floor Reception Desk, by the time and date described in this Notice to Bidders, regardless of whether the bid was mailed prior to that time and date or whether the bid was received at the Capitol Complex Mail Room or other state government location prior to that time and date.

Project documents, including drawings, specifications, proposal forms and addenda items for the project are available at Beeline and Blue, at 2507 Ingersoll Ave., Des Moines, Iowa 50312. Please visit www.beelineandblue.com or contact (515) 244-1611 for more information. Alternatively, Bid Documents can be viewed or printed online at https://programs.iowadnr.gov/engreal/projectlist.asp

The Department shall comply with all public improvement procurement laws, as outlined in the plans and specifications and including but not limited to: Iowa Code chapter 26 related to public construction bidding; Iowa Code chapter 73 related to preferences; Iowa Code chapter 573 related to labor and materials on public improvements; rules promulgated by the Department of Administrative Services – General Services Enterprise as they may apply; rules promulgated by the Department of Natural Resources and the Natural Resources Commission, as they may apply; and any federal statutes, rules and/or executive orders that may be associated depending on funding sources. Bidders shall comply with these laws to be considered and are encouraged to be familiar with public improvement procurement requirements and the bidding documents before submitting a bid.

Each bidder shall accompany the bid with a bid security as defined in Iowa code section 26.8. The bid security must be in an amount set forth in the bidding documents and made payable to the Iowa Department of Natural Resources. Failure to execute a contract for the proposed work and file an acceptable Performance Bond in an amount equal to 100% of the contract price and a certificate of liability insurance within thirty (30) days of the date of the award of the contract will be just and sufficient cause for the rescinding of the award and the forfeiture of the bid security.

SPECIAL NOTICE TO CONTRACTORS

CONTRACTOR IS RESPONSIBLE FOR CONTACTING STATE STORMWATER PROGRAM COORDINATOR (515/281-7017) FOR INFORMATION RELATING TO STORM WATER PERMIT THAT IS NECESSARY IF CONSTRUCTION ACTIVITIES DISTURB ONE ACRE OR MORE.

Direct questions concerning the Project Design, Drawings and Specifications to:

Ryan Richey, Architect
Wallace State Office Building
502 E. 9th St. – 4th Floor
Des Moines, Ia. 50319
Ph: (515) 979-0107

Direct questions concerning Site Review and Project Inspection to:

Heath Delzell, PE
District 6 Inspector
Carlisle, IA
Ph: (515) 979-0104

Direct questions concerning Bidding and Contract Procedures to:

Linda Miller, DNR Procurement
Wallace State Office Building
Des Moines, Iowa 50319-0034
Telephone: 515/281-3345

In accordance with House File 2622 implemented by Iowa Code Sections 442.42 (15) & (16) and 422.47.47(5), Contractors may purchase qualifying items for work on this contract exempt from sales tax. The DEPARTMENT will issue an authorization letter and exemption certificate to the prime contractor and each approved subcontractor." ***Complete information on qualifying materials and supplies can be found at www.state.ia.us/tax, the Iowa Department of Revenue and Finance (IDRF) Web site. Links are found in the Business Taxes and Local Government categories. 701 IAC 19.1-20 is found in Tax Research/Tax Research Library.***

Recorded bid results can be accessed at *https://programs.iowadnr.gov/engreal/projectlist.asp*. Printed bid tabs will not be available for 3 working days after the Letting date.

Time and Date of Letting **11:00 AM, OCTOBER 23, 2014**

PROPOSAL

Project No. **15-06-92-01**

Project Description and Location

DESIGN GUIDE CABINS
LAKE DARLING STATE PARK
WASHINGTON COUNTY, IOWA
PROJECT NO. 15-06-92-01

Proposal of: _____
(Name of Bidder)

Located at: _____ ( )
(Address) (Area) (Telephone)

Amount of Proposal Guarantee	Specified completion date or Number of Working Days	Approx. or Specified Starting Date or Number of Working Days	Liquidated Damages Per Day
$40,000.00	SEPTEMBER 1, 2015	NA	$500.00

The undersigned hereby agrees, if awarded the contract, to execute the proposed contract and to furnish an approved performance bond in a amount not less than 100 percent of the contract award within 30 days after the date of approval of award of the contract, and to provide all labor, materials, and equipment required to complete the project designated above, for the price hereinafter set forth, in strict compliance with the contract documents prepared by the Iowa Department of Natural Resources.

The undersigned agrees, if awarded the contract, to commence the work within a reasonable time after the preconstruction conference or by the specific starting date, if so specified, and to complete the work within the contract period, or to pay liquidated damages in the amount stipulated herein for each calendar day the work remains uncompleted after the expiration of the contract period or any authorized reduction thereof.

A proposal guarantee in the amount stipulated herein is included with this proposal, to be forfeited to the Iowa Department of Natural Resources if the undersigned fails to execute the contract and furnish an approved performance bond, if awarded the contract.

By virtue of statutory authority, preference will be given to products and provisions grown and coal produced within the state of Iowa, and also, a resident bidder shall be allowed a preference against a nonresident bidder from a state or foreign country which gives or requires a preference to bidders from that state or foreign country on projects in which there are no federal funds involved.

BY

_____ _____
(Iowa Contractor Registration No.) (Signed) (Date)

_____ _____
(FID/EIN/SSN) (Phone Number) (Fax Number)

_____
(Email Address)

THE FOLLOWING AFFIDAVIT MUST BE COMPLETED AND NOTORIZED, OR THIS BID WILL BE REJECTED.

- AFFIDAVIT-

The signatory. being duly sworn, does depose and say that the undersigned is an authorized representative of:

_____
(Name of Firm)

Located at: _____

Hereinafter referred to as “Bidder” and does hereby affirm to have personal knowledge that said bidder has examined the drawings and specifications, carefully prepared the proposal form, and has checked the same in detail before submitting; and that said bidder, or the agents, officers, or employees thereof, have not either directly or indirectly, entered into any agreement, participated in any collusion or fraud, or otherwise taken any action in restraint of free competitive bidding in connection with this bid.

_____
(Signed)

_____ Day of _____ , 20 _____

_____
(Signed Notary)

My Commission Expires _____ , 20 _____

SCHEDULE OF PRICES

Project Description and Location
DESIGN GUIDE CABINS
LAKE DARLING STATE PARK
WASHINGTON COUNTY, IOWA
PROJECT NO. 15-06-92-01

Name of Bidder

THE "UNIT PRICE" AND "AMOUNT" COLUMNS MUST BE FILLED IN FOR THIS PROPOSAL TO BE CONSIDERED COMPLETE. IF THERE IS A DISCREPANCY BETWEEN UNIT BID PRICES, EXTENSIONS, OR TOTAL AMOUNTS OF BID, THE UNIT PRICES SHALL GOVERN.

Item No.	Description	Estimated Quantity	Unit Price	Amount
1	CLEARING AND GRUBBING	LUMP SUM		
2	GRADING	LUMP SUM		
3	SEEDING, FERTILIZING AND MULCHING	LUMP SUM		
4	8″ FILTER SOCK	462 LF		
5	TYPE SW-301 SANITARY MANHOLE	1 EA		
6	6″ PVC SDR 23.5 SANITARY SEWER	395 LF		
7	4″ SANITARY SEWER SERVICE	808 LF		
8	4″ SANITARY SEWER SERVICE WYE	6 EA		
9	SANITARY SEWER SERVICE CLEANOUTS	5 EA		
10	4″X4″X2″ TAPPING TEE & VALVE	1 EA		
11	2″ PVC SDR 21 WATER MAIN	490 LF		
12	2″ BLOW-OFF HYDRANT & VALVE	1 EA		
13	1″ PE WATER SERVICE	678 LF		
14	1″ TAP SADDLES	6 EA		
15	WATER SERVICE CURB STOP	6 EA		
16	CLASS "A" CRUSHED STONE ROADWAY	326 TON		
17	GRANULAR BASE FOR PAVEMENT	309 TON		
18	5″ REINFORCED PCC SIDEWALK PAVEMENT	346 SY		
19	6″ REINFORCED PCC PAVEMENT	1004 SY		
20	PRECAST CONCRETE PARKING WHEEL STOPS	14 EA		
21	ELECTRICAL SERVICE	LUMP SUM		
22	PAINT STRIPING & HANDICAP SIGNAGE	LUMP SUM		

23	CABINS (INCLUDING ALL ARCHITECTURAL, MECHANICAL & ELECTRICAL)	6 EA		
24	CONSTRUCTION STAKING	LUMP SUM		
25	MOBILIZATION	LUMP SUM		
		TOTAL		

Bidder Acknowledges Receipt of Any Issued Addenda Below (Number and Date)

PROPOSAL GUARANTEE BOND

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES

KNOW ALL MEN BY THESE PRESENTS:

That we,_____

of_____as PRINCIPAL,

and_____

of_____as SURETY(S),
are hereby held and firmly bound unto the state of Iowa in the penal sum of:

_____Dollars $_____
for the payment, whereof, the said PRINCIPAL and SURETY(S) bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the PRINCIPAL is herewith submitting to the state of Iowa, acting by and through the Iowa Department of Natural Resources, hereinafter called the DEPARTMENT, its sealed proposal for a contract for the _____

_____

_____

at_____in_____County, Iowa.

NOW THEREFORE,
the conditions of this obligation are such that, if said proposal is rejected by the DEPARTMENT, or if said proposal is accepted by the DEPARTMENT and the PRINCIPAL shall enter into a contract in the form specified by the DEPARTMENT in accordance with the terms of the proposal and shall furnish a bond for the faithful performance of said contract in the form specified by the DEPARTMENT, this obligation shall be null and void. Otherwise it shall remain in full force and effect.

In the event that the said proposal is accepted by the DEPARTMENT and the PRINCIPAL shall fail to enter into the contract as defined herein or shall fail to furnish the performance bond as noted above within thirty (30) days of the approval of the award, the PRINCIPAL and SURETY(S) agree to forfeit to the DEPARTMENT the penal sum herein mentioned, it being understood that the liability of the SURETY(S) shall in no event exceed the penal sum of this obligation.

IN WITNESS WHEREOF,
the above bounden parties have executed this instrument under their several seals this _____ day of _____, 20_____, the name and corporate seal of each party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

PRINCIPAL:

By_____

_____

_____

_____

SURETY::

By _____

_____

_____

_____

If a partnership all partners must sign.

PGB-1

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES

CONTRACT
(CAPITAL IMPROVEMENT)

DESIGN GUIDE CABINS
LAKE DARLING STATE PARK
WASHINGTON COUNTY, IOWA
PROJECT NO. 15-06-92-01

THIS AGREEMENT, made this _____ day of, _____20_____by and between the state of Iowa acting through the Department of Natural Resources hereinafter called the **DEPARTMENT** and:

located at

hereinafter called the **CONTRACTOR**

WITNESSETH: That the **DEPARTMENT** agrees to pay the **CONTRACTOR** the contract price provided herein for the fulfillment of the work and the performance of the covenants set forth herein, and the **CONTRACTOR** agrees with the **DEPARTMENT** to commence and complete the project described as follows:

The DNR proposes to install six new two bedroom Design Guide Cabins at Lake Darling State Park. These cabins will have two bedrooms, full kitchen, living room, bathroom with vanity and tub/shower, covered deck and small mechanical room. They will have in-floor heat and split-system cooling and will operate year-round.

For the Sum of: **Dollars ($)**
and all extra work in connection therewith, all in accordance with the terms and conditions herein contained: and to furnish at the **CONTRACTOR'S** own proper cost and expense, all material, equipment, labor, insurance, and other accessories and services necessary to construct and complete, in a workmanlike manner, ready for continuous operation, the above mentioned project. The work shall be performed in accordance with the requirements and provisions of the following documents, all of which are made a part hereof and collectively evidence and constitute the contract:

1. Notice to Bidders.
2. Instructions to bidders.
3. IDNR Standard Specifications and Current Supplemental Specifications
4. Project Specifications Including Addenda Number _____ Through _____
5. Drawings, Sheet Number A-001 Through E3.0 Inclusive
6. Contractor's Proposal.
7. Proposal Guarantee Bond.
8. Performance Bond.
9. This Instrument.
10. Modifications or Change Orders pursuant to IDNR Standard Specifications
11. Resident Bidder Preference Certification on Non-Federal-Aid Projects

The parties to this contract understand that time of completion of the work under this contract is the essence to the contract. The **CONTRACTOR** hereby agrees to commence work under this contract in accordance with Section 1108 of the IDNR Standard Specifications and to complete all the work by SEPTEMBER 1, 2015

The **CONTRACTOR** hereby agrees that liquidated damages in the amount of FIVE-HUNDRED Dollars $ $500.00 shall be retained or assessed against the CONTRACTOR for each day and every day the completion of the work is delayed beyond the time specified herein, not as a penalty, but as a mutually agreed to, predetermined amount to reimburse the **DEPARTMENT** for salaries of engineers and reviewers, clerk hire, interest charged during the period for delays and loss of use.

It is understood that the **CONTRACTOR** consents to the jurisdiction of the courts of Iowa, to hear, determine and render judgment as to any controversy arising hereunder, and that this contract shall be governed by, and construed according to, the laws of the state of Iowa.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, in the day and year first above mentioned.

FOR THE DEPARTMENT:

Deputy Director

This contract was approved by the **NATURAL RESOURCES COMMISSION** at its meeting held on

(Date)

FOR THE CONTRACTOR:

(Signature and Title)

(Firm)

(Address and Zip Code)

Seal if by a Corporation:

Identification Number

Soc. Sec. No.

Or Fed. I. D. No.

PERFORMANCE BOND

STATE OF IOWA
DEPARTMENT OF NATURAL RESOURCES

KNOW ALL MEN BY THESE PRESENTS:

That we,_____

of_____as PRINCIPAL,

and_____

of_____as SURETY(S),
are hereby held and firmly bound unto the state of Iowa in the penal sum of:

_____Dollars $_____
for the payment, whereof, the said PRINCIPAL and SURETY(S) bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

The conditions of this obligation are such that whereas the PRINCIPAL entered a certain contract, hereto attached, and made part, hereof to the state of Iowa, acting by and through the Iowa Department of Natural Resources, hereinafter called the DEPARTMENT,

dated _____ for the _____

at_____in_____County, Iowa.

NOW THEREFORE,
the conditions of this obligation are such that, if the PRINCIPAL shall faithfully perform the contract in accordance with the plans, specifications and contract documents, and shall fully indemnify and save harmless the state of Iowa from all cost and damage which the state of Iowa may suffer by reason of the PRINCIPAL's default or failure to do so and shall fully reimburse and repay the state of Iowa all outlay and expenses which the state of Iowa may incur in making good any such default, then this obligation shall be null and void, otherwise it shall remain in force and effect.

In the event that the PRINCIPAL is in default under this contract as defined herein, the DEPARTMENT shall by written notice inform the PRINCIPAL that this contract is in default; and may, at its option, without process or action at law:

1. Take over all or any portion of the work and complete it either by day labor or reletting the work. The DEPARTMENT may retain all material, equipment and tools on the work, at a rental which it considers reasonable, until the work has been completed.
2. Allow the surety to take over the work within fifteen (15) days and assume completion of said contract and become entitled to the balance of the contract price.
3. Allow the PRINCIPAL to complete the contract.

As required by Chapter 573 of the Code of Iowa.

1. The PRINCIPAL SURETY(S) on this bond hereby agree to pay all persons, firms or corporations having contracts directly with the PRINCIPAL or with subcontractors, all just claims due them for labor performed or material furnished, in the performance of the contract on account of which this bond is given, when the same are not satisfied out of the portion of the contract price shall have been established as provided by law.

2. Every Surety on this bond shall be deemed and held, any contract to the contrary notwithstanding, to consent without notices:
   a. To any extension of time to the contractor in which to perform the contract.
   b. To any change in the plans, specifications, or contract, when such changes does not involve an increase of more than 20 percent of the total contract price, and then only as to such excess increase.
   c. That no provision of this bond or any other contract shall be valid which limits less than one year from the time of the acceptance of the work, the right to sue on this bond for defect in workmanship or material not discovered or known to the DEPARTMENT at the time such work was accepted.

No provision of this bond or any other contract shall be valid which limits to less than five years after the acceptance of the work, the right to sue on this bond for defects in workmanship or material in connection with paving or concrete work.

IN WITNESS WHEREOF,
the above bounden parties have executed this instrument under their several seals this _____ day of _____, 20_____, the name and corporate seal of each party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

PRINCIPAL:	**SURETY:**
By_____	By_____
_____	_____
_____	_____
_____	_____
_____	_____

If a partnership all partners must sign.

This bond approved by the Iowa Department of Natural Resources this _____ day of _____, 20 _____

By _____
Director

IOWA DEPARTMENT OF NATURAL RESOURCES
GENERAL COVENANTS AND PROVISIONS
SECTION NO. 00700
JANUARY 1993 (Revised 11/06/12)

This section consists of the general provisions applying to all types of construction and maintenance as set forth in the following sections

Part 1100. Definitions
Part 1101. Instructions to Bidders
Part 1102. Bidder Qualifications
Part 1103. Award and Execution of Contract
Part 1104. Scope of Work
Part 1105. Control of Work
Part 1106. Control of Materials
Part 1107. Legal Relations and Responsibilities to the Public
Part 1108. Prosecution and Progress
Part 1109. Measurement and Payment

PART 1100. DEFINITIONS

1100.01 GENERAL

A. Whenever in these specifications or in other contract documents, the following definitions, or terms or both, or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

B. In order to avoid cumbersome and confusing repetition of expressions in these specifications, it is provided that whenever anything is, or is to be done, if, as, or, when, or where "contemplated, required, determined, directed, specified, authorized, ordered, given, designated, indicated, considered necessary, deemed necessary, permitted, reserved, suspended, established, approval, approved, disapproved, acceptable , unacceptable, suitable, accepted, satisfactory , unsatisfactory, sufficient, insufficient, rejected, or condemned," it shall be understood as if the expression were followed by the words "by the Engineer" or "to the Engineer."

C. The titles or headings of the sections and articles herein, or referred to on the plans, are intended for convenience of reference and shall not be considered as having any bearing on their interpretation.

D. Working titles and pronouns used for any person referred to in these specifications may be used with a masculine gender for the sake of brevity and are intended to refer to persons of either sex.

1100.02 DEFINITIONS OF ABBREVIATIONS

A. Whenever the following abbreviations are used in these specifications or on the plans, they are to be construed the same as the respective expressions represented.

AAN - American Association of Nurserymen
AAR - Association of American Railroads
AASHTO (or AASHO) - American Association of State Highway and Transportation Officials
ACI - American Concrete Institute
AIA - American Institute of Architects
ANSI - American National Standards Institute
APWA - American Public Works Association
ARA - American Railway Association
AREA - American Railway Engineering Association
ASCE - American Society of Civil Engineers
ASLA - American Society of Landscape Architects
ASTM - American Society of Testing and Materials
AWPA - American Wood Preservers Association
AWS - American Welding Society

AWWA - American Water Works Association
CFR - Code of Federal Regulations
DNR - Iowa Department of Natural Resources
DOT - Iowa Department of Transportation
EEI - Edison Electric Institute
EPA - Environmental Protection Agency
FHWA - Federal Highway Administration
FSS - Federal Specifications and Standards
IEES - Institute of Electrical and Electronics Engineers
IES - Illuminating Engineering Society
ICEA (or IPCEA) - Insulated Cable Engineers Association
MUTCD - Manual on Uniform Traffic Control Devices
NEC - National Electrical Code
NECA - National Electrical Contractors Association
NEMA - National Electrical Manufacturers Association
NFPA - National Fire Protection Association
NRC - Natural Resource Commission
SBC - State Building Code
UBC - Uniform Building Code
UL - Underwriters Laboratories, Incorporated
UMC - Uniform Mechanical Code
UPC - Uniform Plumbing Code
US - United States
USC - United State Code

B. Abbreviations may be used for materials and classes of work:

AC - Asphalt cement
ACC - Asphalt cement concrete
ATB - Asphalt treated base
BSC - Bituminous seal coat
BTA - Bituminous treated aggregate
CTG - Cement treated granular
PCC - Portland cement concrete
SAS - Soil-aggregate subbase
SLS - Soil-lime subbase

1100.03 DEFINITIONS OF TERMS

1. Acceptable Work - Work in reasonably close conformance with the contract requirements.

2. Addendum or Addenda - Changes, revisions, or clarifications of the specifications of contract documents which have been issued to prospective bidders, prior to the time of receiving bids.

3. Advertisement - The public announcements, publications, or solicitations as required by the Contracting Authority, inviting bids for work to be performed.

4. Approval of Award - The acceptance by the Contracting Authority of a bid.

5. Approximate Starting Date - A calendar day shown on the proposal on which it is anticipated, at the time of the letting, that conditions will be such as to permit the Contractor to commence work.

6. Assignment of Contract -The written agreement whereby the Contractor sells, assigns, or transfers his rights in the contract to any person, firm, or corporation.

7. Award - The execution of the contract.

8. Bidder - An individual, firm, corporation, or joint venture submitting a bid for the advertised work.

9. Calendar Day - Every day shown on the calendar.

10. Change Order - A written order to the Contractor, signed by the Engineer, ordering a change which has been found necessary in the work from that originally shown by the plans and specifications. Change orders duly signed and executed by the Contractor constitute authorized modifications of the contract.

11. Channel - A natural or artificial water course.

12. Chief Engineer - An engineer appointed by the Iowa Department of Natural Resources as the head of the Construction Service Bureau.

13. Classes of Work - The divisions made for the purpose of measuring and paying for labor to be performed or materials to be furnished according to the methods of construction involved, as indicated by the items for which bids have been received for each specific contract.

14. Commencement of Work - Work will be considered commenced when the Contractor's operations are started on items of work covered by the contract documents and which require inspection, or when the Contractor notifies the Engineer, and the Engineer agrees, that the Contractor's equipment and personnel are available at the site, but his operations are prevented by weather or soil conditions.

15. Commission - The state Natural Resources Commission as constituted under the laws of the state of Iowa (which is the party of the first part in the contract, let in behalf of the State, of which these specifications are a part).

16. Commissioner - A member of the state Natural Resources Commission.

17. Contract (Also Contract Document) - The written agreement between the Contracting Authority and the Contractor setting forth the obligations of the parties thereunder, including, but not limited to, the performance of the work, the furnishing of labor and materials, and the basis of payment. The contract includes the notice to bidders, proposal, contract form, and contract bonds specifications, supplemental specifications, special provisions, all items covered on the table of contents, plans, notice to proceed, and any change orders and agreements which are required to complete the construction of the work in an acceptable manner, including authorized extensions thereof, all of which constitute one instrument.

18. Contract Item (Pay Item) - A specifically described unit of work for which a price is provided in the contract.

19. Contract Period (Also Contract Time) - The number of working days or calendar days allowed for completion of the contract, including authorized time extensions. In case a calendar date of completion is shown in the proposal, in lieu of or in addition to the working days, the contract shall be completed by that date.

20. Contract Sum - The aggregate sum obtained by totaling the amounts arrived at by multiplying the number of units of each class of work, as shown in the contracts by the unit price specified in the contract for that class of work.

21. Contracting Authority - The governmental body, board, commission, or officer having authority to award a contract.

22. Contractor - The individual, firm, corporation, or joint venture contracting with the Contracting Authority for performance of prescribed work.

23. Contractor Registration - The registration number issued by the Division of Labor Service, in accordance with Chapter 91C of the Code of Iowa.

24. Deficient Work - Work not in reasonably close conformance with the contract requirements, or otherwise inferior, but in the opinion of the Engineer, reasonably acceptable for its intended use and allowed to remain in place.

25. Department of Economic Development - As defined in Chapter 15, Code of Iowa.

26. Department of Labor Services - As defined in Chapter 91, Code of Iowa.

27. Department of Natural Resources (Department)- The Department of Natural Resources, as defined in Chapter 455A, Code of Iowa.

28. Department of Revenue and Finance - As defined in Chapter 421, Code of Iowa.

29. Department of Transportation -The Department of Transportation, as defined in Chapter 307, Code of Iowa.

30. Director - The duly appointed executive officer for the Department of Natural Resources.

31. Drainage Ditch -An artificially constructed, open depression, other than a road ditch, which is constructed for the purpose of carrying surface water runoff .

32. Drawings (or Plans) - The approved plans, profiles, typical cross sections, working drawings, and supplemental drawings, or exact reproductions thereof, including modifications, altered plan, revisions, and amendments, which show the locations characters dimensions, and details of the work to be done.

33. Employee - Any person working on the project, mentioned in the contract of which these specifications are a party, and who is under the direction or control, or receives compensation from, the Contractor or subcontractor.

34. Engineer - The Chief Engineer, or other Engineer of the Contracting Authority, acting directly or through a duly authorized representative, such representative acting within the scope of the particular duties assigned, or of the authority given.

35. Equipment - All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and tools and apparatus necessary for the proper construction and acceptable completion of the work.

36. Extra Work - Work not provided for in the contract, as awarded, but deemed essential to the satisfactory completion of the contract within its intended scope and authorized by the Engineer. Extra work shall not include additional materials, equipment, and labor used due to natural variations in the surface and subsurface conditions, except as specifically provided for elsewhere in the contract documents.

37. Extra Work Order - A change order concerning the performance of work or furnishing of materials involving additional work. Such additional work may be performed at agreed prices, or on a force-account basis, as provided elsewhere in these contract documents.

38. Independent Contractor - Any persons firms or corporation who contracts with the Contractor to perform a service for which the basis of payment is in terms of units of service rather than salary or wages.

39. Inspector - An employee of the Contracting Authority and who is the authorized representative of the Engineer, assigned to make detailed inspections of any or all portions of the work, or materials included in the work.

40. Instruction to Bidders - The clauses setting forth in detail the information relative to the proposed work and requirements for the submission of proposals.

41. Invitation for Bids - See Notice to Bidders.

42. Item -See Contract Item.

43. Joint Venture - Two or more individuals, films or corporations combining any equipment, personnel or finances for the purpose of submitting a single bid.

44. Laboratory - The testing laboratory of the Contracting Authority, or any other testing laboratory which may be designated or approved by the Engineer.

45. Lands Acquired for the Work - The land area, reserved or secured by the Contracting Authority, upon which to construct the work, or where to obtain material therefrom.

46. Major Item of Work - Any contract item (Pay item) for which the original contract amount plus authorized additions is more than 10% of the total original contract sum or $50,000 whichever is less.

47. Materials - Any substances specified for use in the construction of the project and its appurtenances.

48. Notice to Bidders - That portion of the contract documents, prepared and furnished by the Contracting Authority for the information of bidders submitting proposals, which notice specifies provisions, requirements, and instructions pertaining to the method, manner, and time of submitting bids.

49. Notice to Proceed - Written notice to the Contractor to proceed with the contract work including, when applicable, the date of beginning of contract time.

50. Official Publications - The official publications are the formal resolutions and notices relative to the proposed improvement that are required by law to be published in a prescribed manner and that have been published in accordance with the statutes relating to them. Official publications area by statutes vested with all of the force and effect of contract obligations.

51. Owner - The state of Iowa, acting through the Iowa Department of Natural Resources as constituted under the laws of the state of Iowa.

52. Performance Bond - The bond executed by the Contractor and its surety in favor of the owner, guaranteeing the faithful performance of the contract and the payment of all debts pertaining to the work.

53. Plans (or Drawings) - The approved plans, profiles, typical cross sections, working drawings, and supplemental drawings, or exact reproductions thereof, including modifications, altered plan, revisions, and amendments, which show the locations characters dimensions, and details of the work to be done.

54. Project - One or more correlated improvements which constitute the complete improvement of a designated park, recreational reserve, state monument, lake, reserve, game area, fish hatchery, parkway, or other area under jurisdiction of the Department of Natural Resources.

55. Project Engineer - The representative of the Department of Natural Resources, regardless of actual title, directly in change of the work.

56. Proposal - The formal offer of a bidders on the prescribed form, to perform the work and to furnish the labor and materials at the prices quoted.

57. Proposal Form - The approved form on which the Contracting Authority requires formal bids to be prepared and submitted for the work.

58. Proposal Guarantee - The security furnished by the bidder with his/her proposal for a projects as guarantee he/she will execute the contract for the work if the proposal is accepted.

59. Reasonably Close Conformity - Reasonably close conformity means compliance with reasonable and customary manufacturing and construction tolerances where working tolerances are not specified. Where working tolerances are specified, reasonably close conformity means compliance with such working tolerances. Without detracting from the complete and absolute discretion of the Engineer to insist upon such working tolerances as establishing reasonably close conformity, the Engineer may accept variations beyond such tolerances, as reasonably close conformity, where they will not materially affect value or utility of the work and the interest of the State.

60. Right-of-Way - The land area, the right to possession of which is secured or reserved by the Contracting Authority for road purposes.

61. Road - A general term denoting a public way for vehicular travel, including the entire area within the right-of-way.

62. Shop drawings - See "working drawings".

63. Special Provisions - Additions and revisions to the standard and supplemental specifications covering conditions peculiar to an individual project, method and manner.

64. Specifications - The requirements contained herein and in any supplemental specifications, or special provisions applying to the contract, and pertaining to the method and manner of performing the work, or to the quantity and quality of the materials to be furnished under the contract.

65. Specified Completion Date - The date specified in the proposal for completion of the work. After work has commenced or if the completion date is not specified, the last day of the contract period shall be the completion date.

66. Specified Starting Date - A calendar day shown on the proposal on which date commencement of the work is expected.

67. State - The State of Iowa acting through its authorized representative.

68. Station - One hundred lineal feet.

69. Subcontractor - Any individual, firm, or corporation to whom the Contractor, with the written consent of the Contracting Authority, sublets any part of the contract.

70. Superintendent - The Contractor's authorized representative in responsible charge of the work.

71. Supplemental Agreement - Written agreement between the Contractor and the Contracting Authority, modifying the original contract.

72. Surety - The corporation, partnership, or individual, other than the Contractor, executing a bond furnished by the Contractor.

73. Targeted Small Business - Any enterprise, located in the state of Iowa, which is operated for profits under a single management, and which is 51 percent owned, operated, and actively managed by one or more women or minority persons, and has been certified by the Iowa Department of Economic Development.

74. Unacceptable Work - Work not in reasonably close conformance with the contract requirements and ordered to be removed and replaced.

75. Unauthorized Work - Work neither contemplated by the contract documents nor authorized by the Engineer, and work done contrary to the instructions of the Engineer.

76. Work - Work shall mean the furnishing of all labor, materials, equipment, and other incidentals, as detailed in the plans, specifications, and by the Engineer, necessary or convenient to the successful completion of the project and the carrying out of all the duties and obligations imposed by the contract.

77. Work Order - A written order, signed by the Engineer, of contractual status, requiring performance by the Contractor without negotiation of any sort, and which may involve starting, resuming, or the suspension of work. (Not to be confused with extra work order.)

78. Working Day - Prior to commencement of work, beginning on the date designated in the notice to proceeds or beginning on the specified starting date, or as soon thereafter as provided in the specifications, a day other than Saturday, Sunday, or another recognized legal holiday. Any weekdays exclusive of Saturdays, Sundays, or a recognized legal holidays on which weather or other conditions not under control of the Contractor, will permit construction operations to proceed for not less than 3/4 of a normal workday in the performance of a controlling item of work. If such conditions permit operations to proceed for at least 1/2 but less than 3/4 of the normal working hours, 1/2 of a working day will be counted. The days counted will exclude Saturdays, Sundays, and recognized legal holidays the Contractor does not work, but will include Saturdays, Sundays, and recognized legal holidays the Contractor does work. Nonproductive work that does not require inspection may be done on Saturdays with no time charged. Working days will not be charged for the day before or after a holiday when the contract documents specifically prohibit work and the Contractor does not work. Working days will not be counted during periods of suspension of work ordered by the Engineer, except when the suspension is a result of a violation of terms of the contract.

79. Working Drawings - Stress sheets, shop drawings, erection plans, falsework plans, framework plans, cofferdam plans, bending diagrams for reinforcing steel, or any other supplementary plans or similar data which the Contractor is required to submit to the Engineer for approval. Also referred to as "shop drawings". After approval by the Engineer the working drawings became a part of the plans.

PART 1101. INSTRUCTIONS TO BIDDERS

1101.01 GENERAL

A. These instructions are intended to serve as a guide to the requirements with which the bidder must comply prior to and in submitting a proposal, including various "conditions" affecting the award of the contract. They do not in themselves inform the bidder of all the requirements that must be complied with under the contract.

B. The time for bid openings shall be the prevailing Central Standard or Daylight Savings time in force at Des Moines, Iowa on the date set forth in the Notice to Bidders.

C. Before submitting a bid, the bidder shall examine all the drawings and specifications enumerated in the table of contents of this project manual. The successful bidder will be required to do all the work that is shown on the drawings, mentioned in the specifications, or reasonably implied as necessary to complete this contract.

D. The bidder shall visit and examine the site to become acquainted with the adjacent areas, means of approach to the site, conditions of the actual job site, and the facilities for delivering, storing, placing, and handling of materials and equipment.

E. Failure to visit the site or failure to examine any and all contract documents will not relieve the successful bidder from the necessity of furnishing any materials or equipment, or performing any work that may be required to complete the work, in accordance with the drawings and specifications. Neglect of the above requirements will not be accepted as reason for delay in the work or additional compensation.

1101.02 DRAWINGS AND SPECIFICATIONS

A. The drawing and specifications, which are part of this contract, are enumerated in the table of contents of this project manual.

B. It is the responsibility of the bidder to examine the plans, proposal form, specifications, supplemental specifications, special provisions, the site of the works and the state of the work of other contractors on the project to assure that all requirements of the contract and the plans are fully understood. It is the bidder's responsibility to satisfy herself/himself as to the nature of the work and all reasonably ascertainable conditions that may affect his/her performance under the contract.

1101.03 INTERPRETATION

A. Nonverbal explanation or instructions will be given in regard to the meaning of the drawings or specifications during the bid period. Bidders shall bring all inadequacies, omissions, or conflicts to the Engineer's attention, at least ten days before the date set for the bidding. Prompt clarification will be supplied to all bidders of record by addendum.

B. Neither the Department of Natural Resources nor the Engineer will be responsible for verbal instructions.

C. Failure to request clarification or interpretation of the drawings and specifications will not relieve the successful bidder of responsibility. Signing of the contract will be considered as an implicit indication that the Contractor has thorough understanding of the scope of the work and comprehension of the contract documents.

1101.04 CONTENTS OF PROPOSAL FORMS

A. Bidders will be furnished with proposal forms stating the location and description of the proposed work, the approximate quantities of work to be performed or materials to be furnished, the form and amount of the required proposal guarantee, and the contract period.

B. The statement, "By virtue of statutory authority, preference will be given to products, provisions grown and coal produced within the state of Iowa where applicable," which is on the face of the proposal form shall not be applicable to contracts involving Federal-aid participation in construction.

C. The following bidding and letting regulations shall apply to all construction projects for which the Department receives bids.

1. Contracts will be recommended for approval for award on the basis of the greatest total savings in the public interest. The determination of which projects are to be awarded will be based on the approval by the appropriate Commission or other contracting agency.

2. Contractors shall not be permitted to tie projects or to designate on the bidding proposal the limit of the amount they will accept.

1101.05 PREPARATION OF PROPOSALS

A. Only signed proposals, submitted on forms furnished by the Contracting Authority, will be considered, and the bidder will be assumed to have familiarized himself with the requirements of all applicable contract documents. To insure consideration, the bidder shall specify a unit price in figures for each pay item for which a quantity is given and shall also show the products for the respective unit prices and quantities, written in figures in the column provided for the purposes and the total amount of the proposal obtained by adding the amounts of the several items. All the unit price figures shall be in ink or typed. If there is a discrepancy between unit bid prices, extensions, or total amounts of bid, the unit bid prices shall govern.

B. If the proposal is made by a partnership or corporations the name of the partnership or corporations its agents and its principal place of business shall be shown. The proposal shall be signed by an authorized agent of the partnership of corporation.

C. If the proposal is made on the basis of a joint bid, the proposal shall be signed by each of the joint bidders, or in the case of a firms' partnerships or corporations by an authorized agent for such firms' partnerships or corporations and the principal place of business for each shall be shown.

D. For work let by the DNR, the sworn affidavit on the proposal shall be executed by the bidder of an agent thereof, on behalf of each person, firm, association, partnership, or corporation submitting a proposals certifying that such person, firm, association, partnership, or corporation has not, either directly or indirectly, entered into any agreements participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with such contracts and is not under debarment currently by the Federal government for a criminal violation which is reasonably related to bidding and contracting procedures.

E. The attention of the bidders for the work covered by a proposal and referred to as this work, is directed to the fact that contracts for work other than the work covered in this proposal may have been awarded, are being advertised for letting on the same date as this work, or may be awarded in the future.

F. Completion of work covered by this proposal may be contingent upon certain work covered by other contracts being performed on the project in advance of this work, likewise, completion of work covered by other contracts may be dependent upon completion of work covered by this proposal.

G. The contract documents will list types of work involving other contracts anticipated to be let on the same letting date or same time within the contract period anticipated for this work. The contract documents will also list other governmental agencies, railroads, utilities, or other parties who will have work with which it is known that this work must be coordinated.

H. The bidder is expected to be familiar with work already in progress or previously let on this project, the contract periods, the progress being made, and any other conditions regarding that work which may affect his/her bid or his/her performance under this contract.

I. Cooperation and coordination of all contractors and other agencies authorized to do work on the project will be required.

J. The bidder for this work acknowledges these facts and agrees that it is in the public interest to have the work of certain contracts and agencies performed concurrently rather than consecutively. The bidder further agrees to cooperate and coordinate his work with that of other contractors or agencies to the mutual interest of all parties doing work on the project, whether by contract with the State, County, or City or necessary work being done by governmental agency or utility force.

K. By the submission of a bid on this works the bidder acknowledges and agrees that an investigation and inquiry has been made regarding the contracts for work with which this work must be coordinated.

L. In the event disputes arise between contractors or other agencies, or both, doing work on the project as to their mutual rights or obligations, the Contracting Authority or its authorized representative will, when requested to do so or upon his own motion, act as referee and define the rights of all interested parties with regard to the conduct of the work, which decision shall be final as provided in 1105.01.

M. If a prospective bidder, for a project for which the Department is the Contracting Authority, is in doubt as to the true meaning of any part of the contract documents, he may submit to the Contracting Authority a request for additional information, explanations, or interpretations. Interpretations may be in the form of an addendum to the proposal. The Contracting Authority will not be responsible for any information, explanation, or interpretation from any other source.

1101.06 IRREGULAR PROPOSALS

A. Proposals will be considered irregular and may be rejected for any unauthorized changes in the proposal form or for any of the following reasons:

1. If on a form other than that furnished by the Contracting Authority, or if the form is altered or any part thereof is detached.

2. If there are unauthorized additions, conditional or alternate bids, or irregularities of any kind which may tend to make the proposal incomplete, indefinite, or ambiguous as to its meaning.

3. If the bidder adds any provisions reserving the right to accept or reject an award because he is low bidder on another project in the same letting,

4. If the bidder adds any provisions reserving the right to accept or reject an award or to enter into contract pursuant to an award.

5. If a bid on one project is tied to a bid on any other project, except as specifically authorized on the proposal form by the Contracting Authority,

6. If the proposal does not contain a unit price for each pay item listed, except in the case of authorized alternate pay items.

1101.07 ESTIMATE OF QUANTITIES

A. For all work let on a unit price basis, the Engineer's estimate of quantities, as shown in the notice to bidders and the proposals is understood to be approximate only, and will be used only for comparing bids except as otherwise provided in the basis of payment for the various classes of work.

1101.08 SUBMISSION OF PROPOSALS

A. All proposals shall be submitted on the standard proposal form prepared specifically for this projects an example of which is bound in this specification volume. One separate, unbound copy of the standard proposal forms which has been specifically prepared for this projects is supplied by the Department of Natural Resources with the contract documents. Only proposals which are submitted on this form will be considered.

B. One copy of the proposal shall be submitted.

C. No proposa1 for any subdivision or any subclassification of the work, except as indicated, will be accepted. Any conditional bid, amendment to the proposal form, or the inclusion of any correspondence, written or printed matter, or details of any essential provision of the contract documents, or required consideration of unsolicited material or data in determining the award of the contracts will disqualify the proposal.

D. The bid amounts shall be inserted in the spaces provided on the proposal form, setting forth clearly and concisely, all designations and prices. Erasures or other changes on the proposal form must be explained or noted over the signature of the bidder.

E. Addenda issued during the time of bidding shall become part of the contract documents. Bidders shall acknowledge receipt of each addendum in the appropriate space provided on the proposal form. If no addenda are issued, the word "none" is to be entered in the space provided.

F. When samples are required, they must be submitted by the bidder so as to arrive at the designated office prior to the hour set for opening the proposals. Samples shall be furnished free of expense to the Department of Natural Resources, properly marked by identifications and accompanied by a list when there is more than one sample. The Department of Natural Resources reserves the right to mutilate or destroy any samples submitted whenever it may be considered necessary to do so for the purpose of testing. Samples not so mutilated or destroyed, when no longer required to be retained in connection with the award or delivery of supplies, will be returned at the bidder's expense, if such return is requested in the proposal.

G. All proposals must have the affidavit portion of the proposal completed and notarized affirming that the bidder is not guilty of collusion or fraud in connection with his proposal.

H. All proposals must state the full business address of the bidder and be signed with the bidders usual signature. Proposals by partnerships must state the full names of all partners and must state the name of the partnership followed by the signature and designation of one of the members of the partnership or an authorized representative. Proposals by corporations must state the legal name of the corporation and the name of the state of incorporation followed by the signature and designation of the president, secretary, or other person authorized to bind the corporation to the proposal. Contractors are required to include the Iowa Contractors registration number assigned to them by the Iowa Division of Labor Services. The name of each person signing the proposal shall be typed or printed below the signature.

    1. A proposal by a person who affixes to their signature the word "president", "secretary", "agent", or any other designation without disclosing their principals may be held to be the proposal of the individual whose name is signed thereon. When requested by the Department of Natural Resources, satisfactory evidence of the authority of the officers signing in behalf of the corporation shall be furnished.

I. The proposal, with the proposal guarantee, must be securely sealed in an envelope plainly marked as to its contents on the outside of the envelope. Sample envelope forms can be viewed and downloaded on the DNR website **https://programs.iowadnr.gov/engreal/bid_envelope.doc.** The bidder shall be responsible for the sealed envelope being delivered to the place designated for the bid opening on or before the date and time specified in the notice to bidders. The officer whose duty it is to open the proposal will decide when the specified time has arrived. Proposals received thereafter will not be considered and will be returned unopened.

J. No bidder shall submit more than one proposal for identical work for the same project.

1101.09 WITHDRAWAL OF PROPOSALS

A. Proposals may be withdrawn by written or telegraphic request received from the bidder or authorized representative prior to the time fixed for opening of bids, without prejudice to the right of the bidder to file a new proposal. No proposals may be withdrawn by telephone request. Withdrawn proposals will be returned unopened. Negligence on the part of the bidder in preparing the proposal confers no right for withdrawal of the proposal after it has been opened.

1101.10 TAXES

A. The bidder shall include in the proposal all applicable federal and state taxes required by law. See Sales Tax Exemption below.

B. For the purposes of retail sales tax and use tax, general construction contractors, special construction contractors, and construction subcontractors are regarded as consumers or users of all tangible personal property which they purchaser acquire, or manufacture for use in complying their respective construction contracts.

C. Iowa retailers making sales, within the state of Iowa, of tangible personal property to a construction contractor for such use, are making sales at retail, the receipts of which are subject to retail sales tax. This means that a construction contractor should pay retail sales tax to his Iowa suppliers when purchases of tangible property are made within the state of Iowa. If a Contractor uses tangible personal property in completing the constructions which the Contractor has manufactured or fabricated, the tax will be 5% of the cost of manufacture.

D. This likewise means that any construction contractor purchasing, acquiring, or manufacturing tangible personal property outside the state of Iowa, for such use in Iowa, owes use tax on such out-of-state purchases, measured at the rate of 5% of the purchase prices or in the case of a product manufactured by the Contractor, the Contractor owes 5% of the cost of manufacture.

E. The use tax is to be paid by the Contractor directly to the Iowa Department of Revenue and Finance, using the retailers sales and use tax return, unless the out-of-state vendor from whom purchased is registered with the Use Tax Section of the Iowa Department of Revenue and does bill and collect the Iowa Use Tax for the state.

F. In accordance with Iowa Code Section 442.42 (15) & (16) and 422.47 (5), the DEPARTMENT will issue a Sales Tax Examption Certificate to CONTRACTOR and each approved contractor which will permit the material suppliers to sell material which will becomes an integral part of the structure exempt from Iowa sales tax and some applicable local option taxes and school infrastructure local option sales taxes.

G. The CONTRACTOR is responsible for keeping records identifying the materials and supplies purchase and verifying they were used as an integral part of the structure governed by this Contract. Any material purchased tax free and not used on this project are subject to taxes payable within the same quarter as the project completion date.

H. The Sales Tax Exemption Certificate must not be used to claim exemption for tax items not used on this project or thst do not qualify for exemption under the provisions of the Iowa Code Sections listed above. Such misuse will result in civil or criminal penalties.

I. Bidders should enticipate that the sale and use tax couild increase the cost of non-exempted services and material by at least 5% andmake the necessary llowance before submitting a bid.

J. The Department will reclaim sales taxes, after receiving a Contractor’s Statement of Sales Tax for those projects for which a Tax Exemption Certificate was not issued.

1101.11 WORK BY THE DEPARTMENT OF NATURAL RESOURCES

A. Unless specifically provided in the contracts the Department of Natural Resources will not furnish any labor, materials, or supplies necessary to complete the work under this contract.

1101.12 PREFERENCE FOR LABOR AND MATERIALS

A. The Contractor shall observe all of the laws of the state of Iowa with regard to preference for labor and materials, except that preference for Iowa labor and materials shall not apply when federal funding is to pay for any part of the project. When a project is federally funded it is indicated in the notice to bidders.

1101.13 PROPOSAL GUARANTEE

A. All proposals submitted by bidders must be accompanied by a proposal guarantee in the form of a certified check, cashier's check, or a proposal guarantee bond prepared on the standard proposal guarantee bond form furnished to the bidder by the Department of Natural Resources, an example of which is bound in this specification volume.

1. The proposal guarantee shall be made payable to the Department of Natural Resources in the amount specified in the notice to bidders and on the proposal form.

2. If the bond form is utilized in lieu of certified check or cashier's checks it must be executed by a surety company authorized by the Commissioner of Insurance for the state of Iowa to do business in Iowa and which has filed its certificate of authority with the Clerk of Court. One copy of the proposal guarantee bond form is furnished by the Department of Natural Resources with the contract documents. Only one executed copy must be submitted with the bid proposal.

B. Any bid which is not accompanied by a proposal guarantee will be considered no bid and will not be read at the bid opening.

C. All proposal guarantees submitted by unsuccessful bidders will be returned as stated in Section 1103.03 of the General Covenants and Provisions.

1101.14 AWARD OF THE CONTRACT

A. It is the intent of the Owner to award a contract to the lowest responsible Bidder provided the Bid has been submitted in accord with the requirements of the Bidding Documents, is judged reasonable, and does not exceed the funds available. Award of this contract will be at the place and at the time of the first regularly scheduled meeting of the appropriate commission of the Department of Natural Resources following the opening of the proposals, except for reasonable delays as provided in Section 1103.02 of the General Covenants and Provisions.

B. The Department of Natural Resources reserves the right to reject all bids or any proposal or to waive informalities in any proposal or to accept any proposal which will best serve the interests of the state of Iowa.

C. If, at the time this contract is to be awarded, the lowest proposal submitted by a qualified responsible bidder is in the best interest of the state of Iowa, the contract will be awarded, and the bidder to whom the award is made will be promptly notified after the Department of Natural Resources meeting.

D. The Owner shall have the right to accept Alternates in any order or combination and to determine the low bidder on the sum of the Base Bid and the Alternates accepted.

1101.15 EXECUTION OF THE CONTRACT

A. The successful bidder shall, within thirty calendar days after the date of the award of the contract, enter into a written contract with the Department of Natural Resources on the forms furnished by the Department for the performance of the awarded work.

1101.16 PERFORMANCE GUARANTEE BOND

A. Simultaneously with delivery of the signed contracts, the Contractor shall furnish a performance guarantee bond prepared on the standard performance guarantee bond form furnished to the Contractor by the Department of Natural Resources, an example of which is bound in the specification volume.

1. The bond must be executed by a surety company authorized by the Commissioner of Insurance of the State of Iowa to do business in Iowa and which has filed its Certificate of Authority with the Clerk of Court.

2. A copy of the performance guarantee bond form will be attached to a copy of the contract furnished by the Department of Natural Resources to the Contractor after award of the contract. One executed copy of the bond must be returned to the Department of Natural Resources with the signed contract, one copy of the bond may be retained by the surety company for its own records.

1101.17 CERTIFICATE OF INSURANCE

A. On or before execution of the contracts the Contractor shall furnish to the Department of Natural Resources a certificate of liability and property damage insurance.

1. The bidder is directed to examine the insurance coverage limits section of this specification volume to determine the coverage limits which apply to this project. Insurance certificates furnished to the Department of Natural Resources showing inadequate limits of coverage will be rejected, thus delaying final execution of the contract. See Sections 1103.04, 1107.02, and 1107.03 of the General Covenants and Provisions.

1101.18 COMMENCEMENT AND COMPLETION

A. The Contractor shall not commence work before the preconstruction meeting to be held after execution of the contract by all parties. The Contractor will be responsible for contacting the project Inspector to set up a time for the preconstruction meeting at the project site.

B. The Contractor must agree to complete the work by the date specified, or within the number of working days indicated if so specified in the contract. Should it be found impossible to complete the work on or before the time specified for completion, a written request may be submitted for a time extension, setting forth the reasons believed to justify the granting of such requests.

1101.19 APPEAL OF CONTRACT AWARD

A. If a Contractor who submitted a timely proposal disagrees with an award decision, it may appeal that decision by submitting a written appeal to department's director or the director's designee detailing the factual and legal basis for the challenge within five calendar days of the Notice of Intent to Award. The Issuing Officer may submit a written response to the Contractor's written appeal within five business days after receipt of the appeal. The department's director or designee will issue a written decision within seven business days of receipt of the Issuing Officer's written response.

PART 1102. BIDDER QUALIFICATIONS

1102.01 COMPETENCY AND OF BIDDERS

A. Bidders submitting proposals must be recognized contractors, engaged in the class of work provided for in the plans and specifications, and must possess sufficient resources to complete the work. Before the contract is awarded, the bidder may be required to furnish evidence to the satisfaction of the Contracting Authority of the ability to perform and complete the contract.

1102.02 QUALIFICATIONS OF THE BIDDER

A. Before award of the contract can be approved, the Department of Natural Resources shall be satisfied that the bidder involved:

1. Maintains a permanent place of business.
2. Has adequate equipment to do the work properly and expeditiously.
3. Has suitable financial status to meet the obligations incident to the work.
4. Has appropriate technical experience.
5. Has satisfactorily completed past projects.
6. Is not ineligible due to discrimination in employment.

B. The Engineer will make such investigations as deemed necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the Engineer all such information and data for this purpose as the Engineer may request.

1. The Department of Natural Resources reserves the right to reject a bid if the evidence submitted by, or an investigation of, such bidder fails to satisfy the Department of Natural Resources that the bidder is responsible and qualified to carry out the obligations of the contract and to complete the work contemplated therein.

C. Targeted small business set-aside projects.

1. All contractors submitting proposals for set-aside projects shall meet the "Targeted Small Business" definitions and be capable of being certified by the Department of Economic Development within thirty (30) days after the bid letting date. Failure of the low bidder to become certified within this time will be just and sufficient cause for the denial of the award.

2. Contractors eligible for "Targeted Small Business" designation but not currently certified as such by the Department of Inspections and Appeals, should do so immediately by contacting the Targeted Small Business Officer, Lucas State Office Building, Des Moines, Iowa 50319 -0083.

1102.03 REDUCTIONS IN BIDDER QUALIFICATIONS RESTRICTIONS

A. The requirements and conditions for bidder qualifications may be reduced by the Contracting Authority either for contractors who have well established performance records in other fields or for contractors having adequate financial responsibility and experienced supervisory personnel available for the work that is under consideration or for both the above reasons.

B. Likewise, the requirements may be modified by the Contracting Authority for newly formed or reorganized firms or corporations whose basic organization is composed of individuals who are veterans of the construction industry, with proven records of satisfactory performance in the field in which they have elected to bid, provided, however, that they have adequate financial responsibility, equipment, and available experienced supervisory personnel.

1102.04 IMPOSITION OF INCREASE IN BIDDER QUALIFICATION REQUIREMENTS, SUSPENSIONS AND DISQUALIFICATION

A. The requirements and conditions for bidder qualification in 1102.01 may be imposed or re-imposed or increased, or a contractor may be suspended or disqualified.

B. The requirements and conditions for qualifications of a contractor may be imposed or re-imposed or increased if or when:

1. The Contractor seriously delays commencement or completion of any work within the contract period or any extension thereof under circumstances that would normally give rise to a right of the Contracting Authority for liquidated damages or declaration of defaults or;

2. The Contractor does any act or omits doing or performing any act which, in the judgment of the Contracting Authority, evidences a material change in the contractor's financial responsibility or work capability where, in the judgment of the Contracting Authority, the same will materially prejudice the

contractor's ability to successfully prosecute such public improvement contracts, or he knowingly submits false information concerning prequalification, or;

3. The Contractor takes or fails to take any action which the Contracting Authority deems to warrant an imposition of increase in bidder qualification requirements.

C. A contractor may be suspended from bidder qualification if or when:

1. The Contractor continually fails or refuses to remove and replace materials or work found by the Engineer not to be in reasonably close conformity with the contract documents or to correct such material or work so as to cause such materials or finished product to be reasonably acceptable work, or;

2. The Contractor continually and, in the judgment of the Engineer, without good cause therefor, fails to carry on the work in an acceptable manner, or refuses to comply with a written order of the Engineer within a reasonable time, or;

3. The Contractor fails to perform with his own organization the work as required in 1108.01, or otherwise assigns or disposes of work or the contract or any part thereof without approval of the Contracting Authority, or;

4. The Contractor forfeits a proposal guaranty and fails to enter into the contract upon an offer of award by the guarantee Contracting Authority in response to a prior advertisement for bids for the same project for which award is currently being considered, or;

5. The Contractor fails to comply with nondiscrimination requirements of the Standard Specifications or special provisions, or;

6. The Contracting Authority deems a suspension is appropriate for reasons stated in Paragraph A, above.

7. The Contractor is debarred from doing work for the federal government.

8. The Contractor knowingly submitted false or misleading information concerning qualifications.

D. A suspension is intended to be for an indefinite period of time or, in the case of Paragraph C4, for a specific project. A suspension shall continue until the contractor resolves, to the satisfaction of the Contracting Authority the problem for which the suspension was made.

E. A contractor may be disqualified from bidder qualification if or when:

1. Currently debarred by some other state or Federal agency, or;

2. Subcontracts, employs, or otherwise uses services, for work of the Contracting Authority, of one who is debarred by the Contracting Authority or disqualified according to Paragraph 1, except to fulfill agreements for work on existing contracts, or;

3. Is convicted of or pleads guilty or nolo contendere to a charge of engaging in any conspiracy, combination, or other unlawful act in restraint of trade or of similar charges in any Federal court or a court of this or any other state, or;

4. Has offered or given gifts or gratuities to employees of the Contracting Authority in violation of State law or has had as his employee a person who was at that time also an employee of the Contracting Authority, or

5. The Contracting Authority deems a disqualification is appropriate for reasons stated in Paragraph C. above.

F. A disqualification is intended to be for a specified time. A disqualification shall not exceed 36 months. The Contracting Authority will issue a written notice of any intent to disqualify or suspend a contractors except when suspended for a specific project according to Paragraph C4.

G. Should the Contractor believe that the increase in bidder qualification requirements, intended suspensions or intended disqualification is based on false, biased, or incomplete information or that the increase or intended action is severe or unwarranted, the Contractor may make a written request to the Contracting Authority for an opportunity to be heard in a contested case pursuant to Chapter 17A, Code of Iowa.

1. If notice is given, the written request for a hearing must be filed with the Contracting Authority within 10 days of receipt of the notice of intended agency action.

2. If the basis of the intended disqualification is a criminal violation which is reasonably related to bidding and contracting procedures, the intended disqualification may be applied to the organization, including a person, firm, association, partnership, or corporation, to an affiliated officer, representative, or employee thereof, and to any other such organization in which the organization or affiliate or the officer, representative, or employee has an interest as either officer or owner.

H. When a notice is given or when any action is contested, the Contracting Authority will issue a notice of the final action taken.

1102.05 FOREIGN CORPORATIONS

A. Before entering into a contract involving construction or maintenance work, corporations organized under the laws of any other state shall file with the Contracting Authority a certificate from the Secretary of State of the State of Iowa showing that they have complied with all of the provisions of Chapter 404 Code of Iowa, governing foreign corporations. For contracts involving only the furnishing of materials, the foregoing requirement does not apply.

B. When a contract not involving federal-aid participation for a public improvement is to be awarded to the lowest responsible bidder, a resident bidder shall be allowed a preference over a nonresident bidder from a state or foreign country which gives or requires a preference to bidders from that state or foreign county. The preference is equal to the preference given or required by the state or foreign country in which the nonresident bidder is a resident.

C. If another state or foreign country has a more stringent definition of a resident bidder, the more stringent definition is applicable to bidders from that state or foreign county.

D. Any joint venture that includes a nonresident bidder will be considered nonresident, and the preference rule will be used.

1102.06 INCOME TAX DEDUCTION ON NON-RESIDENT CONTRACTORS

A. Each nonresident person or firm doing business as an individual and each nonresident co-partnership will be required, as precedent to receiving an award, to file a certificate issued by the State Tax Commissions as provided in Section 422.17, Code of Iowa, releasing the Contracting Authority from withholding any and all sums required by the provisions of Section 422.17, Code of Iowa.

PART 1103. APPROVAL FOR AWARD AND AWARD OF THE CONTRACT

1103.01 CONSIDERATION OF BIDS

A. The Contracting Authority reserves the right to waive technicalities and to reject any or all proposals. Bidders may be denied a contract award for any one of the following reasons:

1. For failure to meet the Contracting Authority's requirements for qualification of bidders, as set forth in Section 1102.02 and in the special provisions for the project.

2. For failure to maintain satisfactory progress on work already under contract.

3. For failure to meet promptly financial obligations undertaken in connection with other work under contract.

4. For filing more than one proposal at any letting for the same work under the same or different names.

5. For an unsatisfactory record of performance and cooperation on previous contracts.

6. For submitting an obviously unbalanced bid.

7. For having sublet or otherwise assigned work without the approval of the Contracting Authority.

8. For forfeiture of a proposal guarantee and failure to enter into contract upon an offer of an award by the Contracting Authority in response to a prior advertisement for bids for the same project or any combination of projects involving the project for which award is currently being considered.

9. For failure to file and maintain with the Contracting Authority a current Certificate of Insurance meeting the requirements of 1107.02.

10. For failure to provide a current Iowa contractor's registration number according to the provisions of Chapter 91C of the Code of Iowa.

1103.02 APPROVAL FOR AWARD

A. In the approval for award of contracts consideration will be given not only to prices bid but also to the mechanical and other equipment available to the bidders the financial responsibility of the bidders and his ability and experience in performance of like or similar contracts.

B. Approvals for award will be made as promptly as practical after bids have been opened and read. The Contracting Authority reserves the right to delay the approval for award for such time as is needed for consideration of bids and for receipt of concurrence in recommended approvals for award from other governmental agencies whose concurrence may be required.

1103.03 RETURN OF PROPOSAL GUARANTEE

A. Proposal guaranties will be returned to the unsuccessful bidder by mail promptly after the approval for award has been made. Return to the successful bidder will be made promptly after the filing of the contract documents.

1103.04 CERTIFICATE OF INSURANCE

A. The Contractor's certificate of liability and property damage insurance described in 1107.02 shall be filed with the Contracting Authority on or before the execution of the contract and shall be maintained throughout the prosecution of the work and until final acceptance and completion of the contract. A separate verification shall be required for contracts awarded on the basis of joint bids.

1103.05 REQUIREMENT OF CONTRACT BOND

B. In compliance with Section 573 of the Code of Iowa, the Contractor shall, at the request of the Contracting Authority, on all contracts amounting to five thousand ($5,000.00) dollars or more, file an acceptable bond in an amount not less than 100 percent of the contract sum with the Contracting Authority.

1. The bond shall be executed in on the standard form of the Contracting Authority, contractor shall provide one (1) original. This bond shall be held to cover all work included in the contracts whether performed by the Contractor or under a subcontract or assignment. The bond shall be executed by the Contractor and by a surety company authorized to do business in the state of Iowa.

2. The Contractor shall not begin work on any contract before he is notified, in writing, that the required bond has been approved and accepted, or until the signed contract is returned to him.

C. Prime contractors that are certified through Iowa Department of Economic Development as a targeted small business may request a performance bond waiver.

1. The waiver shall be applied only to a prime contract where the project does not exceed $50,000.00, not withstanding Section 573.2 of the Iowa Code.

2. The waiver shall only apply to those contractors which are able to demonstrate the inability of securing a bond because of a lack of experience.

3. A waiver shall not apply to business with a record of repeated failure of substantial performance or material breach of contract in prior circumstances. The granting of a waiver shall in no way relieve the business from its contractual obligations and shall not preclude the Contracting Authority from pursuing any remedies under the law upon default or breach of contract.

1103.06 EXECUTION OF CONTRACT

A. The bidder to whom a contract is being awarded shall execute and file four copies of such contract with the Contracting Authority.

1103.07 FAILURE TO EXECUTE CONTRACT

A. Unless the time limit is modified by special provisions failure to execute a contract and file an acceptable bond within 30 days of the date of the approval for awards herein provided, will be just and sufficient cause for annulment of the approval for award and for forfeiture of the proposal guarantee to the Contracting Authority.

1103.08 SUBCONTRACTORS

A. The bidder to whom a contract is being awarded shall file a list of subcontractors and a copy of each subcontract with the Contracting Authority within 30 days of the date of the approval for award. All subcontracts must comply with the provisions of 1106.01.

1103.09 MATERIAL SUBSTITUTION

A. The bidder to whom a contract is being awarded shall file all requests for materials substitutions within 30 days of the approval of award of the contract.

PART 1104. SCOPE OF WORK

1104.1 INTENT OF PLANS AND SPECIFICATIONS

A. The intent of the plans and specifications is to provide for the construction and completion of every detail of the work described therein. It shall be understood that the Contractor shall furnish all labor, material, tools, transportation, and supplies required for all or any part of the work to make each item complete in accordance with the spirit of the contract. It is understood that the apparent silence of the specifications as to any detail or the apparent omission of a detailed description concerning any point shall be regarded as meaning that only the best general practice is to prevail and that only materials and workmanship of the first quality are to be used.

B. For the purpose of design and the preparation of the Engineer's estimate, the Contracting Authority or its representatives may perform a reasonable amount of exploratory work to gain information relative to surface and subsurface conditions relating to types of soils moisture content, and types and extent of rock strata.

1. This information, when shown on the plans, represents a summary of conditions as of the date the survey was made, it is only an approximate estimation of the site conditions made merely to be suggestive to the Contracting Authority of construction conditions and quantities and classes of work. This information may be used as the bidder sees fit. The appearance of this information on the plans or specifications will not constitute a guarantee that conditions other than those indicated will not be encountered at the time of construction.

2. The bidder is advised that all information concerning the project, compiled by the Contracting Authority preceding the design, is available for examination at the Contracting Authority's headquarters. The prospective bidder shall conduct an examination as provided in 1102.06 to satisfy himself as to the character of the work to be done, the probable construction conditions, and any other

reasonably ascertainable conditions and the potential effect these could have on the performance of work under the contracts which shall be the basis for the bid to be prepared.

C. Any bidder interested in the work is authorized to make whatever additional investigation he consider advisable. In making such additional investigation, the bidder is directed to the Engineer for information relating to available right-of-way. If there are, at that time, any parcels of land over which the Contracting Authority does not have jurisdiction, right of entry must be secured by the prospective bidder from those authorized to grant such permission.

1. All such additional investigation work shall be performed without costing or obligating the Contracting Authority in any way.

1104.02 SPECIAL WORK

A. Any conditions not covered by these standard specifications are stated in the special provisions.

1104.03 INCREASED OR DECREASED QUANTITIES

A. The Contracting Authority reserves the right to make such increase or decrease in the quantities of the work shown on the plans as may be considered necessary to complete fully and satisfactorily the construction included in the contract. The compensation to the Contractor for such changes will be as provided in 1109.04.

B. Except as provided in 1109.05, no significant change in quantities, as defined in 1109.17, shall be made by increasing or decreasing the project area to be improved as shown on the plans and described in the proposal forms unless the Contractor gives written consent to such increase or decrease. However, such consent will not be required for maintenance or restoration work ordered by the Engineer.

1. For the purpose of this article a material change shall be defined as an increase or decrease of more than 20 percent in the measured quantity of any item in the contract.

1104.04 EXTRA WORK

A. The Contracting Authority reserves the right to order, in writing, the performance of work of a class not contemplated in the proposal but which may be considered necessary to complete satisfactorily the work included in the contract. Such extra work will be paid for as provided in 1109.04B.

1104.05 MAINTENANCE OF DETOURS

A. Unless so required by the plans or the special provisions, the Contractor will not be required to assume any responsibility in connection with the maintenance or marking of suitable detours.

1104.06 REMOVAL AND DISPOSAL OF STRUCTURES AND OBSTRUCTIONS

A. The contractor for bridge and culvert work shall remove any existing structure, or part of structure, that in any way interferes with the new construction. If specific payment for such work has not been provided in the contract, it will be paid for as extra work.

B. The contractor for road work shall remove any materials or structures found on the right-of-way which are not designated to remain in place or which have not been designated for use in the new construction.

1. The removal and disposal of pipe culverts will not be paid for directly but shall be considered as incidental works and the cost of such removal and disposal shall be considered to be included in the contract price for other items. Pipe culverts designated for salvage shall be removed by methods that will cause a minimum of damage to the pipe culverts.

2. The removal and disposal of bridges or other masonry or monolithic concrete construction will be paid for. If the contract does not contain an item for such work, it will be paid for as extra work.

1104.07 RIGHTS IN AND USE OF MATERIALS FOUND ON THE RIGHT-OF-WAY

A. Unless stated to the contrary in the contract documents, all materials, such as stone, gravel, sand, timber, and structures or parts of structures, found on the right-of-way or on land acquired for the work, are the property of the Contracting Authority or the owner of the fee title to the land.

1. If such materials are to be removed but use or salvage is not designated on the plans, they shall become the property of the Contractor, and shall be disposed of by the Contractor.

2. When the Contractor is permitted to use materials found on the right-of-way, any excavations that are made below the grade elevations shall be backfilled with other suitable materials so that the finished road conforms to the grade shown on the plans. No extra compensation will be allowed for such backfilling.

1104.08 FINAL CLEANING UP

A. Before final acceptance of the work, the Contractor shall remove all unused material and rubbish from the site of the work, remedy any objectionable conditions the Contractor may have created on private property, and leave the project site in a neat and presentable condition. The Contractor shall make no agreement which allows salvaged or unused material to remain on private property within view of the project except when consistent with previous land use.

B. All ground occupied by the Contractor in connection with the work, which is within view of or adjacent to a road, shall be restored. Restoration shall include appropriate smoothing to its original condition and may include making the area suitable for cultivation and, where vegetation has been disturbed, seeding of the area.

1. Unless otherwise provided for, the Contractor shall be responsible for securing waste privileges on private property. The general Contractor shall be responsible for cleanup of subcontractors at the completion of all work.

C. This article is not intended to restrict burning in accord with applicable regulations.

D. Final clean up shall be subject to approval of the Engineer.

1104.09 RIGHT-OF-WAYS OR LANDS ACQUIRED FOR THE WORK

A. Access to the construction site will be over designated routes of travel, on land owned or made available by the Contracting Authority for the specific use of the Contractor.

B. Right-of-way or lands will be provided without cost to the Contractor, and it is contemplated that all of the needed right-of-way or lands will have been acquired for the work placed under contract.

1. Whenever it is necessary to secure additional right-of-way or land, performance of the work affected thereby is contingent upon the securing of such right-of-way or land. No claims will be allowed for loss or damage occasioned by delays in securing right-of-way or lands.

1104.10 PERMITS AND ARRANGEMENTS WITH OTHER GOVERNMENTAL AGENCIES

A. Whenever the work involves construction with which federal, state, or local governmental agencies are concerned, the performance of the work is contingent on arrangements and/or permits with those concerned agencies.

1. The Contracting Authority shall secure all necessary permits, certificates, and licenses required to prosecute the work, except specifically designated permits, local building permits, and any cost for inspections required by local authorities, which shall be paid for and secured by the Contractor.

2. No additional compensation will be allowed for any delays, inconvenience, or damages sustained by the Contractor due to actions of those concerned agencies with respect to any arrangements or permits they may require.

1104.11 RAILROAD CROSSINGS

A. Whenever the work involves construction with which railroad companies are concerned, the performance of the work is contingent upon arrangements with the railroad companies for the proposed construction.

1. The performance of the work shall be in accord with arrangements established by the Contracting Authority. The Contractor may make additional arrangements.

2. No claim will be allowed for loss or damage caused by failure of the railroad to comply with provisions of the agreement with the Contracting Authority. Upon notice given, the Contracting Authority will institute necessary legal action to enforce the conditions of its agreement with the railroad company.

1104.12 PUBLIC UTILITIES

A. The Contracting Authority will notify all utility companies, all pipeline owners, or other parties affected, and will endeavor to have all necessary adjustments of the public or private utility fixtures, pipelines, and other appurtenances within or adjacent to the limits of construction made as soon as practicable.

B. The Contractor shall be responsible for notification concerning work near pipelines, required by Section 479.47, Code of Iowa, and for conducting his work as required therein.

C. Waterlines, gaslines, wirelines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals, and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted are to be moved by the owners at their expense, except as otherwise provided for in the special provisions or as noted on the plans.

D. It is understood and agreed that the Contractor has considered in the bid all of the permanent and temporary utility appurtenances in their present or relocated positions as shown on the plans and that no additional compensation will be allowed for any delays, inconvenience, or damage sustained by him/her due to any interference from the utility appurtenances or their operation or relocation.

1104.13 DRAWINGS AND SPECIFICATIONS

A. Unless otherwise provided in the contract documents the Contracting Authority shall furnish to the Contractor, awarded the contract, free of charge, all copies of drawings and specifications reasonably necessary for the execution of the work.

1104.14 THE CONTRACTING AUTHORITY'S RIGHT TO OCCUPY

A. The Contracting Authority shall have the right to enter the building or work site and store or attach such fixtures or furniture as it may elect, or to do such other work providing that such storage or work will not interfere with the completion of the Contractor's work. Such occupancy by the Contracting Authority shall in no way imply final acceptance of any portion of the Contractor's work.

1104.15 CONTRACTOR'S UNDERSTANDING

A. It is understood and agreed that the Contractor has, by careful examination, satisfied him/herself as to the nature, character and location of the work, conformation of the ground, character, quality and quantity of the materials to be encountered, character of the equipment and facilities needed, preliminary to and during the prosecution of the work, general and local conditions and all other matters which can in any way affect the work under this contract. No verbal agreement or conversation with any officer, agency, or employee of the Contracting Authority, either before or after the execution of the contracts shall affect or modify any of the terms or obligations herein contained.

1104.16 HISTORICAL AND ARCHEOLOGICAL

A. If during the course of construction evidence of deposits of historical or archeological interest is found, the Contractor shall cease operations affecting the find and shall notify the Iowa Department of Natural Resources and the state Historic Preservation Officer. No further disturbance of the deposits shall occur until the contractor has been notified by the agency that he/she may proceed. The agency will issue a notice to proceed only after the state official has surveyed the find and made a determination to the Iowa Department of Natural Resources.

B. Compensation to the contractor, if any, for lost time or changes in construction to avoid the finds shall be determined in accordance with changed conditions or change order provisions of the specifications.

PART 1105. CONTROL OF WORK

1105.01 AUTHORITY OF ENGINEER

A. The Engineer will decide all questions which may arise as to the quality and acceptability of materials furnished and work performed and as to the rate of progress of the work, all disputed and mutual rights between contractors, all plans and specifications, and all questions as to the acceptable fulfillment of the contract on the part of the Contractor. Except as provided in Section 1109, the Engineer's decisions will be final.

B. For authority to temporarily suspend work see 1105.08 and 1108.06.

1105.02 PLANS

A. The official plans, profiles, and cross sections, on file in the office of the Contracting Authority, show the location, typical construction details, and dimensions of the work contemplated. The work shall be performed in conformity therewith, except in case of error or unforeseen contingency.

B. The plans are made from careful surveys and represent the foreseen construction requirements. Any appreciable deviation from the plans made necessary to expedite construction, or because of errors shall be called to the attention of the other party, in writing, by the party discovering such conditions. If necessary, revised plans will be provided.

1105.03 WORKING DRAWINGS

A. The plans will be supplemented by such working drawings as are necessary to adequately control the work. Working drawings shall be furnished by the Contractor, as required by the specifications or the plans.

1. When certification by a professional structural or civil engineer registered in Iowa is required, it will be so designated on the plans or in other contract documents.

2. Working drawings may include shop drawings of fabricated materials, erection plans, falsework plans, cofferdam plans, or other supplemental plans or data. Contractor submitted shop drawings for steel structures shall show fully detailed dimensions and sizes of all component parts of the structure, descriptions of drains, etc.

    a. Prior to review of working drawings, any work done or material ordered shall be at the Contractor's risk.

3. The Contractor shall expressly understand that the Contracting Authority's review of working drawings submitted by the Contractor covers only requirements for strength and arrangement of component parts.

4. The Contracting Authority assumes no responsibility for errors in dimensions and assumes the Contractor will use material complying with requirements of the contract documents, or, where not specified, those of sound and reasonable quality, and will erect the subjects of such working drawings in accord with recognized standards of first-quality workmanship or, when specified, in accordance with standards of the contract documents.

5. If unanticipated and either unusual or complex construction procedures or site conditions occur, the Engineer may require the Contractor to submit such working drawings as, in the judgment of the Engineer, are necessary to satisfactorily complete the proposed construction.

1105.04 ALTERATION OF PLANS OR CHARACTER OF WORK

A. The Engineer will have the right to make alterations in plans or character of work as may be considered necessary or desirable during the progress of the work to satisfactorily complete the proposed construction. Such alteration will neither waive any conditions of the contract nor invalidate any of the provisions thereof.

1105.05 CONFORMITY WITH AND COORDINATION OF SPECIFICATIONS, PLANS AND SPECIAL PROVISIONS

A. Discrepancies within contract documents:

1. In case of any discrepancy between the drawings on the plans and the figures written thereon, the figures, unless obviously incorrect, are to govern.

2. In case of any discrepancy between the plans, including plan notes, and the general or supplemental specifications, the plans are to govern.

3. In case of a discrepancy between the general specifications and supplemental specifications, the supplemental specifications are to govern.

4. In case of any discrepancy between the general or supplemental specifications and the special provisions or between the plans and the special provisions, the special provisions shall govern.

B. The Contractor shall not take advantage of any apparent error or omission in the plans, specifications, or of any discrepancy between the plans or specifications. The Engineer shall be permitted to make such correction in interpretation as may be deemed necessary for the fulfillment of the intent of the plans and specifications, subject to compensation as provided in 1109.03, 1109.05, and 1109.06.

C. The plans shall not be so changed as to materially affect the cost or the difficulty of performing any item or work for which the contract amount is more than 20 percent of the total contract sum, except with the consent of the Contractor.

D. All work performed and all materials furnished shall be in reasonably close conformity with the lines, grades, cross sections, dimensions, and material requirements, including tolerances, shown on the plans or indicated in the specifications.

E. If the Engineer finds the material, or the finished product in which the material, is used is not within reasonably close conformity with the plans and specifications, but that reasonably acceptable work has been produced, the Engineer shall determine, based on engineering judgment, if the work shall be accepted and remain in place.

1. In this events the Engineer will document the basis of acceptance and supplement it by contract modification which will provide for an appropriate adjustment in the contract price for such work or materials as deemed necessary to conform to the Engineer's determination.

F. If the Engineer finds the material, the finished product in which the material is used, or the work performed is not in reasonably close conformity with the plans and specifications and has resulted in an inferior or unsatisfactory product, the work or material shall be considered unacceptable and shall be removed and replaced, or otherwise corrected, as acceptable to the Engineer, by and at the expense of the Contractor.

1105.06 SUPERVISION BY CONTRACTOR

A. The Contractor, when absent from the construction site, shall have on site at all times, as its agent, a competent superintendent, capable of reading and thoroughly understanding the plans, specifications, and other contract documents and who shall be thoroughly experienced in the type of work being performed.

1. The superintendent shall supervise, direct, and control the Contractor's operations, personnel, work, and subcontractor's operations. The superintendent shall have full authority to execute orders or directions of the Engineer, without delays, and to promptly supply such materials, equipment, tools, labor, and incidentals as may be required.

2. The Contractor shall give the Engineer written notification of the name of the superintendent. The superintendent shall not be replaced, except with the consent of the Engineer, unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in the Contractors employ.

1105.07 CONSTRUCTION STAKES AND BENCH MARKS

A. The Contractor shalle be responsible for all labor, equipment and material necessary to complete the work covered by this contract. The cost of this work shall be considered incidental to other items of work and will not be paid for separately.

B. The Contractor shall be held responsible for the preservation of stakes and marks. If, in the opinion of the Engineer, any of the survey stakes or marks have been carelessly or willfully destroyed or disturbed by the Contractor, the cost of replacing them shall be charged against the Contractor.

C. The Contractor shall provide and keep constantly upon the work site, first-class instruments for use in establishing the various lines, levels and grades for the construction and shall have a superintendent on the work who is thoroughly familiar with their use. The Contractor shall provide and maintain a permanent bench mark at the construction site for the use of mechanics and other subcontractors.

1105.08 AUTHORITY AND DUTIES OF INSPECTOR

A. The Contracting Authority may appoint inspectors to represent the Engineer in the inspection of all materials used in and all work done under the Contract. Such inspection may extend to any part of the work and to preparation or manufacture of materials to be used.

1. The inspector will not be permitted to modify in any way the provisions of the contract documents or to delay the work by failing to inspect materials and work with reasonable promptness. An inspector is placed on the work to keep the Engineer informed as to its progress and the manner in which it is being performed. The inspector will not be authorized to approve or accept any portion of the work.

2. Results of inspection tests and examinations will be available to the Contractor on an informational basis. Absence or presence of representative test data does not alter the Contractor's responsibility for plan and specification compliance in accordance with 1104.01.

3. The inspector will not act as foreman or perform other duties for the Contractors nor improperly interfere with management of the work.

4. In case of dispute between the Contractor and inspector as to quality of materials or manner of performing the works the inspector will have authority to reject materials or suspend the work until the question at issue can be decided by the Engineer. Written notice of suspension of work will be given to the Engineer and Contractor by the inspector.

1105.09 INSPECTION OF WORK

A. The Contractor shall furnish the Engineer with every reasonable facility for ascertaining whether the work is being performed in conformance with the contract documents. At any time before acceptance of the works upon request of the Engineer, the Contractor shall remove or uncover such portions of finished work as the Engineer may direct. After examination has been made, the Contractor shall restore such portions of the work to the standard required by the contract documents.

1. If work thus exposed or examined proves acceptable, the uncovering or removing and replacing of coverings or the restoring of parts removed, shall be paid for as extra work, except that no payment will be made for work involved in checking smoothness of concrete surfaces.

2. If work thus exposed and examined proves unacceptable, the Contractor shall replace the defective work in accordance with the specifications.

3. If work thus exposed and examined proves either unacceptable or deficient, the Contractor will be paid only for work as finally accepted.

4. Work done without the Engineer having been afforded ample opportunity to provide suitable inspection, or unauthorized work, may be ordered removed and replaced at the Contractor's expenses or may be excluded from the quantities measured for payment.

B. If the specifications, Engineer's instructions, laws, ordinances, or any public authority require any work and/or materials to be specially tested or approved, the Contractor shall give the Engineer timely notice of readiness for review. If the review is to be made by authority other than the Engineer, the Contractor shall notify the Engineer of the date fixed for review. Reviews by the Engineer will be promptly made and, where practicable, at the source of supply.

1105.10 REMOVAL OF DEFECTIVE WORK

A. Any defective work shall be removed and replaced at the Contractor's expense.

B. Should the Contractor fail or refuse to remove defective work when so ordered by the Engineer, the Engineer shall have authority to order the Contractor to suspend further operations, and may withhold payment on estimates until such defective work has been removed and replaced in accordance with the plans and specifications.

1. Continued failure or refusal on the part of the Contractor to correct defective work promptly shall be sufficient cause for the Contracting Authority to declare the contract in default and to complete the work in accordance with 1108.11.

1105.11 UNAUTHORIZED WORK

A. Unauthorized work and work done in excess of that provided by the lines and grades shown on the plans or as given by the Engineer, or any work done without the authority of the Engineers will be considered as unauthorized and will not be paid for.

1. Unauthorized work may be ordered removed and replaced at the Contractors expense.

1105.12 OTHER CONTRACTS

A. The Contracting Authority reserves the right to do, or to contract for other work adjacent to, or in the vicinity of, the work herein described.

B. The Contractor agrees to permit such other work to progress and to arrange for joint occupation of the site under such provision as the Engineer determines necessary. If in the judgment of the Engineer, such joint occupation of the site impedes progress on the work herein described, the Contracting Authority will proportionally extend the time for completion of the work.

1. The Contractor hereby waives any claim for damages or extra compensation by reason of such interference with his work.

1105.13 FINAL INSPECTION

A. Upon notification, by the Contractor or his authorized representative, that the work is completed, the Engineer shall make prompt final inspection of each item of work included in the contract. If the work is found not to be in accordance with the contract documents, the Contractor will be advised as to the particular defects to be remedied before final acceptance can be made.

1105.14 RESTRICTIONS ON MOVING AND USE OF HEAVY EQUIPMENT

A. The following restrictions shall apply to the moving and use of heavy equipment:

1. Movement of equipment to and from the project shall be in compliance with the laws governing the operation of vehicles on the highways of Iowa. Movement and operation of equipment over completed portions of pavements, bituminous surfaces, base courses, and structures which are a part of the project shall be with legal axle loads, except as modified in this article.

2. In the case of earthwork and shouldering to be done in connection with either rigid or flexible pavement, or pavement widening and resurfacing, no tractor-drawn, earth-moving equipment shall be operated, or driven on or across the pavements, except at designated crossovers, as authorized by the Engineer.

a. When crossovers are specifically permitted, the Contractor will designate, before use, the location and number of crossovers to be used. The Engineer will not approve crossovers in areas of limited sight distance, near structures, railroad crossings, or at any other location which will place safety of the traveling public in jeopardy. At these crossovers, equipment having axle loads greater than the maximum permitted by law may be used.

b. Crossovers shall be 30 feet in length measured along the centerline and shall not be closer than 300 feet to each other.

c. For each crossover used, the Contractor shall, at the Engineer's option, either replace the pavement or pay the Contracting Authority at the rate of five thousand ($5,000.00) dollars on the basis of a two-lane pavement.

d. In lieu of the surface crossover, approved hauling bridges may be used. The hauling bridge shall accommodate two lanes of public traffic, and it shall be removed from the roadway at the close of each day's operations. When a hauling bridge is used, no payment will be required.

e. The provisions of the Supplemental Specification for Traffic Controls in effect on the contract letting date, shall apply.

3. No dragline, cranes or power shovel shall be operated with any part of the machine resting upon a pavement, bituminous surface, base course, or structure except with approval of the Engineer and in accord with restrictions in that approval.

4. Under no conditions shall machines equipped with metal lugs or similar projections on the treads be operated on the surface of a pavement, bituminous surface or base course.

5. For building shoulders, on completed pavements of any type, the maximum axle load used for equipment operating on pavement shall not exceed the legal axle load, as defined herein.

6. Crawler-type tractors shall not be moved on or off a pavement or base course except at places where the compacted earth adjacent to slab is at least 2 inches higher than the surface of the pavement or base course. Whenever heavy, crawler-type equipment, such as a crane or mixers is moved on or off the edge of a pavement or base course, a substantial timber approach shall be built, at the edge of slab, to prevent overloading or otherwise injuring the edge of the slab.

7. Compacting equipment having axle loads greater than 20,000 pounds may be used on the work under the following provisions:

   a. The equipment shall be transported to and from the work and across the bridges on the work in compliance with laws of the State of Iowa.

   b. For compaction of subbase, the weight of equipment used shall not be greater than that of compaction equipment used in correction of the roadbed for grade and cross section.

   c. For compaction of base course, the weight of equipment used shall not be greater than the weight of equipment used in compaction of the subbase on which the base is placed.

   d. For compaction of surface courses, the weight of equipment shall not be greater than that of equipment used in compaction of the base on which the surface course is placed.

8. For grading or any other type of work, no rollers or other equipment, having an axle load greater than 50,000 pounds or a total weight in excess of 60,000 pounds shall be operated over a culvert, except as may be authorized by the Engineer, and then, in strict compliance with prescribed precautionary measures.

1105.15 PLACEMENT OF FILL MATERIAL IN STREAMS AND WATERBODIES

A. The placement of fill material in streams is regulated by Federal law. The intent of this specification is to require contractor operations in streams and other waterbodies and adjacent swamps, marshes, bogs, or similar areas, to be in compliance with Federal regulations.

B. Fill material shall mean; any material used for the primary purpose of replacing an aquatic area with dry land, or of changing the bottom elevation of a waterbody.

C. Fill material shall consist of clean, suitable, naturally occurring material, free from toxic pollutants in other than trace quantities.

D. Temporary stream crossings shall be bridged or culverted so as not to restrict expected high flows or disrupt the movement of aquatic life native to the stream or waterbodies. Expected high flows are those flows, which the Contractor expects to experience during the period of time that the crossing is in place.

1. Temporary stream crossings shall:

a. Not extend over 100 feet into any swampy, bogy, marshy, or similar area that is adjacent to the stream or waterbody.

b. Be maintained to prevent unnecessary erosion and other nonpoint sources of pollution.

c. Be removed after they are no longer needed.

1105.16 COST REDUCTION INCENTIVE

A. The Contractor may submit to the Engineer, in writing, proposals for modifying the plans, specifications, or other contract requirements for the sole purpose of reducing the total cost of construction.

1. The proposals shall not impair, in any manner, essential functions or characteristics of the projects, including but not limited to, service life, economy of operation, ease of maintenance, desired appearance, or design and safety standards.

B. Proposals shall contain the following changes:

1. Existing requirements and proposed changes,

2. Contract requirements that must be changed if the proposal is adopted,

3. A detailed cost estimate of performing the work as stipulated and as proposed,

4. The time within which the Engineer must make a decision thereon,

5. The items of work affected by the proposed changes, including any quantity variation attributable thereto.

C. The provisions of this article shall not be construed to require the Engineer to consider any cost reduction proposal which may be submitted hereunder.

1. Proposed changes in basic design of a bridge or pavement type will not be considered an acceptable proposal.

2. The Contracting Authority will not be liable to the Contractor for failure to accept, or act upon, any proposal submitted pursuant to this article, or for any delays to the work attributable to any such proposal.

3. If a proposal is similar to a change in plans or specifications under consideration by the Contracting Authority for the project at the time said proposal is submitted, or if such a proposal is based on, or similar to, standard specifications, special provisions, or plans adopted by the Contracting Authority after the advertisement for the contract, the Engineer will not accept such proposals and the Contracting Authority reserves the right to make such changes without compensation to the Contractor under provisions of this article.

D. The Contractor shall continue to perform the work in accordance with contract requirements until a change order, incorporating the cost reduction proposal, has been issued. If a change order has not been issued by the date on which the Contractor's cost reduction proposal specifies that a decision thereon should be made, or such other date as the Contractor may subsequently have specified in writing, such proposal shall be deemed rejected.

E. The Engineer shall be the sole judge of the acceptability of a cost reduction proposal and of the estimated net savings in construction costs from adopting all, or any part of, such proposal. In determining the estimated net savings, the right is reserved to disregard the contract bid prices if, in the judgment of the Engineer, such prices do not represent a fair measure of the value of work to be performed or to be deleted.

F. The Contracting Authority reserves the right, where it deems such action appropriate, to require the Contractor to share in the Contracting Authority's costs of investigating a cost reduction proposal. Where such a condition is imposed, the Contractor shall indicate his acceptance thereof in writing, and such acceptance shall constitute full authority to deduct amounts, payable to the Contracting Authority from any money due, or that may become due, to the Contractor under the contract.

G. If the Contractor's cost reduction proposal is accepted in whole or in part, such acceptance will be by change order, which shall specifically state that it is executed pursuant to this article. Such a change order shall incorporate the changes in the plans and specifications which are necessary to permit the proposal, or such part of it as has been accepted, to be put into effects and shall include any conditions upon which the Contracting Authority's approval is based, if the approval is conditional.

    1. The change order shall also set forth the estimated net savings in the cost of performing the work attributable to the proposal effectuated by the change order, and shall further provide that the Contractor be paid 50 percent of said estimated net savings amount.

H. Acceptance of the cost reduction proposal and performance of the work thereunder shall not extend the time of completion of the contract, unless specifically provided for in the change order authorizing use of the proposal.

I. The amount specified to be paid to the Contractor in the change order which effectuates a cost reduction proposal shall constitute full compensation to the Contractor for the proposal and performance of the work thereof pursuant to the said change order.

J. The Contracting Authority expressly reserves the right to adopt a cost reduction proposal, for general use on contracts administered by the Contracting Authority, when it determines that said proposal is suitable for application to other contracts.

    1. When an accepted proposal is adopted for general use, only the contractor who first submitted such proposal will be eligible for compensation pursuant to this article, and in that case, only to those contracts awarded to him/her prior to submission of the accepted proposal and as to which such proposal is also submitted and accepted.

    2. Cost reduction proposals identical or similar to previously submitted proposals will be eligible for consideration and compensation under provisions of this article, if the identical or similar previously submitted proposals were not adopted for general application to other contracts administered by the Contracting Authority.

    3. Subject to the provisions contained herein, the State or any other public agency shall have the right to use all, or any part of any submitted cost reduction proposal without obligation or compensation of any kind to the Contractor.

PART 1106. CONTROL OF MATERIAL

1106.01 QUALITY OF MATERIALS

A. It is the intent of the specifications that first-class materials shall be used throughout the work, and that these first-class materials shall be incorporated in such a manner as to produce completed construction

which is acceptable in every detail. Only materials conforming to the requirements of these specifications, approved by the Contracting Authority, shall be incorporated into the work

B. When more than one kind of manufacture of a material is specified, the option will be with the Contractor, but the choice shall be confined to the materials mentioned.

C. Whenever in any of the contract documents, an item of material or equipment is defined by describing a proprietary product or by using the name of a manufacturer or vendor, the terms "or equivalent", or "or equal", if not inserted, shall be implied. This specific item of material or equipment mentioned shall be understood as establishing a standard of type, function, efficiency, minimum basis of design, and quality desired. Other manufacturer's products of comparable quality, design and efficiency, and suitable for the service intended will be considered, but no change will be made without written approval of the Contracting Authority.

D. Requests for materials substitutions must be submitted in duplicate, or in the quantities required elsewhere in the specifications, and meet the requirements of 1103.09

E. **1106.02 SOURCE OF MATERIALS**

A. At the option of the Engineer, the source of supply of each material shall be approved by the Contracting Authority before the delivery is stated.

1. If requested by the Contracting Authority, representative preliminary samples, of prescribed character and quality, tested in accordance with the methods referred to under samples and tests, shall be submitted by the contractor or producer for examination.

2. All materials proposed to be used may be inspected or tested at anytime during their preparation and use.

3. If, after trial, it is found that sources of supply which have been approved do not furnish a uniform product or if products from any source do not meet the specifications, at any time, the Contractor shall furnish approved material from other approved sources. No material which, after approval has in any way become unfit for use, shall be used in the work.

1106.03 SAMPLES AND TESTS

A. Each consignment of materials required by the Engineer, shall be tested or inspected before being incorporated into the work and approved by the same Engineer before it is used.

1. The contractor shall afford facilities for collecting and forwarding samples as the Engineer may require.

2. Unless otherwise designated in the standard, supplemental specifications, or instructional memorandums, the inspection, sampling, testing, and basis of acceptance of materials shall be in accordance with the current AASHTO "Standard Specifications for Sampling and Testing of Transportation Materials" including published interim standards.

1106.04 STORAGE OF MATERIALS

A. The Contractor shall be responsible for care and storage of materials delivered for the work or purchased for use thereon. Material which has been delivered and has become damaged before actual incorporation in the work may be rejected by the Engineer even though it may have been previously acceptable. Stored materials shall be located to facilitate thorough inspections.

1106.05 UNACCEPTABLE MATERIALS

A. All materials not conforming to requirements of the specifications at the time they are to be used shall be considered unacceptable, and all such materials will be rejected and shall be removed immediately from the work site, unless otherwise instructed by the Engineer. No rejected materials the defects of which have been corrected shall be used until approval has been received.

PART 1107. LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

1107.01 LAWS TO BE OBSERVED

A. The Contractor is presumed to be familiar with all laws, ordinances, and regulations that may, in any manner, affect those engaged or employed by the Contractor, the materials or equipment used, or which may in any way, affect the conduct of the Contractor's work. The Contractor shall conduct his work to avoid conflict with any such laws, ordinances, or regulations, and shall save harmless the Contracting Authority and its representatives against any claim arising from violation thereof.

B. The Contractor shall give preference to Iowa domestic labor, in accordance with the provisions of Chapter 73 of the Code of Iowa, and this provision is hereby specifically made a part of any contract of which these contract documents are a part. A person shall be deemed a domestic laborer of this state if he/she is a citizen and has resided in this state for more than six months.

C. The provisions of Chapter 73 of the Code of Iowa concerning preferences for Iowa products and labor shall not apply to contracts involving work financed wholly, or in part, by the federal government.

D. The Contractor and all subcontractors shall have on file with the Contracting Authority, a valid state of Iowa contractors registration number, issued by the Iowa Department of Labor Services, in accordance with Chapter 91C of the Code of Iowa.

1107.02 LIABILITY INSURANCE

A. It shall be the Contractor's responsibility to have liability insurance covering all of the construction operations incident to completion of this contract. The Contractor must have on file, with the Contracting Authority, a current "Certificate of Insurance" prior to award of contract. The certificate shall identify the following: insurance company firm name and address, contractor firm names policy period, type of policy, limits of coverage, and scope of work covered, (single project or statewide).

1. This requirement shall apply with equal forces whether the work is performed by -- (1) persons employed directly by the Contractors (2) by a subcontractor or his employees, or (3) by an independent contractor.

B. In addition to the above, the Contracting Authority shall be included as an insured party, or a separate owner's protective policy shall be filed showing the Contracting Authority as an insured party.

C. The liability insurance shall be written by an insurance company (or companies) qualified to do business in Iowa. For independent contractors engaged solely in the transportation of materials, the minimum coverage provided by such insurance shall not be less than required by Chapter 327, Code of Iowa, for truck operators or contract carriers as defined therein. For all other contractors, subcontractors, and independent contractors, the minimum coverage by such insurance shall be as follows:

Public Liability Insurance
Per person - $100,000.00
Each occurrence - $300,000.00
Property Damage Insurance
Each occurrence - $50,000.00

D. Failure on the part of the Contractor to comply with the requirements of this article will be considered sufficient cause to suspend the work, withhold estimates, and to deny the Contractor from receiving further contract awards, as provided in 1103.01.

1107.03 PATENTS AND ROYALTIES

A. The Contractor shall be responsible for all claims for infringement of patents, or for royalties on tools, machinery, appliances, devices, or materials used in construction and completion of the work, except as are specifically required by the contract documents.

1. The Contractor agrees that the Department may retain out of the money that is or may become due the Contractor an amount to cover all such claims and to retain the same, until all such claims are paid or adjusted.

B. The Contracting Authority assumes responsibility for payment of claims for damages from patent or copyright infringement or for royalties on material processes, specifications, or types of construction that are required by the contract documents.

1107.04 RESTORATION OF CONSTRUCTION WORK OPENED BY PERMIT

A. Prior to final acceptance, if any repairs to the work constructed hereunder are made necessary by construction or repair of drains or sewers, laying or repairing of pipes or conduits for telegraphy, telephone or electric wires, or from any other disturbance of said work under permission issued by the Contracting Authority, the Contractor shall, upon notification by the Engineer, immediately make necessary repairs in conformity with the specifications.

1. Such repairs shall be paid for as extra work, however, no compensation will be allowed when such repairs are made necessary by the Contractor's negligence or carelessness.

B. The Contractor shall not authorize any person or persons to make alterations or additions to the construction work unless a permit duly authorized by the Contracting Authority is presented.

1107.05 FEDERAL PARTICIPATION

A. The attention of the Contractor is called to the provisions of the Acts of Congress known as the "Land and Water Conservation Fund Act", the "Federal Aid in Wildlife Restoration Act", the "Federal Aid in Fish Restoration Act", the "Boating Safety Act", the "Superfund Amendments and Reauthorization Act ", the " Clean Water Act" and amendments thereto, and any other acts of congress providing for fish and wildlife of conservation improvements.

1. When the United States Government is to pay for all or any portion of the cost of an improvement or project, the construction work, although it is under the direct supervision of the Contracting Authority and subject to the laws of the State of Iowa, is also subject to the above mentioned Acts of Congress and all rules, regulations, and reimbursements that may be imposed by the federal authority thereunder. Such construction work will, therefore, be subject to inspection by the duly authorized agents of the federal government, but such inspections will not make the federal government a party to the contract.

B. On all contracts involving Federal aid, all steel products incorporated into the work must have been manufactured in the United States. The Engineer may allow minimal amounts of these materials from foreign sources, provided the cost does not exceed 0.1 percent of the contract sum or $2,500 whichever is greater.

1107.06 SAFETY, HEALTH, POLLUTION AND SANITATION

A. In the performance of his contract, the Contractor shall comply with all applicable laws, rules, regulations, and ordinances governing safety, health, pollution, sanitation, noise control, and disposal of waste materials, and shall make available such additional safeguards, safety devices, protective equipment, and take such actions as are reasonably necessary to protect life and health of employees and the public.

1. The Engineer will not act as an enforcement agent for compliance of rules and regulations governing industrial safety. However, violations of properly promulgated laws, rules, regulations, and ordinances reported to the Engineer by responsible agencies may result in the issuance of a suspension order until such time as the violation is corrected.

B. The Contractor shall make adequate provisions satisfactory to the Engineer for safety of inspectors, particularly at sampling locations. Provisions shall include guards for moving belts, pulleys, and wheels near the sampling point and a stable platform to be used when sampling is to be done from an elevated location.

C. There shall be suitable retention dams, in areas where approved liquid asphaltic material, or asphalt cement are stored and used, to minimize pollution of nearby areas from effect of normal rains. The Contractor shall take other necessary precautions to prevent pollution of streams, lakes, ponds, reservoirs, and other areas with fuels, oily bitumens, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

D. The disposal by open burning of landscape waste originating on the construction site shall be permitted unless prohibited by local ordinances or regulations. However, the burning of landscape waste produced in clearing, grubbing, and construction operations shall be limited to areas located at least one-fourth mile from any inhabited buildings. Rubber tires will not be used to ignite landscape waste.

E. The Contractor shall be specifically responsible for adhering to all local burning ordinances or regulations, and to ascertain what the local burning restrictions consist of in addition to the regulation stated above and to see that all subcontractors comply with those restrictions.

F. All internal combustion engines, used for any purpose on the job, or related to the job, should be equipped with a muffler of the type recommended by the manufacturer. No internal combustion engine will be operated without a muffler. Faulty or damaged mufflers must be replaced. Machinery must be properly maintained at all times in order to limit engine noise, as well as other extraneous noise.

G. When directed by the Engineer, the Contractor shall apply moisture to the construction area and haul routes, as necessary, to prevent the spread of dust, at no expense to the Contracting Authority.

1107.07 PUBLIC CONVENIENCE AND SAFETY

A. The Contractor shall conduct the work as to assure the least possible obstruction to access by the residents along the project. The Contractor should schedule and conduct the work in such a way as to provide for their safety and convenience.

1. Work and materials required by the Engineer for public convenience and safety in excess of that provided for in the contract, shall be considered as provided for in 1109.03.

1107.08 BARRICADES AND WARNING SIGNS

A. The Contractor shall take every reasonable precaution to prevent the public from interfering with the work, and to prevent the work from interfering with the public, for providing for safety of the general public traveling to, through, within, along, and across the project, and shall take such precautions, measures, or acts as are required herein and as specifically required by the contract documents or by the Engineer. In additions the Contractor shall provide such additional safeguards as deemed necessary to protect equipment, the work, and the public at the Contractors own expense.

B. The Contractor shall erect and maintain suitable barriers, and at night, such lights, as will prevent accidents to persons or property in and around the area of work.

C. The Contractor shall provides at his own expense, such security guards as are necessary to protect equipment and to maintain proper lighting. Security guards that may be necessary for the protection of the public shall be provided by the contractor on written order from the Engineer.

D. Whenever the work is under the Contractor's control, the Contractor shall be held responsible for any damage to the newly completed portions of the work resulting from public misuse.

1107.09 USE OF EXPLOSIVES

A. When the use of explosives is necessary for the prosecution of the work, the Contractor shall exercise the utmost care not to endanger life or property. The Contractor shall be responsible for all damage resulting from use of explosives.

B. All explosives shall be stored in a secure manner in compliance with all laws and ordinances and in quantities maintained at a practical minimum. Storage places shall be clearly marked. Where no local laws

or ordinances apply, storage shall be provided, satisfactory to the Engineer and, in general, not closer than 1,000 feet from the road or from any building, camping area , or place of human occupancy.

C. The Contractor shall notify each public utility company, having structures in proximity to the site of the work, of the intent to use explosives. Such notice shall be given sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property from injury.

1107.10 PROTECTION AND RESTORATION OF PROPERTY

A. The Contractor shall replace or renew fences, sidewalks, or other property damage by reason of the work or the negligence of the Contractors employees. The Contractor shall take suitable precautions to prevent damage to telephone, telegraphy, and electric transmission lines along the highway and to pipes, conduits, and other underground structures. The Contractor shall carefully protect from disturbance all land monuments and property marks until an authorized agent has witnessed or otherwise referenced their locations and shall not remove them until so directed.

1. The Contractor shall be responsible for damage or injury to property resulting from the prosecution of his work, however, responsibility shall not extend to damage to fences, telephones, telegraph, or electric lines occupying the right-of-way unlawfully, provided due caution has been used in removing them. The Contractor's responsibility shall not be released until the work under the contract is completed and accepted.

1107.12 RESPONSIBILITY FOR DAMAGE CLAIMS

A. The Contractor shall indemnify and save harmless the state of Iowa, the Contracting Authority and other agencies which have concurred in the award of contract, their officers and employees, from all suits, actions, or claims of any character brought because of any injuries or damage received or sustained by any person, persons, or property because of any act, omissions or neglect in safeguarding or performing the work, or through use of unacceptable materials in constructing the work, and so much of the money due the said Contractor, under and by virtue of the contract, as may be considered reasonable and necessary by the Contracting Authority for such purpose, may be retained for the use of the State, or in case no money is due, the surety may be held until such suit or suits, action or actions, claim or claims for injuries or damages, as aforesaid, shall have been settled and suitable evidence to that effect furnished to the Contracting Authority, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence of adequate protection by public liability and property damage insurance.

1. Notwithstanding the above, it is specifically agreed between the parties executing this contract that it is not intended by any of the provisions of any part of the contract documents to create in the public or member thereof a third party beneficiary hereunder, or to authorize anyone not a party to this contract to maintain a suit for personal injuries or property damage pursuant to the terms of provisions of this contract.

2. The duties, obligations, and responsibilities of the parties to this contract with respect to third parties shall remain as imposed by law. It being the intention of the parties that indemnity herein provided shall not extend to acts of omission, of negligence for which the Contracting Authority is solely responsible. But indemnity shall extend to all claims in which the Contractor and the Contracting Authority are found to be either jointly or concurrently negligent.

B. Responsibility of the Contractor for providing warning devices, required by 1107.08 to avoid damages or injuries on any portion of the work covered by the contract, shall not cease until the work on such portion has been released by the Engineer.

1. A release shall be construed to mean a written statement by the Engineer to the effect that the Contractor may cease to maintain barriers and lights, that the work may be opened to the publics and that the Contractor is relieved of further maintenance of that portion of the work. Such release shall not constitute an acceptance of the work.

C. The Contractor's responsibility for maintenance of lights on any individual structure shall cease upon final acceptance of such structure, or when specifically released in writing by the Engineer.

1107.13 OPENING OF SECTION OF CONSTRUCTED WORK TO THE PUBLIC

A. When any substantial portion, part, or feature of a contract is completed to the extent that its stability and integrity is not dependent upon completion of the other item, or work required in the contract, that portion, part, or feature may be released by the Engineers after conferring with the Contractor, and opened to traffic or received for public usage prior to final approval and acceptance of all work involved in the contract.

1. The Contractor will not be responsible for damages due to the elements or the ordinary use of the public to those portions, parts, or features of the work which have been released by the Engineer.

2. The Contractor will be responsible for any damages which may be caused by defective work or failure to comply with the contract documents.

B. The above provisions relating to a release by the Engineer will be applicable only to those portions, parts, or features of the contract for which the Engineer has furnished to the Contractor a written release.

1107.14 CONTRACTOR'S RESPONSIBILITY FOR WORK

A. The Contractor shall be responsible for the care and maintenance of partially completed and furnished work on any portion of the project until released by the Engineer from such responsibility. It will be the Contractor's responsibility to adjust the Contractor's operation or method of operation to prevent any damage of any nature to any portion of the partially completed or completed work. Repair work shall be done promptly upon being so ordered by the Engineer.

1107.15 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTY AND SERVICES

A. At points where the Contractor's operations are adjacent to properties of railway, telegraph, telephone, and power companies, or are adjacent to other property, damage to which might result in considerable expense, loss, or inconvenience. Work shall not be commenced until all arrangements necessary for the protection thereof have been made.

B. The Contractor shall cooperate with owners of underground or overhead utility lines in their removal and rearrangement operations, in order that these operations may progress in a reasonable manner, that duplication of rearrangement work may be reduced to a minimum, and that services rendered by those parties will not be unnecessarily interrupted.

C. In the event of interruption to water or utility services, as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with said authority in restoration of service.

1. If water service is interrupted, repair work shall be continuous until service is restored.

2. No work shall be undertaken around fire hydrants until provision for continued service has been approved by the local fire authority.

1107.16 PERSONAL LIABILITY OF PUBLIC OFFICIALS

A. In carrying out any of the provisions of the contract, or in exercising any power or authority granted to any agency or representative of the Contracting Authority thereby, there shall be no liability upon such agent or representatives including the Engineer or authorized agents, either personally or as an official of the Contracting Authority, it being understood that in such matters the agent acts as the agency and representative of the Contracting Authority.

1107.17 NO WAIVER OF LEGAL RIGHTS

A. The Contracting Authority shall not be precluded or stopped by any measurement, estimate, or certificate made, either before or after the completion and acceptance of the work and payment therefor, from showing the true amount and character of the work performed and materials furnished by the Contractor, or from showing that any such measurement, estimate, or certificate is untrue or incorrectly made, or that the work or materials do not, in fact, conform to the contract.

B. The Contracting Authority shall not be precluded or stopped, notwithstanding any such measurement, estimate, or certificate, and payment in accordance therewith, from recovering from the Contractor and the Contractor's sureties such damages as it may sustain by reason of the Contractor's failure to comply with the terms of his contract.

C. Neither acceptance by the Contracting Authority, or any representative of the Contracting Authority, nor any payment for or acceptance of the whole or part of the work, nor any extension of time, nor any possession taken by the Contracting Authority, shall operate as a waiver of any portion of the contract, or for any power herein reserved, or any right to damages herein provided. A waiver of any breach of contract shall not be held to be a waiver of any other or subsequent breach.

PART 1108. PROSECUTION OF PROGRESS

1108.01 SUBLETTING OF CONTRACT

A. The Contractor shall perform, with his/her own organization, work amounting to not less than 30% of the total contract cost, however, any items designated in the contract as "specialty items" may be performed by subcontracts and the cost of any such specialty items so performed by subcontract may be deducted from the total cost before computing the amount of work required to be performed by the Contractor with his/her own organization.

B. Any items that have been selected as "specialty items" for the contract are listed as such in the special provisions found elsewhere in the contract documents.

C. At the time specified by the contract documents or when requested by the Engineer, the Contractor shall submit, in writing to the Contracting Authority, for approval the names of the subcontractors proposed for the work. Subcontractors may not be changed except at the request of and with the approval of the Contracting Authority.

1. The Contractor is responsible to the Contracting Authority for the acts and omissions of the subcontractors, and of their direct and indirect employees, to the same extent as the Contractor is responsible for the acts and omissions of its own employees.

2. The contract documents shall not be construed as creating any contractual relation between the subcontractor and the Contracting Authority.

D. The Contractor shall bind every subcontractor and every subcontractor agrees to be bound by the terms of the contract, the contract documents, the plans, the general conditions of the contract, the supplementary general conditions, the special conditions, and the specifications as far as applicable to the subcontractors work.

E. The subcontractor shall be bound to the Contractor by the terms of the contract, the contract documents, the plans, the general conditions, and specifications, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by those documents, assumes towards the Contracting Authority.

1. The Contractor agrees to be bound to the subcontractor by all the same obligations that the Contracting Authority assumes to the Contractor under the terms of said documents, and by all the provisions thereof affording remedies and redress to the Contractor from the Contracting Authority.

F. The Contractor shall not assign, sublet, or transfer in whole or part any of the work herein specified without the written consent of the Contracting Authority. Any such assignment, subletting, or transfer shall not in any manner relieve the Contractor from any of the responsibilities assumed herein.

G. For convenience of reference and to facilitate the letting of contracts and subcontracts, the specifications are separated into title sections. Such separations shall not, however, operate to make the Engineer an arbitrator to establish limits to the contracts between Contractor and subcontractors.

H. This article shall further be applicable to contracts involving Federal-aid participation in construction insofar as they are consistent with the required provisions for Federal-aid contracts attached to the contracts,

and shall be additional specifications insofar as they cover matters not covered by the required provisions for Federal-aid contracts.

1108.02 PROSECUTION OF WORK

A. The proposal form may designate the contract period by either completion date, approximate starting date, of specified starting date.

B. Intermediate contract periods may be designated for completion of certain portions of the contract. The contract period for each portion and the liquidated damages, if any, will be listed in the special provisions.

C. The return of the signed and executed contract to the Contractor shall serve as notice to the Contractor that the contract bond is acceptable, that the contract is in force, and that the Contractor may complete arrangements for materials and other work in accordance with the contract documents.

D. Should delay become apparent before or after the work is started, the Engineer will immediately notify the Contractor, in writing, that work on the contract will be delayed and, if possible, the approximate duration of such delay. For delays exceeding 2 weeks, new construction dates may be established by the Engineer after consulting with the Contractor.

1. Specified Starting Date: When a starting date is specified, working days will be charged to the Contractor starting on the specified starting date or 10 days after execution of the contract, whichever is later. Starting work prior to the specified date will be considered upon request, and working days will be charged when work starts.

2. Approximate Starting Date:

    a. Site available immediately, as determined by the Engineer: Anytime after execution of the contract and on or after the approximate starting date, the Contractor may work, weather and specifications permitting. Working days will be charged any time the Contractor is working on/or after the approximate starting date. Starting work prior to the approximate starting date will be considered upon request. If allowed, working days will be charged.

    b. Site Availability Date Unknown, as determined by the Engineer: It is expected the site will be available by the approximate starting date. If it appears the site will not be available by the approximate starting date, the Engineer will inform the Contractor of the delay and if possible the duration of the delay. The Contractor may commence work, weather and specifications permitting, any time after execution of the contract and on or after the approximate starting date provided the site has become available. If work is started under these conditions, working days will be charged. Starting work before the approximate starting date and before the site is available, will be considered only after the Contractor has submitted a signed waiver of any right to claim extra compensation for damages due to delays from any cause related to the early commencement. If approved, working days will not be charged when working prior to the date of site availability. If the Contractor is working on the project when the site becomes available, working days will be first charged on the following day.

3. Specified Completion Date: The Contractor may commence work any time after execution of the contract, weather and specifications permitting.

    a. Working days will begin to be charged whenever the Contractor starts work.

4. Winter Work: The proposal may require winter work on all or portions of the project, and working days will be counted as indicated therein. When not so specified, the Contractor may work, unless advised to the contrary be the Engineers between November 15 and April 1 with no working time charged. If the best interest of the Contracting Authority so dictates, the Engineer may require the Contractor to continue work after November 15.

    a. Working days will not be charged if working time remains on November 15, and working days may be charged for days worked if no working time remains on November 15.

5. Notice to Proceed: A notice to proceed will be issued when, in the opinion of the Engineer, considering the approximate starting date, site availability, and working days allowed, failure of the Contractor to commence work places the timely completion of the project in jeopardy. The starting date in the notice to proceed will not be less than 15 calendar days after the date of the issuance of the notice. Working days will be charged beginning with the starting date established by the notice or when the Contractor starts work if prior thereto. A notice to proceed will be issued, except:

    a. It will be assumed when a specified starting date is used.

    b. It will be assumed when a specified completion date is used, the number of working days allowed will be counted back from the specified completion date, exclusive of Saturdays, Sundays, and holidays, to determine the first day working days will be charged.

    c. It may be included as an agreed starting date at a preconstruction conference for projects with an approximate starting date.

    d. It will be assumed when the Contractor is working at the time for issuance of the notice.

    e. It will be assumed, if an early work waiver is approved, as having been issued at the time of site availability, as documented in the project records.

6. Weekly Report of Working Days: Whenever the Contractor is subject to being charged with working days, the Engineer will furnish the Contractor a weekly statement indicating the working days to be charged against the Contractor for that period. Should the Contractor believe the statement to be inaccurate, a statement should be submitted to the Engineer, in writing, stating the objection and reasons, within 10 calendar days after receipt of the statement. If the Contractor fails to submit an objection within that time, the original statement may be considered as accurate and final.

7. Work Progress: The progress of the work shall be at a rate sufficient to complete the contract within the time allowed. If it appears that the rate of progress is such that the contract will not be completed within the time allowed, or if the work is not being executed in a satisfactory and workmanlike manner, the Engineer may order the Contractor to take such steps as necessary to complete the contract within the period of time specified or to prosecute the work in a satisfactory manner.

    a. If the Contractor fails to comply with such order within 2 weeks after receipt of the order, the Contractor may be disqualified from receiving any additional bidding proposals, and the Contracting Authority shall have the right to declare the contract in default and to complete the work in accordance with 1108.11.

    b. Failure of the Contracting Authority to issue such order shall not alter the Contractor's responsibility under the contract.

    c. The Contractor's sequence of operations shall be such as to cause as little inconvenience to the general public as possible.

8. Schedule of Staging: On any project, or part of a project, on an existing road where the work may prohibit or restrict public or private access that has been previously available, the Contractor may be required to submit a schedule of staging for the Engineer's approval before work is started.

    a. Preliminary work may be required in stage construction, even though the work involved in these operations is similar, in order to minimize the inconvenience to the public and those to whom access has been previously available. This requirement will apply equally to work that is subcontracted.

9. Accelerated Work Schedule: An accelerated work schedule may be required by a note on the proposal. When required, the Contractor shall marshal the necessary forces, including but not limited to: extra crews, subcontractors, extra work hours, or other acceptable methods to insure completion of the projects or various stages of the projects within the contract period and in compliance with the specifications.

a. A work plan shall be submitted to the Engineer for review prior to commencement of work. Work will be permitted on a 24-hour-day basis and on Sundays and holidays when traffic interference exists, though work may be restricted during peak traffic periods. No credit will be allowed for delayed or slow delivery of materials. The special provisions may include other requirements or modifications for the accelerated work schedule.

10. Preconstruction Conference: The Engineer shall schedule and conduct a preconstruction conference. The Contractor and intended subcontractors shall participate in this conference. The Engineer will invite utilities and others having responsibilities or interest in the work.

1108.03 LIMITATIONS OF OPERATIONS

A. The Contractor shall conduct the work so as to create a minimum amount of inconvenience to the public. At anytime, when in the judgment of the Engineer, the Contractor has obstructed, closed, or is conducting his/her operations on a greater portion of the project vicinity than is necessary for the proper prosecution of the work, the Engineer may require the Contractor to finish the section on which work is in progress before work is started on any additional sections.

B. Whenever work which is being done by other contractors or subcontractors is contiguous to, or a part of the work included in this contract, the Engineer shall in case of dispute, determine and define the respective rights of the various interests involved, in order to secure the completion of all parts of the work in general harmony and with satisfactory results.

C. Except when an accelerated work schedule is required, no work will be permitted on Sundays, holidays observed by the Department of Natural Resources or within the time frame of dusk until dawn (as observed by current Farmer's Almanac) unless explicit permission from the Engineer has been obtained.

1. The Contractor should request a determination of the holidays to be observed at the beginning of each calendar year.

1108.04 METHODS AND EQUIPMENT

A. The methods, equipment, and appliances used shall produce a satisfactory quality of work and shall be adequate to maintain the schedule of progress specified. Equipment used on any portion of the project shall be such and its use so regulated that no serious or irreparable damage to the adjacent property, or highways will result from its use. If damage does occur to the highways suitable repairs shall be made.

B. When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the contract, the Contractor is free do use any methods or equipment that will accomplish the contract work in conformity with the requirements of the contract, as demonstrated to the satisfaction of the Engineer.

C. When the contract specifies that the construction be performed by use of certain methods and equipment, such methods and equipment shall be used, unless others are authorized by the Engineer. If the Contractor desires to use a method or type of equipment other than specified in the contract, he/she may request approval from the Engineer to do so.

1. The request shall be in writing and shall include a full description of the methods and equipment proposed to be used and an explanation of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing construction work in conformity with contract requirements.

2. If after trial use of the substituted methods or equipment the Engineer determines that the work produced does not meet contract requirements, the Contractor shall discontinue use of the substitute method or equipment and shall complete the remaining construction with the specified method and equipment.

3. The Contractor shall remove the defective work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment

for the construction items involved or in contract time as a result of authorizing a change in methods or equipment under these provisions.

1108.05 CHARACTER OF WORKERS

A. Any employee of the Contractor who is careless, incompetent, or disorderly, or who refuses or neglects to perform work in accordance with the specifications, or who shall commit trespass upon any public or private property in the vicinity of the work, shall be discharged upon the written request of the Engineer and shall not be reemployed on any of the work unless written permission is given by the Engineer.

1108.06 TEMPORARY SUSPENSION OF WORK

A. Work shall be suspended, wholly or in part when, in the opinion of the Engineer, weather or other conditions are unfavorable to its satisfactory prosecution.

1. Work shall also be suspended at the direction of the Engineer pending settlement of disputes arising of failure of the Contractor to comply with provisions of the contract. Written notice of suspension of work shall be given by the Engineer.

2. When the conditions causing suspension no longer exists, written notice to resume work will be given to the Contractor by the Engineer. Promptly after such written notices the Contractor shall resume prosecution of the work as provided in 1106.02.

B. The start of work may be delayed or work may be suspended upon request of the Contractor and with approval of the Engineer. The Engineer may require the request to be in writing and also may require the Contractor to include with the request a schedule for satisfactory completion of the work.

1108.07 EXTENSION OF CONTRACT PERIOD

A. An extension of the contract period will be granted by the Engineer for additional work requiring additional construction time and may result from a modification of the plans or extra work.

1. If any delay is caused by active interference by the Contracting Authority, the Contracting Authority will grant such an extension of time for completion of the contract as will, in the opinion of the Engineer, compensate for such delay. An extension of the contract period will be granted by the Contracting Authority for:

a. Additional work resulting from a modification of the plans for the project, or

b. Other reasons beyond the control of the Contractor which, in the Contracting Authority's judgment would justify such extension.

A. All claims for extension of the contract period shall be made in writing to the Engineer no more than thirty days after the occurrence of the delays otherwise they shall be waived. In the case of continuing cause of delays only one claim is necessary.

1108.08 LIQUIDATED DAMAGES

A. Time is an essential element of the contract and it is important that the work be pressed vigorously to completion.

B. For each calendar day that any work shall remain uncompleted after the end of the contract period, number of working days allowed, or any extension granted under 1108.07, the amount per calendar day specified in the proposal form will be assessed, not as a penalty, but as predetermined and agreed liquidated damages.

1. The Contracting Authority will prepare and forward to the Contractor an invoice for such liquidated damages.

2. The final payment will be withheld until payment shall have been made on this invoice.

C. Assessment of liquidated damages will be based only on the number of working days required to complete the work in excess of the specified working days allowed, plus authorized extensions thereto.

D. This provision for the assessment of liquidated damages for failure to complete work within the contract period does not constitute a waiver of the Contracting Authority's right to collect any additional damages other than time delays which the Contracting Authority may sustain by failure of the Contractor to carry out the terms of the contract.

1108.09 FAILURE TO COMPLETE WORK WITHIN CONTRACT PERIOD

A. If the Contractor fails to complete his work within the contract periods or any extension thereof, as provided in 1108.07, upon written notice to the Contractor and surety, said contract shall be in default. The Contracting Authority may, at its option, permit the Contractor or the Contractor's surety to complete the work included in the contracts or may proceed to complete the work in accordance with 1106.11. In either event, the Contractor or the Contractor's surety shall be responsible for all costs incident to the completion of the work, and also for the liquidated damages stipulated in the proposal form. The Contracting Authority may waive such portion of the liquidated damages as may accrue after the work is in condition for safe and convenient use by the public.

1108.10 CONTRACTS IN DEFAULT

A. The Contracting Authority may declare a contract in default for any one of the following reasons:

1. Failure to complete the work within the contract period or any extension thereof,

2. Failure or refusal to comply with an order of the Engineer within a reasonable time,

3. Failure or refusal to remove rejected materials,

4. Failure or refusal to correct any defective or unacceptable work,

5. Bankruptcy or insolvency, or the making of an assignment for the benefit of creditors,

6. Failure to carry on the work in an acceptable manner.

1108.11 COMPLETION OF CONTRACTS IN DEFAULT

A. If for any reason a contract is declared in default, the Contracting Authority shall have the right, without process or action at law, to take over all or any portion of the work and complete it, at its option, either by day labor or by reletting the work.

1. Written notice shall be given the Contractor by the Contracting Authority that the contract has been declared in default, and upon receiving such notices the Contractor shall peaceably relinquish possession of the said work or the parts thereof specified in the notice.

B. The Contracting Authority may, at its option and, at a rental which it considers reasonable, retain all material, equipment, and tools on the work until the work has been completed.

C. Neither the Contracting Authority nor any member or employee thereof shall be in any way liable or accountable to the Contractor or the Contractor's surety for the method by which the completion of said work, or any portion thereof, may be accomplished, or for the price paid therefor.

1. Should the cost of completing work be in excess of the original contract prices the Contractor and the Contractor's surety shall be held responsible for such excess cost.

2. Should the cost of such completion, including all proper charges, be less than the original contract price, the amount so saved shall be paid to the Contractor.

3. Neither by taking over the work nor by declaring the contract in default shall the Contracting Authority forfeit the right to recover damages from the Contractor or the Contractor's surety for failure to complete the entire contract.

1108.12 REMOVAL OF EQUIPMENT

A. In the case of cancellation of this contract before completion from any cause whatsoever, the Contractor, if notified to do so by the Contracting Authority, shall promptly remove any part or all of his equipment and supplies from the property of the Contracting Authority. In the event of failure of the Contractor to remove such equipment and supplies within thirty days after the issuance of the notification for removal, the Contracting Authority shall have the right to remove such equipment and supplies at the expense of the Contractor.

1108.13 ORDER OF COMPLETION AND USE OF COMPLETED PORTIONS OF THE WORK

A. The Contractor shall complete any portion or portions of the work in such order of time as the Engineer may require. The Contracting Authority shall have the right to take possession of, and use any completed or partially completed portion of the work at anytime, but such taking possession and use shall not be deemed as acceptance of the work so taken or used or any part thereof. If such prior use increases the cost or delays the work, the Contractor shall be entitled to such extra compensation or extension of time, or both, as determined by the Engineer.

1108.14 METHOD OF SERVING NOTICES

A. Any notice to be given by the Contracting Authority to the Contractor under this contract shall be deemed to be served if delivered to any office used by the Contractor, or foreman, or agent, at or near the work, or deposited in the post office, postpaid, addressed to the Contractor at the last known place of business.

1108.15 TERMINATION OF CONTRACTOR'S RESPONSIBILITY

A. The contract shall be considered completed when the work has been accepted in writing by the Contracting Authority.

1. Such acceptance shall release the Contractor from all further obligation with respect thereto, except as to conditions and requirements set forth in the performance bond, and if, within one year after the final acceptance or a longer period of time, as may be prescribed by law or by the terms of any applicable guarantee required by the contract documents, any of the work is found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of a written notice from the Contracting Authority to do so unless the Contracting Authority has previously given the Contractor a written acceptance of such conditions specifically starting the condition that is accepted.

2. The Contracting Authority shall give such notice promptly after discovery of the condition. All such defective or non comforming work shall be removed from the site if necessary, and the work shall be corrected to comply with the contract documents without cost to the Contracting Authority.

B. The Contractor shall bear the cost of making good, all work destroyed or damaged by such removal or correction of separate contractors.

PART 1109. MEASUREMENT AND PAYMENT

1109.01 MEASUREMENT OF QUANTITIES

A. The work completed under the contract shall be measured according to United States standard measures. Payment will be based on the actual quantity of work performed under the various work classifications in the contract, unless otherwise provided below, or by the method of measurement for the various classes of work.

B. By written agreement between the Contractor and the Engineer, final settlement may be made on the basis of contract quantities without final field measurements. Such an agreement may be made before work is started or after work has been completed, if no material deviation from the original plans is involved.

1. Except for those items for which quantities cannot be accurately predetermined, the contract quantities have been accurately and properly estimated, but adjustments will be made for obvious errors or authorized changes.

2. The Engineer shall exercise such controls and make such measurements, as are necessary, to assure that each item of work is done in substantial compliance with the contract documents. The use of this agreement for payment shall not be considered as a change in the contract.

1109.02 SCOPE OF PAYMENT

A. The Contractor shall accept the compensation herein provided as full payment for furnishing all materials labor, tools, and equipment for performing all work under the contract or any extension thereof allowed under 1108.07, also, for all costs arising from the action of the elements or other natural causes, agreements, and performance, nonperformance, or delays involving other contractors and third parties, or injunctions or lawsuits resulting therefrom, or from any unforeseen difficulties not otherwise provided for in the specifications and which may be encountered during prosecution of the work and up to the time of acceptance thereof, except damage to the work due to acts of war. Nothing herein shall in itself be construed to prejudice or deny any claim filed under provisions 1109.12.

B. The contract price for any item shall be full compensation for acceptable work and for materials, equipment, tools, and labor for performance of all work necessary to complete the item in accordance with the plans and specifications, except as specifically exempt in the clauses covering the basis of payment for the item.

1109.03 ADJUSTMENT IN CONTRACT PRICE

A. When the measured quantity of any item varies by more than 20% from the estimated quantity specified in the contracts an adjustment in price may be made for such item of work, and the adjustment will be made on the full variance from the contract quantity. Such adjustment may be requested by either party to the Contract.

1. If the contract sum for an item is less than five thousand ($5,000.00) dollars, the price of that item will not be subject to adjustment.

B. If the increase or decrease in quantity is due to an alteration in plans, any price adjustment shall be requested and agreed upon before the work is done. If the increase or decrease in quantity is not the result of an alteration in plans, but results from errors in original estimates, or unforeseen conditions, price adjustments may be requested after the work is completed.

C. In making price adjustments, consideration shall be given to the portion of the cost of the work that can be classified as fixed costs, independent of the exact quantity of work performed, such as transportation and installation costs on equipment, overhead costs, etc. Any price adjustment shall be arrived at from the standpoint that neither party to the contract shall be penalized by the increase or decrease in quantities which occasioned the price adjustment.

D. If changes or alterations, as outlined in 1105.04, result in a substantial increase or decrease in cost or difficulty of the work, appropriate modifications will be made in the contract by extra work order, regardless of the quantity.

E. All price adjustments shall be agreed to by the Engineer and the Contractor and shall be subject to the approval of the Contracting Authority.

1109.04 PAYMENT FOR WORK PERFORMED

A. All contract price adjustments approved by the Engineer shall be subject to the concurrence of the Contracting Authority.

B. The Contractor will receive and accept payment for work performed under his contract as follows:

1. Items or Work Performed Which Are Covered by Definite Prices Stipulated in the Contract: For all items of acceptable work performed which are covered by definite unit prices or lump-sum amounts

specified in the contract, the Contractor shall receive and accept compensation at the rate specified in the contract, except as provided in 1109.03 and for items identified as that of "significant change" as provided in 1109.17.

2. Extra Work: Extra work ordered by the Engineer, of a quality or class not covered by the contract, will be paid for, either at an agreed price or on a force-account basis.

3. Agreed-Price Basis: For extra work ordered by the Engineer and performed on an agreed-price basis, the Engineer and the Contractor shall enter into a written agreement before such work is undertaken. This written agreement shall describe the extra work that is to be done and shall specify the agreed price or prices.

4. Force-Account Basis: Extra work performed on a force-account basis will be paid for in the following manner:

   a. For laborers, timekeepers, foremen, and superintendents, the Contractor shall receive the rate of wage shown on previous payrolls for the time they are actually engaged in the extra work, to which shall be added an amount negotiated up to 15% thereof, plus the amount of social security tax imposed by law upon the Contractor because of such force-account work, plus the cost of worker's compensation, public liability insurance, and employment security contributions. The percentage shall cover compensation for furnishing of necessary small tools for the work together with all other overhead expense items.

   b. The wage of the superintendent, timekeeper, or foreman who is employed partly on force-account work and partly on other work shall be prorated between the two classes of work according to the number of persons shown by the payroll, as employed on each class of work.

   c. For materials used on force-account work, the Contractor shall receive the actual cost of materials delivered on the work, including the freight and handling charges as shown by original receipted bills, to which cost shall be added an amount negotiated to 15% thereof.

   d. For machinery, tools, or equipment, fuel and lubricants therefor, except small hand tools which may be used, the Engineer shall allow the Contractor a reasonable rental rate to be agreed upon in writing before such work is begun. No profit percentage shall be added to the rate.

   e. Compensation, as herein provided, shall be accepted by the Contractor as payment in full for extra work done on a force-account basis. It will be assumed that such payment includes the use of tools and equipment for which no rate is allowed, overheads and profit.

   f. At the end of each day, the Contractor shall prepare payrolls in duplicate for labor furnished on a force-account basis, using the Contracting Authority's standard force-account forms. Both copies shall be signed by the inspector and Contractor's representative. One copy shall be furnished to the Engineer and one to the contractor.

   g. Claims for extra work performed on a force-account basis shall be submitted to the Engineer in triplicate. To the claims shall be attached such receipt or statements as the Engineer may require in support of such claims. Such claims shall be filed not later than the tenth day of the month following that in which the work was actually performed, and shall include all labor charges, rental charges on machinery, tools, and equipment, and all material charges insofar as they are available.

5. Deficient Work: Payment for work judged by the Engineer to be deficient work shall be made at the reduced rate specified in the contract documents or, if no such rate is specified, at a modification of the contract prices as determined by the Engineer.

1109.05 CANCELLED WORK

A. The Contracting Authority shall have the right to cancel any or all items from the contract when unforeseen circumstances, failure to secure permits, approvals, loss of funding, unanticipated design changes, or other reasons beyond the control of the Contractor prevent or unreasonably delay completion of the contract, or

of certain items of the contract, or when the Contracting Authority determines that cancellation is in the public or national interest.

B. The Contractor may be prevented from starting work on a contract, or an identified phase of a contract, as a result of a delay caused by the Contracting Authority or others.

C. When the contract period is defined by approximate starting date and the delay prevents the Contractor's starting work on the contract or an identified phase of the contract for 30 days beyond the date which, by notice to the Engineer, the Contractor proposed to start work, the Contractor may request cancellation by written notice to the Engineers stating the reasons.

D. In either case, within 30 days from the date of the request, the Engineer will eliminate or minimize, if possible, the cause for the delay and issue a notice to proceed, redefine the basis on which the work is to proceed, or cancel the contract or phase of the contract.

E. The Contractor shall not use delays that occur prior to starting work or an identified phase of the work as a basis of a claim against the Contracting Authority except for an extension of contract period.

F. Notices described in this article should be transmitted by certified mail.

G. For finished portions of items canceled, the Contractor will be paid at the contract unit prices, in accordance with the provisions of 1109.04. For finished portions of major items canceled, the Contractor will be paid as provided in 1109.17. For all items, materials ordered and delivered for the unfinished portion of such canceled, or omitted items, the Contracting Authority will pay cost plus 10 percent as an overhead charge. The Contractor's expense for work of handling or transporting such material shall be included in computing the cost.

H. The Contracting Authority will also pay any actual expenses sustained by the Contractor by reason of such cancellation or omission and not represented by work completed or material delivered. In computation of material cost or expenses sustained, no anticipated profit will be included.

1. Material paid for shall become the property of the Contracting Authority and shall be disposed of as directed by the Engineer.

1109.06 PARTIAL PAYMENTS

A. If the work extends over a period of more than one month, the Engineer may, upon request from the Contractor, prepare monthly estimates based on the amount of work completed in an acceptable manner.

1. On contracts for which the contract sum is $10,000.00 or more, monthly estimates may be allowed, based on 90% of invoiced value of processed or fabricated materials which have been delivered on the project site, provided the materials are of acceptable quality and the manner of storage is satisfactory to the Engineer.

2. The Engineer's monthly estimates shall be partial payments on the contract, and the allowance of a monthly estimate by the Contracting Authority does not constitute final acceptance of the work upon which the estimates are based. Each estimate shall be filed by the Contractor in the form of a claim against the Contracting Authority and certified to by the Engineer on a payment request form supplied by the Contracting Authority.

B. Five percent (5%) of each progress estimate shall be deducted and held as a suspended payment. Payments may be made on the remainder of the progress estimate, except under circumstances which would prejudice the rights of those who have filed claims pursuant to Chapter 573, Code of Iowa.

1. The retained percentage will not be due and payable for a period of at least 30 days after the date of final acceptance of the entire contract or following the release or adjudication of claims that may have been filed, or until the Contractor has filed the sworn final estimate and sales and use tax statement with the Contracting Authority.

2. Should a reasonable doubt arise as to the integrity of any part of the completed work, the estimate for that portion shall not be allowed until the cause for such doubt has been removed.

3. The progress estimates and payments are approximate only, and shall be subject to correction in the final estimate and payment.

C. Failure to make partial payment within 30 days after receipt and approval of the monthly estimate by the Engineer, will cause interest to accrue and additional payment therefor to be made in accordance with provisions of Chapter 573, Code of Iowa, subject to limitations included therein.

1109.07 SUPPLEMENTAL CONTRACT FOR WORK INTERRUPTED

A. After ninety-five (95%) of the work has been performed to the satisfaction of the Contracting Authority, including consideration of the contract period, and it is apparent that conditions beyond the control of the Contractor will delay the completion of the contract for more than 60 days, the Contractor may request a supplemental contract for the uncompleted portion of work on the same terms as those of the original contract.

1. If the Contracting Authority agrees, and the surety for the Contractors consents to the extension of the bond for the time required to complete the supplemental contract, the supplemental contact will be issued. After the contract has been entered into, full payment will be made for the work completed, except under circumstances which would prejudice the rights of those who have filed claims pursuant to Chapter 573, Code of Iowa.

B. The unpaid money, held by the Contracting Authority as a retainer of the original contract price, will be due and payable to the Contractor 30 days after the date of the Contracting Authority's approval of the supplemental contract, except as provided for the release and adjudication of claims in 1109.06.

1109.08 CERTIFIED STATEMENT OF SALES TAX AND USE TAX PAID

A. Unless the Contracting Authority has issue an authorization letter and a Sales Tax Exemption Certificate for this project, before final payment can be made on a contract, the Contractor and subcontractors shall file a certified statement on forms provided by the Contracting Authority, showing the amount of Iowa sales tax and use tax paid by them on all materials which have become a component part of the finished, completed contract and on such supplies for this construction as were actually consumed on this work.

B. These statements shall be submitted in duplicate to the Contracting Authority at the completion of the contract.

1109.09 ASSIGNMENT OF MONIES

A. The Contractor shall not assign, by power of attorney or otherwise, any of the monies to become due and payable under this agreement unless the Contractor has received written consent of the Contracting Authority.

1109.10 SUBMITTALS REQUIRED BEFORE FINAL PAYMENT

A. Before final payment can be made on this contract, the Contractor shall submit to the Engineer the following:

1. A request for prefinal and final payment.

2. One copy of any guarantees for products incorporated into the work.

3. Two copies of the operating instructions on each piece of equipment incorporated into the work.

4. Statements of Sales Tax from the Contractor and subcontractors, unless in receipt of an authorization letter and a Sales tax Exemption Certificate issued by the Contracting Authority fo this project.

1109.11 FINAL ACCEPTANCE AND PAYMENT

A. Final acceptance is stipulated to mean a written acceptance by the Contracting Authority. The Contracting Authority shall make final acceptance promptly upon the satisfactory completion of the work. Final payment shall be made as soon as possible following the expiration of statutory time for filing claims, or following adjudication or release of claims against the amount withheld.

B. Failure to make final payment within 70 days after completion of the work, and if all requirements of the contract are completed, will cause interest to accrue and additional payment therefor to be made in accordance with provisions of Chapter 573, Code of Iowa, subject to limitations included therein, however, this provision shall not apply when final payment includes a supplemental contract for work interrupted, as provided for in 1109.07.

C. Completion of the work will be considered as the date of approval and work acceptance by the Contracting Authority. When interest is to be paid, the date from which interest is to be calculated will be the thirty-first day after all required materials, certifications, and other documentation required to be submitted by the Contractor are received by the Engineer, however, the Contractor will be paid no interest if final payment is made within 70 days from the date of approval and work acceptance. The signed final payment request is not required documentation, but if not returned to the Engineer within 30 days, it will be considered required documentation.

D. Signing of the final payment request or acceptance of payment based thereon, shall not waive any rights of either party in the resolution of any claim filed in accordance with 1109.12.

E. The Contracting Authority shall satisfy itself as to the faithful completion of each part of the work, and may reject any portion found to be inconsistent with the terms of the contract.

1109.12 DISPUTED CLAIMS FOR EXTRA COMPENSATION

A. In any case where the Contractor deems that extra compensation is due for work or material not clearly covered in the contract and not ordered by the Engineer as extra work as defined herein, the Contractor shall notify the Engineer in writing of the intention to make a claim for extra compensation before beginning the work on which the claim is based.

B. The Contracting Authority shall be responsible for damages attributable to the performance, nonperformance, or delay of any other contractor, governmental agency, utility, firm, corporation, or individual authorized to do work on the project, only when such damage is a result from negligence on the part of the Contracting Authority, Engineer, or any of its officers or employees.

1. In any case where the Contractor deems that extra compensation is due from the Contracting Authority as damages resulting from such performances, nonperformances, or delays, the Contractor shall notify the Engineer in writing at the time the delay occurs.

C. In either cases if such notification is not given, or if after such notification is given, the Engineer is not afforded facilities for keeping strict account of actual cost, as defined for force-account construction, the Contractor thereby agrees to waive the claim for extra compensation for such work. Such notice by the Contractors and the fact that the Engineer has kept account of the cost as aforesaid, shall not be construed as establishing the validity of the claim.

1. The claims when filed, shall be in writing and in sufficient detail to permit auditing and evaluation by the Contracting Authority. Claims shall be supported by such documentary evidence as the claimant has available and shall be verified by affidavit of the claimant or other persons having knowledge of the facts.

2. In the event the claimant wishes an opportunity to present the claim in person, then the claim shall be accompanied by a written request to do so.

3. Where the claimant asks an opportunity to present the claim in person, the Contracting Authority, within a reasonable period of time after the filing of the claim, shall fix a time and place for a meeting between the claimant and the Contracting Authority or its designated representatives.

a. The Contracting Authority shall, within a reasonable time from filing of the claim or the meeting above referred to, whichever is later, rule upon the validity of the claim and notify the claimant in writing, of its ruling together with the reasons therefor. In case the claim is found to be just, in whole or in part, it shall be allowed and paid to the extent so found.

E. The Contractor shall not institute any court action against the Contracting Authority for the adjudication of any claims until such claim has first been presented to Contracting Authority pursuant to this articles and submitted to arbitration or a request for arbitration is denied pursuant to 1109.13.

1109.13 ARBITRATION

A. If a Contractor's claim, as outlined in 1109.12, has been disallowed, in whole or in part, then the Contractor may, within 30 days from the date the ruling of the Engineer is mailed to the Contractor, make a written request to the Engineer that the claim or claims be submitted to a board of arbitration.

1. The Engineer shall decide whether the matter is one which is subject to arbitration and shall, within 30 days of the receipt of the request for arbitration, grant or deny the request.

2. The Engineer's decisions shall be final.

B. Said board of arbitration shall consist of three persons, one to be chosen by the Engineer, one by the Contractor, and the third by the two arbitrators.

C. The arbitrators selected shall be persons experienced and familiar with construction or engineering practices in the general type of work involved in the contract, but shall not have been a regular employee or an individual retained by either party at the time involved in the controversy, or at the time of arbitration.

D. The board of arbitration shall make its own rules of procedure and shall have authority to examine records kept by the Engineer and the Contractor.

1. If the desired records are not produced within 10 days after they are requested, the board of arbitration shall proceed without them as best it may.

2. In determining the findings, or awards, or both, the majority vote of the board shall govern. Copies of the findings or awards or both, signed by the arbitrators shall be filed with the Engineer and the Contractor.

3. A majority report or minority report may be filed. The board of arbitration shall fix the cost of the proceedings, including a reasonable compensation to the arbitrators, and shall determine how the total cost shall be borne.

E. The board of arbitration shall have jurisdiction to pass upon questions involving compensation to the Contractor for work actually performed or materials furnished and upon claims for extra compensation which have not been allowed by the Engineer. Jurisdiction of the board shall not extend to:

1. A determination of quality of workmanship, or materials furnished, or to an interpretation of the intent of the plans and specifications, except as to matters of compensation.

2. Setting aside or modifying the terms or requirements of the contract.

F. The findings or awards or both, of the arbitration board, if acceptable to both parties to the contract, may become a basis for final payment.

G. If the findings of the arbitration board are unacceptable to either party to the contract, said findings may become the basis for further negotiations between the parties. If a solution agreeable to both parties has not been reached through the filing of a claims through arbitration, or if arbitration has been denied, either party may resort to whatever other methods for resolving the claim are available.

1109.14 CLAIMS AGAINST CONTRACTOR

A. The Contractor guarantees the payment of all just claims against him/her or any subcontractor, in connection with the work. If another contractor on the project submits a claim for alleged damages caused by delay due to the Contractor not having completed its work in a timely manner, the Contractor's bond shall remain in effect until payment of such claim is made, or until litigation is started, at which time the bond will be released.

1109.15 TIME LIMITS FOR FINAL ADJUSTMENT

A. The Contractor shall understand that the Contracting Authority will not be bound to consider applications for correction of estimates and payments after the Contractor has signed the final estimate, or after 30 days from the date when the final estimate is submitted to the Contractor for approval. Should an error be discovered as a result of the Contractor's annual audit, an application for corrections promptly made will be considered.

1109.16 NATIONAL EMERGENCY PROVISIONS

A. The Contracting Authority may, with written notice, terminate the contract, or a portion thereof, when the Contractor is prevented from proceeding with the construction contract as a direct result of an executive order of the President with respect to the prosecution of war, or in the interest of national defenses as provided in Chapter 573A of the Code of Iowa.

B. When contracts, or any portion thereof, are terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract unit prices or as mutually agreed for items of work partially completed or not started. No claim for loss of anticipated profits shall be considered.

1. Reimbursement for organization of work (when not included in the contract) and moving equipment to and from the job will be considered where the volume of work completed is too small to compensate the contractor for these expenses under the contract unit prices, the intent being that an equitable settlement will be made with the Contractor.

C. Acceptable materials, obtained by the Contractor for the work, which have been inspected, tested, and accepted by the Engineer, and which are not incorporated into the work, shall be purchased from the Contractor at actual cost, as shown by receipted bills and actual cost records, at such points of delivery as may be designated by the Engineer.

D. Termination of a contract, or a portion thereof, shall not relieve the Contractor of its responsibilities for the completed work, nor shall it relieve the Contractor's surety of its obligation for and concerning any just claims arising out of the work performed.

1109.17 STANDARD CONTRACT CLAUSES

A. Differing site conditions.

1. During the progress of the work, if subsurface or latent physical conditions are encountered at the site differing materially from those indicated in the contract or if unknown physical conditions of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the contract, are encountered at the site, the party discovering such conditions shall promptly notify the other party, in writing, of the specific differing conditions before they are disturbed and before the affected work is performed.

2. Upon written notification, the Engineer will investigate the conditions, and if he/she determines that the conditions materially differ and cause an increase or decrease in the cost or time required for the performance of any work under the contract, an adjustment, excluding loss of anticipated profits, will be made and the contract modified in writing accordingly.

a. The Engineer will notify the Contractor of his/her determination whether or not an adjustment of the contract is warranted.

3. No contract adjustment which results in a benefit to the Contractor will be allowed unless the Contractor has provided the required written notice.

4. No contract adjustment will be allowed under this clause for any effects caused on unchanged work.

B. Suspension of work ordered by the Engineer.

1. If the performance of all or any portion of the work is suspended or delayed by the Engineer, in writing, for an unreasonable period of time (not originally anticipated, customary, or inherent to the construction industry) and the Contractor believes that additional compensation and/or contract time is due as a result of such suspension or delay, the Contractor shall submit to the Engineer, in writing, a request for adjustment within seven (7) calendar days of receipt of the notice to resume work. The request shall set forth the reasons and support for such adjustment.

2. Upon receipt, the Engineer will evaluate the Contractor's request. If the Engineer agrees that the cost and/or time required for the performance of the contract has increased as a result of such suspension and the suspension was caused by conditions beyond the control of and not the fault of the Contractor, its suppliers, or Subcontractors at any approved tier, and not caused by weather, the Engineer will make an adjustment, excluding profit, and modify the contract in writing accordingly.

   a. The Engineer will notify the Contractor of his/her determination, whether or not an adjustment of the contract is warranted.

3. No contract adjustment will be allowed unless the Contractor has submitted the request for adjustment within the time prescribed.

4. No contract adjustment will be allowed under this clause to the extent that performance would have been suspended or delayed by any other cause, or for which an adjustment is provided for or excluded under any other term or condition of this contract.

C. Significant changes in the character of work.

1. The Engineer reserves the right to make, in writing, at any time during the work, such changes in quantities and such alterations in the work, as are necessary to satisfactorily complete the project.

   a. Such changes in quantities and alternations shall not invalidate the contract nor release the Surety, and the Contractor agrees to perform the work as altered.

2. If the alterations or changes in quantities significantly change the character of the work under the contract, whether or not changed by any anticipated profits, adjustments will be made to the contract. The basis for the adjustment shall be agreed upon prior to the performance of the work. If such a basis cannot be agreed upon, an adjustment will be made either for or against the Contractor in such amount as the engineer may determine to be fair and equitable.

3. If the alterations or changes in quantities do not significantly change the character of the work to be performed under the contracts the altered work will be paid for as provided elsewhere in the contract.

4. The term "significant change" shall be construed to apply only to the following circumstances:

a. When the character of the work as altered, differs materially in kind or nature from that involved or included in the original proposed construction or;

b. When a major item of work, as defined elsewhere in the contract, is increased in excess of 125 percent or decreased below 75 percent of the original contract quantity, any allowance for an increase in quantity shall apply only to that portion in excess of 125 percent of original contract item quantity, or in case of a decrease below 75 percent, to the actual amount of work.

1109.18 INTEREST PAYMENTS

A. Interest on monthly payment estimates.

1. Interests shall be paid to the Contractor on any progress payment approved by the Chief Engineer under paragraph A of paragraph 1109.06 of these General Covenants and Provisions, which remains unpaid after thirty (30) days of the receipt by the Contracting Authority.

a. Receipt by the Contracting Authority shall be defined as the date the Contracting Authority's central office mail staff receives the progress payment request and stamp it. All progress payment requests which are delivered directly to the central office by the Contractor or the Inspector of the Contracting Authority shall have a date of receipt entered by the mail room staff.

b. Interest shall accrue on the 31st day after receipt by the Contracting Authority, if approved by the Chief Engineer, and shall end on the date the warrant is issued by the Iowa Department of Revenue. The rate of interest shall be the same as the rate of interest in effect under 453.6 of the Iowa Code, as the date interest begin to accrue.

B. Interest on retainage.

1. Interest shall be paid on any retained funds held under paragraph B of section 1109.06 of these General Covenants and Provisions. Interest shall be paid as outlined in Iowa Administrative Code section 561, Chapter 8.7.

END OF SECTION 00700

SECTION 00710
(Revised 9/8/95)

SPECIFIC EQUAL EMPLOYMENT OPPORTUNITY RESPONSIBILITIES

Notice of Requirements for Affirmative Action to ensure Equal Employment Opportunity (Executive Order 11246 as amended) and Iowa Executive Orders 15 and 34. This includes employment goals for minorities and women in construction.

60-1.4 EQUAL OPPORTUNITY CLAUSE.

A. Federally assisted construction contracts.

1. Except as otherwise provided, each administering agency shall require the inclusion of the following language as a condition of any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of the equal opportunity clause.

B. The applicant hereby agrees that it will 1ncorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loans insurance, or guarantee, the following equal opportunity clause:

C. During the performance of this contracts the Contractor agrees as follows:

1. The Contractor will not discriminate against any employee, or applicant for employment because of race, colors, religion, sex, national origin, or disability.

a. The Contractor will 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. Such action shall include, but not be limited to the following; Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship.

b. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

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

3. The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers representatives of the Contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

4. The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

5. The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

6. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labors or as otherwise provided by law.

7. The Contractor will include the portion of the sentence immediately preceding paragraph 1. and the provisions of paragraphs 1. through 7. in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor.

   a. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance.

   b. Provided, however, that in the event a Contractor becomes involved in, or is threatened with litigation with a subcontractor or vendor as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

I. DEFINITIONS.

A. Definitions as used in these specifications:

1. **Covered Area** means the entire State of Iowa, however, those areas of a Hometown Plan approved by the U.S. Department of Labor will be considered separately.

2. **Director** means Director, Office of Federal Contract Compliance Program, United States Department of Labor or any person to whom the Director delegates authority.

3. **Employer Identification Number** means the Federal Social Security Number used on the Employer's Quarterly Federal Tax Returns U.S, Treasury Department Form 941.

4. **Designated Geographical Areas.**

   a. **Standard Metropolitan Statistical Area (SMSA)**. These areas represent a reasoned judgement as to how metropolitan areas are defined statistically in a uniform manner, using data items that are:

      (1) widely recognized as indicative or metropolitan character, (population, urban character, nonagricultural employment, population, density, and commuting ties), and

      (2) available from a body of Federal statistics which has been uniformly and simultaneously collected in all parts of the country, and processed and tabulated according to consistent standards. Thus, if a project is located within an SMSA, it can be concluded that a reasonable commuting area exists within the SMSA, and that goals based on SMSA statistics are accurate.

   b. **Economic Area (EA)**. These areas are viewed as centers of commerce, and they generally cover areas which include the places of work and residence for most workers. There are 183 such areas, defined along county lines, covering the entire country. Counties were assigned to these economic areas in accordance with commuting patterns based primarily on data gathered by the Bureau of the Census.

5. **Minority** includes:

a. **Black** (all persons having origins in any of the Black African racial groups not of Hispanic origin);

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

c. **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), and

d. **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).

(Note: Minority women from the above referenced groups shall be counted as satisfying both the minority and female employment goals in each geographic area.)

II. GENERAL.

A. Equal Employment Opportunity requirements not to discriminate and to take affirmative action to assure equal employment opportunity as required by Executive Order 11246 and Executive Order 11375. The requirements set forth in this specification shall constitute the specific affirmative action requirements for project activities under this contract and supplement the equal employment opportunity requirements set forth in the Required Contract Provisions.

III. EQUAL OPPORTUNITY POLICY.

A. The Contractor will accept as his/her operating policy the following statement which is designed to farther the provision of equal employment opportunity to all persons without regard to their age, race, color, religion, sex, national origin, or disability, and to promote the full realization of equal employment opportunity through a positive, continuing program.

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their age, race, religion, sex, color, national origin, or disability. Such action shall include: employment, upgrading, demotion, and transfer, recruitment and recruitment advertising, layoff, and termination, rates of pay and other forms of compensation, and selection of training, including apprenticeship, preapprenticeship, and/or on-the-job training."

IV. GOALS.

A. Specific goals for female and minority participation have been established.

B. The goals for female participation, expressed in percentage terms for the total hours worked by the Contractor's aggregate workforce in each trade on all construction work, is 6.9 percent, with no timetable. This goal applies nationwide.

1. Goals for minority participation in Iowa, expressed in percentage terms for the total hours worked by the Contractor's aggregate workforce in each trade on all construction work, are shown on the map of Iowa that follows. The goals shown apply to each designated geographical area, as shown on the map.

C. These goals are applicable to all the Contractor's construction work (whether or not it is non-Federal or Federally assisted) performed in the designated area. For each contract and/or subcontract in excess of $10,000, the goals for minority participation will apply for all work to be performed in geographical areas designated by the Director pursuant to 41 CFR 60-4.6, and the goal for female participation will apply nationwide.

1. The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on his/her implementation of the Equal Opportunity Clause, specific affirmative action obligations

required by the specifications set forth in 41 CFR 60-4.3(a), and his/her efforts to meet the goals established for minority participation for the geographical area where the work is to be performed, or nationwide goal for female participation.

2. The hours of minority and female employment and training must be substantially uniform throughout the time period for the work of the contracts and within each trade, and the Contractor shall make a good-faith effort to employ minorities and women evenly on each of his/her projects.

3. 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, the Executive Orders and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

D. The Contractor shall provide written notification to the Department of Natural Resources (on behalf of the Director of the Office of Federal Contract Compliance Programs) within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under this contract.

1. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number, estimated dollar amount of the subcontract, estimated starting and completion dates of the subcontracts and the geographical area in which the contract work is to be performed.

E. Application of Minority Participation Goals.

1. Minority Participation. A single minority participation goal is established for each SMSA and EA. Timetables for the achievement of minority goals are not provided. A separate goal is established for each SMSA and for each EA. When a contract or subcontract to which this specification applies is for work located within a SMSA, the goal for what SMSA applies. When a contract or subcontract to which this specification applies is for work located outside an SMSA, the goal for that EA applies.

a. The applicable goal for the Contractor or subcontractors is the goal for each geographical area where the work is being performed, and all the work of the Federal or Federally assisted construction contractor or subcontractor is covered, whether the work is being performed for a contract to which the specification applies or not. Therefore, a contractor with work in SMSA "X" would apply the goal for SMSA "X" for that work. The same contractors however, would apply the SMSA "Y" goal to all his/her work in SMSA "Y", even though the Contractor's work in SMSA "Y" is neither Federal nor Federally assisted.

2. Participation of Minority Women. The Contractor and required subcontractors will be permitted to count minority women belonging to one of the recognized minority groups listed in Article I of this specification as satisfying both the minority goal for each designated geographic area and the overall female goals. Conversely, nonminority women will only count toward satisfying the overall female goal.

V. STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246).

A. Whenever the Contractors or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, he/she shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation set forth herein.

B. If the Contractor is participating (pursuant to 41 CFR 60-4.5) In a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, his/her affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan.

1. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or subcontractor participating in an approved Plan is individually required to comply with his/her obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which he/she has employees.

2. The overall good faith performance by other Contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to make good faith efforts to achieve the Plan goals and timetables.

C. The Contractor shall implement the specific affirmative action standards provided in paragraphs 6a through p. Article V, of these specifications. The goals set forth in the specifications are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which he/she has employees in the covered area. The Contractor is expected to make substantially uniform progress toward his/her goals in each craft during the period specified.

D. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

E. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such 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 program, approved by U.S. Department of Labor.

F. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluations of the Contractor's compliance with these specifications shall be based upon his/her effort to achieve maximum results form his/her actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

1. Endure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project.

   a. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of, and carry out, the Contractor's obligations to maintain such a working environments with specific attention to minority or female individuals working at such sites or such facilities.

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

3. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral form a union, a recruitment source, or community organization, and of what action was taken with respect to each such individual.

   a. If such individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

4. Provide immediate written notification to the Director, when the union or unions with which the Contractor has a collective bargaining agreement, have not referred to the Contractor a minority person or women sent

by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet his/her obligations.

5. Develop on-the-job training opportunities and/or participate in training programs for the area which 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. Training programs may be specifically required elsewhere in the contract documents. The Contractor's responsibility for training opportunities is not necessarily limited to training programs that are specifically required. The Contractor shall provide notice of these programs to the sources compiled under 6b above.

6. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting his/her EEO obligations, by including it in any policy manual and collective bargaining agreement, by publicizing it in the company newspaper, annual report, etc., by specific review of the policy with all management personnel and with all minority and female employees, at least once a year, and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

7. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions, including specific review of these items with on-site supervisory personnel, such as superintendents, general foremen, etc. , prior to the initiation of construction work at any 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 EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to, and discussion the Contractor's EEO policy, with other Contractors and subcontractors with whom the Contractor does or anticipates doing business.

9. Direct the Contractor's 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 one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment sources the Contractor shall 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 other minority persons and women and, where reasonable, provide after schools summer, and vacation employment to minority and female youths both on the site and in other areas of the Contractor's workforce.

11. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

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

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 EEO policy and the Contractor's obligations under these specifications are being carried out.

14. Ensure that all facilities and company activities are nonsegregated, except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

15. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractor and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

16. Conduct a reviews at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

G. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (6a through p).

1. The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of the obligations under 6a through p of these specifications, provided the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet his/her individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor.

2. The obligation to comply, however, is the Contractor's, and failure of such group to fulfill an obligation shall not be a defense for the Contractor's noncompliance

H. A single overall goal for women and goals for minorities in each designated area are included in Article IV of these specifications. The Contractor is required to provide equal 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 the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved the goal for women generally, the Contractor may be in violation of the Executive Order if a specific minority group or women are underutilized.

I. The Contractor shall not use the goal, or affirmative action standards to discriminate against any person because of age, race, color, religion, sex, national origin, or disability.

J. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts, pursuant to Executive Order 11246.

K. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

L. The Contractors in fulfilling his/her obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph G of these specifications, so as to achieve maximum results from his/her efforts to endure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

M. The Contractor shall designate a responsible official to monitor all employment-related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records.

1. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, 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.

2. Records shall be maintained in an easily understandable and retrievable form, however, to the degree that existing records satisfy this requirement, Contractor shall not be required to maintain separate records.

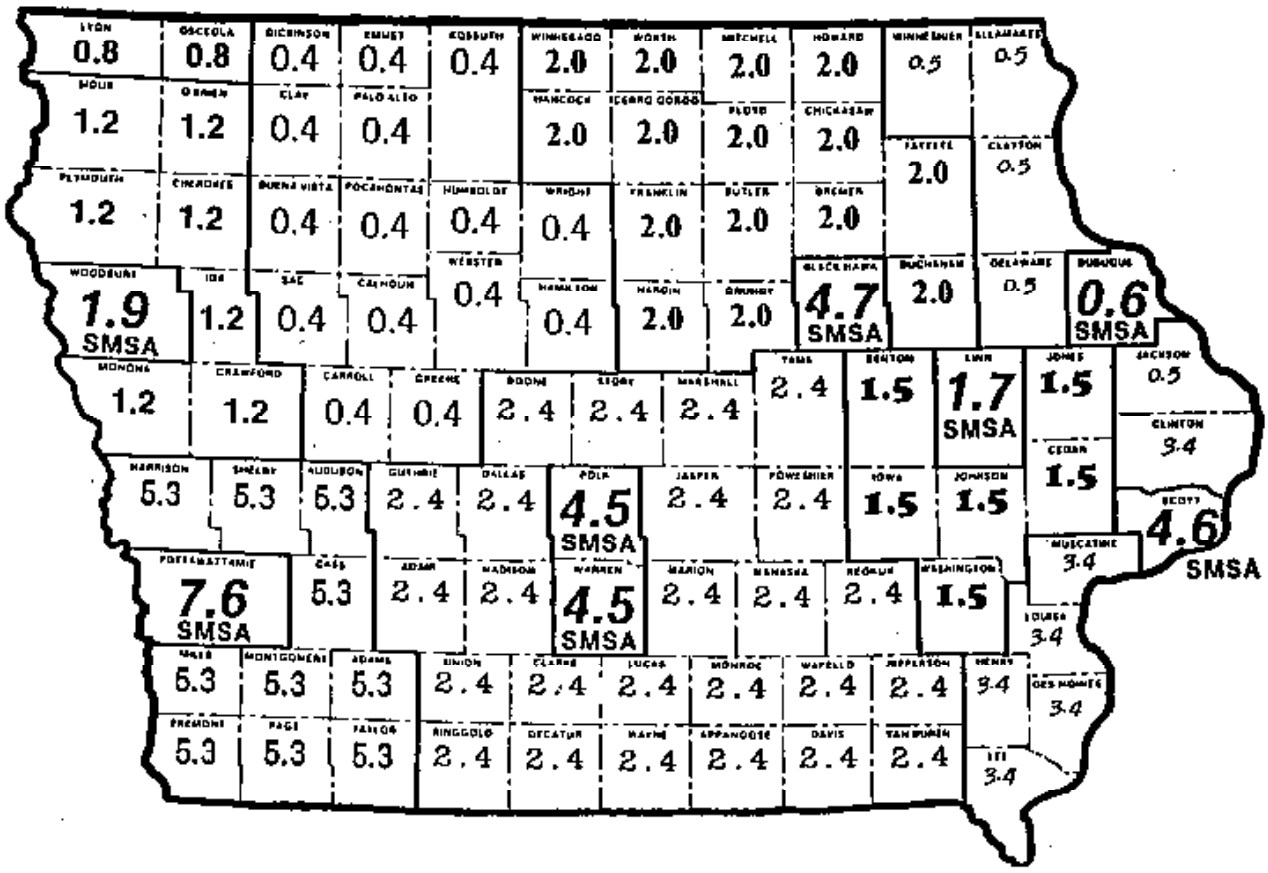
N. Nothing herein provided shall be construed as a limitation upon the application of other Iowa which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the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

VI. SUPPLEMENTAL REPORTING REQUIREMENTS.

A. The Contractor and subcontractors are required to make available upon request its Affirmative Action Program containing goals and time specifications. These contractual provisions shall be fully enforced. Any breach of the provisions shall be regarded as a material breach of contract.

B. The Contractor will keep such records as are necessary to determine compliance with equal employment opportunity obligations. The records kept by the Contractor will be designed to indicate the number of minority and nonminority group members and women employed in each work classification on the project. All such records must be retained for a period of three years following completion of the contract work and shall be available at reasonable times and places for inspection by authorized representatives of the Department of Natural Resources and any Federal Agency funding any part of this project.

"Minority employment goals are expressed as a percentage (%) of total hours worked for each craft and/or trade in each county."



PART 0 - GENERAL

0.00 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

0.01 GENERAL:

A. The general conditions of the contract are the General Covenants and Provisions bound within.

1. These General Covenants and Provisions are herein modified or supplemented by this Supplementary Covenant and Provisions.

2. Articles of the General Covenant and Provision not directly affected by this section remains in full force as written unless exceeded in requirement herein or elsewhere in the Specifications.

0.03 DEFINITION OF TERMS:

A. Article 1101.03 "Definition of Terms" is supplemented and modified as follows:

1. General Explanation: A substantial amount of specification language constitutes definitions for terms found in other Contract Documents, including Drawings which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in Contract Documents are defined generally in this article. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to the extent not stated more explicitly in another provision of Contract Documents.

2. Imperative Language: Used generally in Specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by Contractor, or when so noted, by others.

3. Chief Engineer: This term will apply to the Chief of the Engineering Bureau of the Department of Natural Resources.

4. Project Engineer: The Project Engineer will be the reviewing and approving authority for all equipment, material or systems to be used in the construction as specified herein. Unless otherwise specified, no material, equipment or systems or components of systems will be used or installed on this project without written approval. The Project Engineer will be the individual, regardless of the title actually used. listed in the special notice to bidders as the contact for questions concerning design, plans and specifications.

5. DNR Construction Inspector: The Department of Natural Resources Construction Inspector will be the direct representative of the department at the project location with the authority to verify compliance with the provisions of each and all divisions of this Project Manual. Contact the DNR Construction Inspector regarding questions on site review, inspections and project coordination.

6. Procurement Supervisor: The Procurement Supervisor will answer all questions regarding Bidding and Contract Procedures.

7. General Requirements: The provisions of requirements of Division-1 sections. General requirements apply to entire work of Contract and, where so indicated, to other elements which are included in project.

8. Indicated: The term "indicated" is a cross-reference to details, notes or schedules on Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for the purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

9. Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed," "requested," "authorized," "selected," "directed by Project Engineer," "requested by the Project Engineer," etc. However, no such implied meaning will be interpreted to extend Project Engineer's responsibility into Contractor's area of construction supervision.

10. Approve: Where used in conjunction with Project Engineer's or Project Inspector's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of the term "approved," will be held to limitations of responsibilities and duties as specified in General Covenants and Provisions and Supplementary Covenants and Provisions. In no case will "approval" be interpreted as a release of Contractor from responsibilities to fulfill requirements of contract documents.

11. Project Site: The space available to Contractor for performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of project site is shown on Drawings, and may or may not be identical with description of land upon which project is to be built.

12. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.

13. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.

14. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.

15. Installer: The entity (person or firm) engaged by Contractor or its subcontractor or sub-subcontractor for performance of a particular unit of work at project site, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in portions of the work they are to accomplish.

PART 1 - INSTRUCTIONS TO BIDDERS

1.02 DRAWINGS AND SPECIFICATIONS:

A. Article 1101.02 "Drawings and Specifications" is supplemented and modified as follows:

1. The Drawings and Specifications, which are enumerated in the Index of drawings and Table of Content of this project manual, are part of this contract.

PART 4 - SCOPE OF WORK

4.10 PERMITS AND ARRANGEMENTS WITH OTHER GOVERNMENTAL AGENCIES:

A. Article 1104.10 "Permits and Arrangements with Other Governmental Agencies" is supplemented and modified as follows:

1. Contractor shall take out and pay for any building or construction permit which may be required, secure and pay for all permits, certificates and licenses required to prosecute the work, and shall arrange for and pay for all inspections required by local authorities.

2. Contractor is to apply and pay for NPDES Stormwater Discharge Permit for Construction Operations, as required by EPA regulations for work performed after March 10, 2003, for any land-disturbing activity which will disturb an area of one or more acres.

a. Permits are available from IDNR Stormwater Coordinator, Wallace State Office Building, Des Moines, Iowa 50319. (Tel. 515/281-7017)

b. Copies of Permit Application and Permit issued are to be furnished to DNR Construction Inspector prior to any construction operations.

4.13 DRAWINGS AND SPECIFICATIONS:

A. Article 1104.13 "Drawings and Specifications" is supplemented and modified as follows:

1. Contractor shall be responsible for distributing to all involved in this project, Drawings and Specifications in quantities reasonably necessary for the completion of the portion of work they are responsible for. No additional payment will be made for shortcomings resulting from misunderstanding of Contract Documents due to any shortage of information between General Contractor, subcontractors, and Material Suppliers.

PART 5 - CONTROL OF WORK

5.02 PLANS:

A. Article 1105.02 "Plans" is supplemented or modified as follows:

1. Plans for this project may be referred to as "Drawings, Project Drawings or Plans, Profiles and Cross Sections."

5.07 CONSTRUCTION STAKES AND BENCHMARKS:

A. Article 1105.07 "Construction Stakes and Benchmarks" is supplemented and modified as follows:

1. The contractor shall be responsible for providing all labor, equipment and material necessary to complete the work covered in paragraph A of the General Covenants and Provision of this contract. The Contractor or his/her assigned representative shall assume the function of the Engineer as described herein in addition to those assigned to the Contractor and be held responsible for such. The cost of this work shall be paid for as “Construction Survey” Bid Item.

PART 6 - CONTROL OF MATERIALS

6.03 SAMPLES AND TESTS:

A. Article 1106.03 "Samples and Tests" is supplemented and modified as follows:

1. All testing required by the contract documents or the DNR Construction Inspector shall be considered a part of the Contract and shall be paid for by the Contractor.

PART 9 - MEASUREMENT AND PAYMENTS

9.10 SUBMITTAL REQUIRED BEFORE FINAL PAYMENT:

A. Article 1109.10 "Submittals Required Before Final Payment" is supplemented and modified as follows:

1. Submit to the Engineer or the DNR Construction Inspector all submittals required in Section 01300 before final payment can be made, unless otherwise specified.

2. Other submittals may be required in other sections.

END OF SECTION 00811

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions and the Supplementary Covenants and Provisions.

1.02 SUMMARY OF WORK:

A. Work Covered by Contract Documents:

1. Name of the project is "Lake Darling Design Guide Cabins", Project Number 15-06-92-01. Drawings and Specifications are dated OCTOBER 1, 2014.

2. Briefly and without force and effect upon contract documents, work of the contract can be summarized as follows:

a. The DNR proposes to install six new two bedroom Design Guide Cabins at Lake Darling State Park. These cabins will have two bedrooms, full kitchen, living room, bathroom with vanity and tub/shower, covered deck and small mechanical room. They will have in-floor heat and split-system cooling and will operate year-round.

B. Occupancy:

1. Owner: The DNR shall have the right to enter the building or work site and store or attach such fixtures or furniture as it may elect, or to do other work providing that such storage or work will not interfere with the completion of the Contractor's work. Such occupancy by the DNR shall in no way imply final acceptance of any portion of the Contractor's work.

1.04 MEASUREMENT AND PAYMENTS:

A. Measurements and payments shall be in accordance with Section 01250 of these specifications.

B. Before ordering any fabricated material or doing any work, verify all measurements at the project site. No additional compensation will be allowed because of difference between actual dimensions and the measurements indicated on the drawings. Report any difference immediately to the DNR for instructions before proceeding with the work.

1.06 COORDINATION:

A. Project Coordination:

1. Take out and pay for any building permit which may be required, secure and pay for all permits, certificates and licenses required to prosecute the work, and arrange and pay for all inspections required by local authorities.

2. Visit the site, compare the Drawings and Specifications with any work in place, and verify all conditions, including other work, if any, being performed. Failure to visit the site will in no way relieve the Contractor from necessity of furnishing any materials or performing any work that may be required in accordance with Drawings and Specifications.

B. Job Site Administration: Take complete charge of work under this contract. Coordinate the work of all trades and all phases of general, structural, plumbing, mechanical, and electrical work.

1.07 FIELD ENGINEERING:

A. Provide such field engineering services as are required for a proper completion of the work.

1. Immediately upon entering project site for the purpose of beginning work:

a. Establish actual project location, set back and side yards, if any, with the DNR Construction Inspector.

b. Establish and maintain all lines and levels.

B. Additional requirements for field engineering may also be described in other sections of these specifications.

C. Verify all figures shown on Drawings before laying out work and report all discrepancies to the DNR Construction Inspector. Contractor will be held responsible for any error resulting from failure to do so.

1.09 ABBREVIATIONS AND SYMBOLS:

A. Reference to a technical society, institution, association, or government authority is made in the Specifications in accordance with the following abbreviations:

AAMA	Architectural Aluminum Manufacturers Association
AASHO	American Association of State Highway Officials
ACI	American Concrete Institute
AIA	American Institute of Project Engineers
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALS	American Lumber Standards
APA	American Plywood Association
ATI	Asphalt Tile Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Project Architectural Wood Work Institute
AWPA	American Wood Preservers' Association

AWS	American Welding Society
CS	Commercial Standard, U.S. Department of Commerce
FGJA	Flat Glass Jobbers Association
FS	Federal Specification
GA	Gypsum Association
IES	Illuminating Engineering Society
MIA	Marble Institute of America
MLMA	Metal Lath Manufacturers Association
MS	Military Specification
MSTD	Military Standard
NAAMM	National Association of Metal Manufacturers, The
NHLA	National Hardwood Lumber Association
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NEC	National Electric Code of NBFU
NFPA	National Fire Protection Association
NLMA	National Lumber Manufacturers Association
NTMA	National Terrazzo and Mosaic Association, Inc.,
NWMA	National Woodwork Manufacturers Association
SDI	Steel Deck Institute
SSPC	Steel Structures Painting Council
SCPI	Structural Clay Products Institute
SPR	Simplified Practice Recommendations, U.S. Department of Commerce
TCA	Tile Council of America
UL	Underwriters' Laboratories, Inc.
USA	United States of America Standards Association

1.13 PROJECT MEETINGS:

A. Preconstruction Conference: Soon after award of contract and prior to the start of construction, attend a preconstruction conference with the representative of the Owner to define the requirements for contract administration and construction operation.

1. Contact the DNR Construction Inspector who will determine the time, date and place of the conference.

B. Progress Meetings: The Contractor or the Contractor's representative shall be available at the job site to meet with the DNR Construction Inspector, as frequently and as arranged during the preconstruction conference, to discuss work progress.

1. Give verbal report of progress, discuss work schedule, and present all conflicts, discrepancies and other difficulties for resolution.

1.16 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS:

A. Definitions: Specific administrative and procedural minimum actions are specified in this section, as extension of provisions in other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized

as an indication by Project Engineer that such temporary activity is not required for successful completion of the work and compliance with contract documents.

B. General: Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have replaced the need.

C. Temporary Utilities: The types of services required may include, but not by way of limitation, water, sewerage, surface drainage, electrical power and telephones. Where possible and reasonable, connect to existing franchised utilities for required services; comply with service companies recommendations on materials and methods, or engage service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations.

1. Sanitary Facilities:

a. Temporary Toilets: When such or permanent facilities do not exist, provide and maintain toilets for use by workers. Keep toilets in sanitary condition.

b. Temporary toilet facilities shall meet OSHA requirements.

D. Security:

1. Protection of Work and Property:

a. Place and maintain such barricades as may be necessary to prevent public access to the project site at no cost to the Owner.

E. Options and Substitutions:

1. Bid shall include all equipment, materials, and services as specified, noted on the Drawings or required for a complete and proper installation.

1.19 CONTRACT CLOSEOUT:

A. Final Cleaning:

1. Remove waste material and rubbish caused by the Work and leave all work clean and free of debris of any kind.

2. Keep the site and access road reasonably clean and free of rubbish or waste material in order that the work may progress efficiently. Remove such rubbish or waste material entirely from the premises at each time of such cleaning.

3. When the Work is completed and ready to turn over to the Owner, leave such work clean. This applies to all areas affected by contract work.

4. On completion of the Work, thoroughly police and clean-up the premises surrounding the building.

B. Final Inspection:

1. Request a final inspection in writing, at least ten days prior to the anticipated date of completion, from the DNR Construction Inspector.

2. Work will not be considered ready for final inspection until all the work has been completed and the Contractor has certified that all items are properly operating and in strict compliance with the Contract Documents.

3. The Contractor or project supervisor shall be at the job site during the final inspection.

4. After the inspection, the DNR Construction Inspector will present the Contractor a list of items not meeting contract requirements which must be made acceptable before final payment is made.

END OF SECTION 01000

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 DESCRIPTION OF WORK:

A. Provide such field engineering services as are required for proper completion of the work including, but not necessarily limited to:

1. Establishing and maintaining lines and levels;

2. Structural design of shores, forms, and similar items provided as part of the Contractor's means and methods of construction;

3. Establishing finish grade stakes (including blue tops) as necessary;

B. Additional requirements for field engineering may also be described in other sections of these specifications.

1.03 REFERENCES:

A. Refer to Section 1105.07 "Construction Stakes and Bench Marks" of the General Covenants and Provisions for assignment of responsibilities for the Owner and Contractor.

1.04 SUBMITTALS:

A. Comply with pertinent provisions of Section 01300, if applicable.

1.05 PROCEDURES:

A. In addition to procedure directed by the Contractor for proper performance of the Contractor's responsibilities:

1. Locate and protect control points before starting work on the site.

2. Preserve permanent reference points during progress of the work.

3. Do not change or relocate reference points or items of the work without specific approval from the DNR Construction Inspector.

4. Promptly advise the DNR Construction Inspector of a lost, destroyed, or reference point-requiring relocation due to other changes in the work.

a. When directed by the DNR Construction Inspector, replace referenced stakes at no additional cost to the Owner.

B. Meet with DNR Construction Inspector to establish actual building location, set backs, and side yards, if required.

END OF SECTION 01050

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 LUMP SUM / UNIT PRICE BID:

A. Bid each item on a Unit Price basis or Lump Sum basis as required, including furnishing all labor, equipment and materials necessary to complete all the work indicated in the Contract Documents.

1.03 QUANTITIES:

A. Various estimated quantities are furnished within the Contract Documents to assist the Contractor in reviewing the Project prior to bidding. The estimated quantities are not intended to be used by the Contractor as sole basis for determining the scope and volume of the work. The Contractor is responsible for verifying all quantities necessary to submit bids for the construction of a proper and complete project.

1.04 MEASUREMENT:

A. The contractor is responsible for constructing the project to the final lines and grades shown. Owner will measure construction units only to ensure that at least minimum quantities have been properly installed.

1.05 SCOPE:

A. Each item in the Bidder's Proposal Schedule of Prices will be paid at the unit or lump sum price. The price for each item shall be considered full compensation for furnishing superintendence, overhead, bonds, insurance, mobilization, testing and profit necessary to complete the construction of the item of the project listed in the Bidder's Proposal.

B. It is not the intent of the Bidder's Proposal to itemize each and every item and system required. Items required for project completion and not specifically mentioned in Bidder's Proposal shall be included with items which they would be considered subsidiary.

1.06 ESTIMATED QUANTITIES:

A. The items and quantities described above, as well as others listed throughout the Contract Documents, are provided for the bidder's review and consideration. The quantities listed herein are not guaranteed by the owner or the Project Engineer to be totally accurate nor to include all items of work. They are provided for the bidder's

convenience to assist in the preparation of the bid. The bidder is responsible for preparing his own quantity takeoff and bid preparation.

END OF SECTION 01250

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 SUMMARY:

A. Provide submittals required in this Section, refer to technical specification for submittal requirements for each section of the work to be performed.

1.03 PROGRESS SCHEDULE:

A. Submit a project schedule to the Project Engineer for approval within 30 days after award of contract, but not later than the contract start date. The type of schedule required is at Contractor's option.

B. Prepare an approved, reproducible form and include the following:

1. Breakdown of work activities in categories so approved and segmented as necessary to allow close monitoring of progress of the work during construction.

2. Order of the work necessary to meet time for completion.

3. Breakdown of the work schedule of all subcontractors scheduled in cooperation with Contractor's work.

4. Anticipated monthly value for work completed.

5. Space for the additional display of actual performance on the schedule.

C. After necessary revisions have been made and approved, present one print of schedule to each subcontractor and three copies to the Owner.

D. Upon request, update the schedule to reflect changes required by actual conditions and indicate actual work completed. Provide same number of copies as required for original submission.

E. Payment will be withheld until progress schedule in acceptable form has been received by Project Engineer.

1.04 PRICE BREAKDOWN:

A. Within 30 days after award of contract, but not later than the contract start date, submit to the Project Engineer for approval a price breakdown of major lump sum bid items into smaller components for the purpose of determining monthly progress payments.

B. Include profit and overhead prices in each item.

C. Payment will be withheld until receipt of price breakdown.

D. Provide breakdown as follows:

E. Items listed above include, but are not limited to, the following:

1.05 SHOP DRAWINGS AND MANUFACTURER'S LITERATURE:

A. Prior to installation of any item specified as requiring submittal, submit two (2) copies for Owner's use plus the number required for return to the Contractor, of manufacturer's literature containing detailed specifications and performance data, or shop drawings fully describing the items showing fabrication, layout, setting or erection details, including erection plan and details as required.

B. Number all submittals consecutively . Resubmittals shall bear the original submittal number plus a letter suffix: Example - #30A is the first resubmittal of item #30; #30B is the second resubmittal, etc.

C. Shop drawings used at site must be approved by the Project Engineer.

D. Do not construe the approval of shop drawings to be a complete check. This approval will indicate only that the general method of construction and detailing is satisfactory. Approval of such drawings will not relieve the Contractor of the responsibility to comply with all terms and conditions of the plans and specifications. The Contractor shall be responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work.

1.06 SAMPLES:

A. Submit in Duplicate:

B. Provide samples of sufficient size to permit an accurate appraisal of color, texture, finish, workmanship, and other appropriate characteristics.

C. Submit samples with shop drawings when both are required.

D. Field Samples and Mock-Ups:

1. Erect mock-ups at location acceptable to the DNR Construction Inspector, at project site.

2. Construct each sample or mock-up complete to the dimension indicated, including work of all crafts required in finish work.

1.07 QUALITY ASSURANCE:

A. Coordination of Submittals:

1. Prior to submitting required material, carefully review and coordinate all aspects of each item being submitted.

2. Verify that each item and its submittal conform in all respects with the specified requirements.

3. Prior to sending submittals to Project Engineer, the stamp and sign each submittal, certifying that they conform in all respects with the specified requirements.

B. Substitutions:

1. The contract is based on the standards of quality established in the Contract Documents. Substitutions will be considered only when listed with the Project Engineer prior to the bid date, and when substantiated by Contractor's submittal of required data within 35 calendar days after award of contract.

2. The following products do not require further approval except for interface within the work:

a. Products specified by reference to standard specifications such as ASTM or similar standards.

b. Products specified by manufacturer's name and catalog model number for which another product is not substituted.

3. Do not substitute materials, equipment or methods unless such substitutions have been specifically approved in writing.

C. Or Equal:

1. Where the phrase "or equal," or "or equal as approved by the Project Engineer," occurs in the Contract Documents, do not assume that the materials, equipment or methods will be approved as equal unless the item has been specifically approved for this work by the Project Engineer.

2. The Project Engineer's decision shall be final.

1.08 RESUBMISSION REQUIREMENTS:

A. Shop Drawings:

1. Revise initial Drawings as directed and resubmit in accordance with submittal procedures.

2. Indicate on Drawings all changes which have been made in addition to those requested by the Project Engineer.

B. Product Data and Samples: Resubmit new data and samples as specified for initial submittal.

C. Make all resubmittals within 7 calendar days after date of Project Engineer's previous review.

1.09 DISTRIBUTION OF SUBMITTALS AFTER REVIEW:

A. Project Engineer will distribute copies of shop drawings and product data, after review, to:

1. DNR Construction Inspector (1 copy)
2. Project Engineer's File (1 copy)
3. General Contractor (remaining copies)

B. Project Engineer will distribute samples in accordance with requirements.

1.10 CONTRACTOR RESPONSIBILITIES:

A. Review shop drawings, product data, and samples prior to submission to the next level of control.

B. Verify:

1. Field dimensions.
2. Field construction criteria.
3. Catalog numbers and similar data.

C. Coordinate each submittal with requirements of:

1. The work.
2. The contract documents.
3. The work of other contractors.

D. Contractor's responsibility for errors and omissions in submittals is not relieved by Project Engineer's review of submittals.

E. Notify Project Engineer, in writing, of proposed deviations in submittals from contract requirements, prior to or at the time of submission.

F. Contractor's responsibility for deviations in submittals from contract document requirements is not relieved by Project Engineer's review of submittals.

G. Do not begin any work which requires submittals without having Project Engineer's stamp and initials or signature indicating approval.

1.11 REQUIRED SUBMITTALS:

A. Include, but do not limit to, the following submittals:

Spec. Section	Item Description	Shop Drawing	Product Data	Samples, Test Results, Certification
02260	Water Distribution		X	
15400	Plumbing		X	
16000	Electrical		X	

1.12 RECORD DRAWINGS:

A. Provide and maintain at the project site, one complete set of prints of the project drawings. The drawings shall be kept in good, clean and readable condition.

B. The project site drawings shall have neatly inscribed all changes in work including relocation of lines, valves and fixtures, change in type of materials, etc. Changes shall be noted with red pencil or red ink.

C. Submit these corrected prints at time of final acceptance and prior to final payment. Note all data and changes on these record drawings in sufficient detail and clarity and provide information necessary for preparation of "as-built" drawings.

D. Final payment will be withheld until a set of corrected prints of the record drawings has been received by the Project Engineer/DNR Construction Inspector.

1.13 GUARANTEES, WARRANTIES AND CERTIFICATES:

A. Submit all guarantees, warranties and certificates prior to final payment.

B. Refer to Section 01700 of these specifications.

1.14 OPERATING AND MAINTENANCE INSTRUCTIONS:

A. Submit all operating and maintenance instructions to the DNR Construction Inspector prior to final payment.

B. Refer to Section 01700 of these specifications.

1.15 CHANGE ORDER PRICE QUOTES:

A. In the event of the need for change order, the DNR Construction Inspector will request a price quote from the Contractor for proposed changes to the contract.

B. For evaluation purposes, the Contractor's quote shall be broken down to show the costs of labor and materials for each proposed category of work included with the change, along with the total cost for Contractor's overhead, profit and bond for the proposed change.

C. All contract time extensions required as a result of a proposed change must be justified and supported in detail at the time of the proposal.

1.16 TEST REPORTS:

A. Refer to Section 01400 of these specifications.

1.17 DELIVERY TICKETS:

A. Submit to the DNR Construction Inspector one legible copy of each delivery ticket for all material delivered to the construction site.

B. The delivery ticket shall show brand name, catalog number and number of items received.

END OF SECTION 01300

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 SCOPE:

A. Supplementary tests and reports required in this section with any tests, reports, and other information that may be required additionally in any section of the specifications.

B. Inspection, sampling, and testing is required, but not limited to, the following:

1. Section 03300 – Cast In Place Concrete

C. Sampling and testing frequencies and requirements are to comply with IDOT IM-204.

1.03 TESTS BY INDEPENDENT TESTING LABORATORY:

A. Testing Laboratory:

1. Contractor to select and pay for an independent testing laboratory, acceptable to the Project Engineer, to perform specified services required by the contract.

2. Employment of testing laboratory will in no way relieve Contractor's obligations to perform work in accord with the contract.

3. Include in lump sum bid the cost for all testing services required. No separate payments will be made for testing. Include all associated costs in the various appropriate bid items. Project Engineer/DNR Construction Inspector will direct all tests. The Contractor shall pay the testing firm.

B. Contractor Shall:

1. Make available at no cost, all material to be tested.

2. Provide labor necessary to supply samples and assist in making tests.

3. Advise laboratory of the identity of material sources and instruct suppliers to allow inspections by laboratory.

C. Testing laboratory shall:

1. Submit written report promptly, covering each inspection and test to the Project Engineer, including:

a. Date issued.

b. Project title and number.
c. Testing laboratory name and address.
d. Name and signature of laboratory technician.
e. Date of inspection and sampling.
f. Record of temperature and weather.
g. Date of test.
h. Identification of product and specification section.
i. Location of project.
j. Type of inspection or test.
k. Observations regarding compliance with Contract Documents.

2. Promptly notify Project Engineer of irregularities or deficiencies of work which are observed during performance of testing services.

3. Perform additional services required by the Project Engineer/DNR Construction Inspector.

D. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on, contract requirements.

2. Approve or accept any portion of work.

3. Perform any duties of the Contractor.

E. Conduct tests in accordance with the requirements of the designated specifications or, where not specified, the latest appropriate standard of the American Society for Testing and Material.

1.04 LABORATORY SERVICES AND TESTS REQUIRED:

A. Concrete:

1. Secure samples of aggregates Contractor proposes to use and test for compliance with specifications.

2. Certify compliance with specification of cement proposed for use by the Contractor.

3. Review concrete design mix proportions for the required concrete strengths using materials Contractor proposes to use on the project. Incorporate specified admixtures and not less than amount of cement specified. Perform appropriate laboratory tests, including compression tests of cylinders and slump test to substantiate mix designs. Submit one copy of report to the Project Engineer, one copy to the DNR Construction Inspector, and one copy to the Contractor, clearly indicating the results of the mix design review.

4. When requested by the DNR Construction Inspector, inspect and test material during concrete work to substantiate compliance with specifications and mix requirements.

5. Slump Test: The DNR Construction Inspector will require slump tests to be performed as he desires in accordance with the provisions of these specifications.

6. Test Cylinders:

a. Each test shall consist of a set of three cylinders provided by the Contractor. Sampling and testing frequencies and requirements are to comply with IDOT IM-204.

b. Provide a minimum of one set of test cylinders each day concrete is placed.

d. The Contractor shall make and cure test cylinders in conformity with ASTM C-31.

e. Note on record drawings placement locations represented by test cylinders.

7. Perform compression tests in accordance with applicable sections of IDOT specifications.

8. Identify all test cylinders with symbols to indicate location on the job where concrete tests were made. Note on record drawings.

C. Aggregate gradation and compaction as per applicable specifications.

1.05 CONTRACTOR'S RESPONSIBILITIES:

A. Furnish product mix design to meet or exceed Contract Documents.

B. Cooperate with laboratory personnel and provide access to work, as well as to manufacturer's operations.

1. Monitor each inspection, sampling and test.

C. Provide to laboratory, preliminary representative samples of material to be tested, in specified quantities.

D. Furnish copies of mill test reports.

E. Furnish verification of compliance with contract requirements for material and equipment.

F. Furnish casual labor and facilities:

1. To provide access to work to be tested.

2. To obtain and handle samples at site.

3. To facilitate inspections and tests.

4. For laboratory's exclusive use for storage and curing of test samples.

G. Notify laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests. Notify DNR Construction Inspector when work is ready for testing. Schedule testing after approval of the DNR Construction Inspector. The Department of Natural Resources will not pay for any testing scheduled without the DNR Construction Inspector's specific authorization.

H. Correct work which is defective or which fails to conform to the Contract Documents in accordance with the general condition. Do not delay the project schedule or the work of other contractors with corrective work.

I. Pay all costs of re-testing when test results indicate non-compliance with contract requirements.

J. Patch all surfaces and areas disturbed by testing operations.

END OF SECTION 01400

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 WEATHER PROTECTION:

A. General:

1. Provide necessary protection against weather to maintain all materials, apparatus, fixtures, and work free from damage whether in shipment, in storage, or in place.

2. Do not perform wet work when temperature is below 40 degrees Fahrenheit or is forecast to be below 40 degrees Fahrenheit within the ensuing 48 hours, except when work is properly protected and sufficient heat is provided.

B. Heat Provision:

1. When heat is required for proper weather protection, provide temporary enclosures of work and acceptable means to provide sufficient heat to maintain a temperature of not less than 50 degrees Fahrenheit. Provide higher temperatures when required by these specifications.

2. Use only heating apparatus and fuels of approved safe types. Keep equipment and surroundings in a clean, safe condition. Use flame resistant tarpaulins and other materials for temporary enclosure of space. Use vented heaters only.

1.03 TEMPORARY UTILITIES:

A. Electricity, Lighting and Heating:

1. Provide such temporary service as may be required for construction purposes with required distributing facilities and meter.

2. Pay the cost of all electrical energy used on this part of the project until completion of the contract. If partial occupancy by the Owner occurs prior to completion, the Owner will pay proportional share of electrical energy used.

3. Provide light bulbs required for all temporary construction lighting and replace when necessary.

4. Use no temporary service material in permanent system without written approval of the Owner. When temporary electrical lines are no longer required, remove them

and restore any parts of buildings or grounds damaged by such removal to original condition.

5. Provide and maintain temporary lighting at barricades as required for safety.

6. Provide any heating required by these specifications.

B. Telephone:

1. Provide and pay all charges for telephone service.

C. Water:

1. Provide, protect, and maintain an adequate water supply for use on the project for construction purposes, either by means of the permanent water supply line or by installing a temporary waterline as may be required.

2. Install, valve, maintain, and protect such water supply lines as may be required.

3. Remove temporary lines when they are no longer required. Restore to original condition any part of grounds or buildings damaged by removal.

4. Pay the cost of all water used on this portion of the project until final completion of the contract.

D. Toilets:

1. Provide and maintain suitable, weather tight, painted sanitary toilet facilities for all workers during construction period. When toilet facilities are no longer required, promptly remove from site. Disinfect, clean or treat the area as required.

2. Provide and maintain facilities in accordance with requirements of applicable local and state health authorities and OSHA.

3. Keep all toilet facilities clean and supplied with toilet paper at all time.

1.04 OPERATION AND STORAGE AREAS:

A. All operations of the Contractor (including storage of materials) upon premises shall be confined to areas authorized or approved by the DNR.

B. Premises adjacent to the construction will be made available for use by the Contractor without costs whenever such use will not interfere with other uses or purposes.

C. Do not enter on or occupy with personnel, tools, equipment, or material any ground outside the DNR's property without the written consent of the owner of such ground.

D. Other contractors and employees or agents of the DNR may for all necessary purposes enter upon the work and premises used by the Contractor, and the Contractor shall conduct

his work so as not to impede unnecessarily any work being done by others on or adjacent to the site.

E. Provide and maintain weather tight storage sheds for own use.

F. Provide storage sheds with substantial floors raised a minimum of six (6) inches above the ground.

G. Locate all storage sheds as approved by the DNR Construction Inspector.

H. Completely remove from site after completion of work.

1.05 PROTECTION AND RESTORATION:

A. General: Protect all structures, including walks, pipelines, trees, shrubbery, and lawns during the progress of the work; remove from the site all debris and unused materials; and, upon completion of the work, restore the site as nearly as possible to its original condition, including the replacement, at the Contractor's sole expense, of any facility or landscaping which has been damaged.

1.06 ACCESS ROADS:

A. Temporary Roads and Storage Areas:

1. Construct and maintain all temporary access roads and storage areas required. Locate and construct all roads, ramps, mats, storage areas, and similar items in a manner approved by the Owner and provide overall management of available site areas.

B. Laws and Regulations:

1. Observe all laws and regulations of the local, county, and state authorities in the use of all public roads and highways for the transportation of materials and equipment in connection with work on the project. Observe all overhead construction, bridges, cables, and the like. Repair damage to roads, highways, overhead construction and similar off-site items, resulting from operations in connection with this project.

1.07 WATER CONTROL:

A. Carry on construction work in a manner that will direct surface water away from the structures and away from adjoining property.

B. Provide own means of pumping, well pointing or otherwise maintaining excavations free from ground water encountered. Provide means of properly conveying such water off the construction site.

1.08 PARKING:

A. Make necessary provisions for parking of all employees on the project within the site limits. Include necessary access roads and maintenance of all roads and parking areas during construction period.

B. Park vehicles to avoid interference with normal construction activities and to avoid interference with Owner's operation.

1.10 SAFETY:

A. Provide at least one non-freezing-type fire extinguisher in each workshop and shed used for storage of materials on the premises. Place in readily accessible location.

B. Provide and maintain a basic first aid kit.

1. Provide first aid supply commensurate with size of project with items necessary for first aid treatment of all injuries.

2. Advise workers of the location of first aid supplies.

3. Post telephone numbers of nearest hospital or ambulance service and fire station in conspicuous location. Advise all workers of location of telephone numbers.

END OF SECTION 01500

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: The work consists of furnishing all labor, material and equipment for the control and prevention of environmental pollution and damage as the result of construction operations under this Contract and for those measures set described herein, as indicated on the Drawings, specified herein, and as required for the construction of all work of this contract.

1. Scope: The control of environmental pollution and damage requires consideration of air, water, and land, and includes management of visual aesthetics, noise, solid waste, radiant energy and radioactive materials, as well as other pollutants.

2. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract.

a. Confine activities to areas defined by the Drawings and Specifications.

B. Related Sections: Drawings and General Provisions of the Contracts, including the General Covenants and Provisions, Supplementary Covenant and Provisions and General Requirements.

1.02 REFERENCES:

A. Provide protection of Air Resources in accordance with the following state and local codes and rules: Iowa Department of Environmental Quality Act, Oh. 455B of the 1977 Code of Iowa; Iowa Department Rules, 1973 I.D.R. 267 et seq.

1.03 DEFINITIONS:

A. Environmental pollution and damage: 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 aesthetic, cultural and/or historical purposes.

1.04 QUALITY ASSURANCE:

A. Quality Control: Establish and maintain quality control for environmental protection of all items set forth herein.

1. Record on daily reports any problems in complying with laws, regulations and ordinances and corrective action taken.

2. Assure compliance of subcontractors with this section.

B. Regulatory Requirements:

1. Notification: The Project Engineer/DNR Construction Inspector will notify the Contractor in writing of any observed noncompliance with the aforementioned Federal, state or local laws, or regulations, permits and other elements of the Contractor's environmental protection plan.

2. After receipt of such notice, inform the Project Engineer/DNR Construction Inspector of proposed corrective action and take such action as may be approved.

3. If the Contractor fails to comply promptly, the Project Engineer/DNR Construction Inspector may issue an order stopping all or part of the work until satisfactory corrective action has been taken.

a. No time extensions shall be granted such suspension.

C. National Pollutant Discharge Elimination System (NPDES): Contractor to provide a Notice of Intent (Form 1415) for application of a General Permit for Storm Water Discharge, file all necessary Forms and Drawings with the applicable Bureau of the DNR, and pay necessary application fees.(Required for sites of one acre or more)

1. For Storm Water General Permit Assistance: Contact (515)281-7017 or (515)281-8693 for information.

D. Pollution Control Training: Train personnel in all phases of environmental protection.

1. Include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities to insure adequate and continuous environmental pollution control.

1.05 PROJECT/SITE CONDITIONS:

A. Environmental Requirements:

1. Protection of Land Resources: Prior to beginning construction, the Contractor shall identify all land resources to be preserved within the Contractor's work area.

1.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES:

A. 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.

PART 2 - PRODUCTS

2.01 MATERIAL AND EQUIPMENT:

A. Provide and maintain material and equipment necessary to perform the specified work.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verification of Conditions: Prior to beginning construction, the Contractor shall identify all land resources to be preserved within the Contractor's work area.

B. Limits of Work Area:

1. Mark the areas that are not required to accomplish work to be performed under this contract.

2. Mark or fence isolated areas within the general work area which are to be saved and protected.

3.02 PROTECTION OF LAND RESOURCES:

A. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without special permission from the Contracting Authority.

B. Do not fasten nor attach ropes, cables, or guys to any trees for anchorage unless specifically authorized.

C. Where such special emergency use is permitted, provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs.

3.03 PROTECTION OF MONUMENTS AND MARKERS:

A. Protect monuments and markers before and during construction operations.

B. Where construction operations are to be conducted during darkness, the markers shall be visible.

C. The Contractor shall convey to his personnel the purpose of marking and/or protection of all necessary object.

3.04 PROTECTION OF LANDSCAPE:

A. Clearly identify trees, shrubs, vines, grasses land forms and other landscape features to be preserved by marking, fencing, or wrapping with boards, or any other approved techniques.

3.05 LOCATION OF FIELD OFFICES, STORAGE AND OTHER CONTRACTOR FACILITIES:

A. Place field offices, staging areas, stockpile storage, and temporary buildings in areas approved by the Project Engineer/DNR Construction Inspector.

B. Do not temporarily move or relocate Contractor facilities unless approved by the Engineer/DNR Construction Inspector.

3.06 DISPOSAL OF SOLID WASTES:

A. Place solid wastes in containers to be emptied on a regular schedule.

1. Conduct handling and disposal to prevent contamination.

2. Transport all solid waste off state property and dispose of in compliance with Federal, state, and local requirements for solid waste disposal.

3.07 DISPOSAL OF CHEMICAL WASTE:

A. Store chemical waste in corrosion resistant containers, remove from the work area and dispose of in accordance with Federal, state and local regulations.

3.08 DISPOSAL OF DISCARDED MATERIALS:

A. Handle discarded materials other than those which can be included in the solid waste category as directed by the Contracting Authority.

3.09 PRESERVATION AND RECOVERY OF HISTORICAL, ARCHEOLOGICAL AND CULTURAL RESOURCES:

A. Existing historical, archeological and cultural resources within the Contractor's work area will be so designated by the Department and precautions taken to preserve all such resources as they existed at the time they were pointed out to the Contractor.

B. Install protection and assume responsibility for the preservation of these resources as designated on the Drawings, or if not designated as necessary for their preservation.

C. Report any unusual items that might have historical or archeological value, found or observed during construction activities as soon as practicable to the DNR Construction Inspector.

3.10 PROTECTION OF WATER RESOURCES:

A. Keep construction activities under surveillance, management and control to avoid pollution of surface and ground waters.

B. Implement applicable management techniques to control water pollution in accordance with the listed construction activities which are included in this contract.

C. Installation, maintenance and removal of water pollution control methods and materials to be incidental to other items of work on the project, unless a specific Bid Item for Erosion Control exists.

D. Comply with detailed Project Plans for temporary erosion control procedures to be performed on this project.

3.11 PROTECTION OF FISH AND WILDLIFE RESOURCES:

A. Keep construction activities under surveillance, management and control to minimize interference with, disturbance to and damage of fish and wildlife.

B. List species that require specific attention along with measures for their protection prior to beginning of construction operations.

3.12 PROTECTION OF AIR RESOURCES:

A. Keep construction activities under surveillance, management and control to minimize pollution of air resources. Perform or operate activities, equipment, processes, and work to accomplish the specified construction in strict accordance with the State of Iowa and all Federal emission and performance laws and standards.

B. Implement special management techniques as set out below to control air pollution by construction activities.

1. Control of Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities at all times, including weekends, holidays and hours when work is not in progress.

a. Maintain all work areas within or outside the project boundaries free from particulates which would cause the applicable air pollution standards to be exceeded or which would cause a hazard or a nuisance.

b. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area.

c. Sprinkling, to be efficient, must be repeated at such intervals as to keep the disturbed area damp at all times, The Contractor must have sufficient competent equipment available to accomplish this task.

d. Perform control of particulates as the work proceeds and when ever a particulate nuisance or hazard occurs.

2. Control hydrocarbons and carbon monoxide emissions from equipment in accordance with Federal, State and local allowable limits at all times.

3. Control odors at all times for all construction activities.

4. Assume responsibility for monitoring of air quality throughout the entire areas affected by the construction activities.

3.13 PROTECTION OF SOUND INTRUSIONS:

A. Keep construction activities under surveillance and control to minimize damage to the environment by noise.

3.14 MOSQUITO CONTROL:

A. During dredging and due to large areas of shallow water in the disposal area, mosquito breeding must be controlled.

B. Deposit dredge material to minimize stagnant water pools.

C. Conduct non-aerial spraying or other methods of application of EPA approved chemicals to control mosquito breeding.

3.15 CLEANING:

A. Post Construction Clean Up: Cleanup all areas used for construction.

B. Restoration of Landscape Damage: Restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas, in accordance with the plan submitted for approval by the Contracting Authority.

END OF SECTION 01560

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 MATERIAL:

A. All materials, equipment, and other items incorporated in the work of this project must be new, and both materials and workmanship of best grade of their respective kinds.

B. To assure ready availability of materials, parts, or components for repair, replacement or future expansion purposes, all materials, equipment, and related components must be obtained from sources which maintain a regular, domestic stock.

C. Throughout all sections of these specifications, provide other material not specifically described but required to provide Owner with a complete and proper installation of all phases of the work of this contract. Select these materials subject to the approval of Project Engineer/DNR Construction Inspector.

1.03 ITEMS NOT IN CONTRACT:

A. All items indicated "N.I.C." on drawings or specifications are items not included in this contract.

B. Provide necessary provisions in the work of this project to permit proper installation of "N.I.C." items.

1.04 TRANSPORTATION AND HANDLING:

A. Provide protection against damage for all materials during delivery to and storage at the site.

B. Handling of all materials and equipment shall be such as will prevent damage to such material and/or equipment.

C. Replace or repair to the satisfaction of the DNR Construction Inspector, all items damaged because of Contractor's failure to properly protect during transportation and handling, when on or off the project site, at no additional cost to the Owner.

1.05 STORAGE AND PROTECTION:

A. Protect all materials, work, and equipment against damage at all times.

B. Refer to Section 01500 for requirements for storage sheds. Store all materials that might be damaged within storage sheds.

END OF SECTION 01600

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 CLEANING UP:

A. Keep premises free of accumulation of surplus materials and rubbish from contractor and subcontractor operations.

1. Remove all rubbish from premises.

B. Remove rubbish weekly and at other times as required by the DNR Construction Inspector. Keep interior of building free at all times of unattended combustible rubbish.

C. Immediately prior to final inspection:

1. Clean all surfaces to condition acceptable for immediate occupancy.

2. Remove all marks, stains, fingerprints, paint droppings, and other foreign matter from all finished items.

1.03 GUARANTEES, BONDS AND AFFIDAVITS:

A. Submit all written guarantees, bonds and affidavits required to the Owner prior to final payment.

B. Guarantees shall extend the full period of the required guarantee period after:

1. Replacement of work found defective during guarantee period.

2. Repair of inoperative items or adjustments to proper working conditions of items not operating properly at time of inspection at final completion.

1.04 RECORD DRAWINGS:

A. Required prior to final payment. Refer to Section 01300 of these specifications. Submit to DNR Construction Inspector.

1.05 SHOP DRAWINGS:

A. Refer to Section 01300 of these specifications.

1.06 TESTS:

A. Complete all tests required to prove actual operating performance of equipment and systems incorporated into the project. Refer to Section 01400 of these specifications.

B. Submit reports of all tests to the Owner prior to final payment.

1.07 MAINTENANCE AND OPERATING:

A. Refer to Section 01730 of these specifications, if applicable.

1.08 DAMAGE TO EXISTING STRUCTURES:

A. Prior to final acceptance by the Owner, repair or otherwise return to original condition any parts of the existing facilities which have been damaged during construction.

1.09 FINAL INSPECTION:

A. Request a final inspection in writing, at least ten days prior to the anticipated date of completion, from the DNR Construction Inspector.

B. Work will not be considered ready for final inspection until all the work has been completed and the Contractor has certified that all items are properly operating and in strict compliance with the contract documents.

C. The Contractor or his project supervisor shall be present at the job site during the final inspection.

1. The DNR Construction Inspector will present the Contractor, after the final inspection, a list of any items not meeting contract requirements. This list will be confirmed in writing and all items listed must be made acceptable before final payment will be made.

END OF SECTION 01700

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: To aid the instruction of operating and maintenance personnel, and to provide a source of information regarding the systems incorporated into the Work, furnish and deliver the data described in this section and in pertinent other sections of these specifications.

1. Additional data requirements may be described in individual sections.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 SUBMITTALS:

A. Comply with pertinent provisions of Section 01300.

B. Submit two copies of a preliminary draft of the proposed manual or manuals to the Engineer for review and comments.

C. Unless otherwise directed in other sections, or in writing by the Engineer, submit two copies of the final manual to the DNR Construction Inspector.

1.03 QUALITY ASSURANCE:

A. In preparing required data, use only personnel thoroughly trained and experienced in operation and maintenance of the described items, completely familiar with this section's requirements, and sufficiently skilled in technical writing to communicate the essential data.

PART 2 - PRODUCTS

2.01 INSTRUCTION MANUALS:

A. Where instruction manuals are required to be submitted under other sections of these specifications, prepare in accordance with the provisions of this section.

B. Format:

1. Size: 8-1/2" x 11"

2. Paper: White bond, at least 20 lb. weight

3. Text: Neatly written or printed

4. Drawings: 11" in height preferable; bind in with text; foldout acceptable; larger drawings acceptable but fold to fit within the manual and provide a drawing pocket inside rear cover or bind in with text.

5. Flysheets: Separate each portion of the manual with neatly prepared flysheets briefly describing contents of the ensuing portion; flysheets may be in color.

6. Binding: Use heavy-duty plastic or fiberboard covers with 3-ring binders. All binding is subject to the Owner's approval.

7. Measurements: Provide all measurements in U.S. standard units: feet-and-inches, lbs., and cfm.

C. Provide front and back covers for each manual, using durable Owner's approved material, clearly identified on or through the cover with at least the following information:

OPERATING AND MAINTENANCE INSTRUCTIONS
(name and address of work)
(name of contractor)
(general subject of this manual)
(space for approval signature of)
(the owner and approval date)

D. Contents include at least the following:

1. Neatly typewritten index near the front of the manual, giving immediate information as to location within the manual of all emergency information regarding the installation.

2. Detailed list of subcontractors, including address, phone number and product or equipment installed.

3. Complete instructions regarding operation and maintenance of all equipment involved, including lubrication, disassembly, and reassembly.

4. Complete nomenclature of all parts of all equipment.

5. Complete nomenclature and part number of all replaceable parts, name and address of nearest vendor, and all other data pertinent to procurement procedures.

6. Copy of all guarantees and warranties issued.

7. Manufacturers' bulletins, cuts, and descriptive data, where pertinent, clearly indicating the precise items included in this installation and deleting, or otherwise clearly indicating, all manufacturers' data with which this installation is not concerned.

8. Such other data as required in pertinent sections of these specifications.

PART 3 - EXECUTION

3.01 INSTRUCTION MANUALS:

A. Preliminary:

1. Prepare a preliminary draft of each proposed manual.

2. Show general arrangement, nature of contents in each portion, probable number of drawings and their size, and proposed method of binding and covering.

3. Secure the Architect's approval prior to proceeding.

B. Final: Complete the manuals in strict accordance with the approved preliminary drafts and the Architect's review comments.

C. Revisions:

1. Following the instruction of operation and maintenance personnel, review all proposed revisions of the manual with the DNR Construction Inspector.

END OF SECTION 01730

PART 1 – GENERAL

1.01 SECTION INCLUDES
A. Certification of Products
B. Acceptance and Warranty
C. Seed Types and Mixes
D. Equipment
E. Application of Seed

1.02 DESCRIPTION OF WORK
Includes the requirements for seedbed preparation; furnishing, applying, and covering the seed; and compaction of the seedbed.

1.03 SUBMITTALS
Comply with Division 1 - General Provisions and Covenants, as well as the following:
A. Submit certification of products to the Engineer prior to seed placement:

1. Seed: Submit a mechanically printed seed tag from an Iowa Crop Improvement Association-approved seed conditioner or grower. Submit a laboratory analysis for all seeds, specifying the purity and germination. Provide 48 hours notice prior to mixing the seed and give the Engineer an opportunity to witness the seed mixing.

2. Fertilizer: Submit certification of the fertilizer analysis with scale weight and statement of guaranteed analysis. Submit from a certified fertilizer dealer, a mechanically printed commercial fertilizer label, or bill of lading. Comply with the inspection and acceptance requirements of Iowa DOT Materials I.M. 469.03.

3. Wood Cellulose Fiber Mulch: Submit certification of the degradable wood cellulose fiber mulch ingredients with applicable use and rate, and the water retention capacity by manufacturer or supplier.

4. Wood Excelsior Mulch: Bale wood excelsior and determine the mass (weight). Use the mass of the material, furnished by the manufacturer, to determine the rate of application.

5. Straw Mulch: Certify weight. Furnish a list of the number of bales and a corresponding ticket from an approved scale for the mulch material to be used on the project.

6. Compost: Submit certification of composted organics analysis with U.S. Compost Council’s Seal of Testing Assurance (STA), recommended rates of application, and manufacturer’s estimated cubic yards per ton.

7. Inoculant: Furnish information from inoculant packaging.

8. Tackifier: Submit certification of the tackifier ingredients, recommended rates of application, and expiration date.

B. When requested, submit written instructions recommending procedures for maintenance of seeded areas.

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: All labor, materials, and equipment required to construct, shore, and remove all forms to accommodate all concrete specified in herein, as shown on the Drawings, and as specified in other sections of these specifications.

B. Related Sections: Drawings and General Provisions of the Contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 02200 - Earthwork
Section 032000 - Concrete Reinforcement
Section 033000 - Cast-In-Place Concrete
Section 033500 – Concrete Finishing

1.02 REFERENCES:

A. Safety: All formwork and methods of construction shall conform to the requirements of the state of Iowa Bureau of Labor and all OSHA Standards.

1.03 SUBMITTALS:

A. Provide submittals in accordance with Section 0133000 – Submittal Procedures.

B. Manufacturer's Data: Within 30 calendar days after award of the contract, submit manufacturer's data and installation instruction for proprietary materials including form coatings, ties and accessories, and manufacturer's form system if used.

C. Shop Drawings: When requested by the DNR Construction Inspector or the Architect for the purpose of explaining details or structural integrity, the Contractor shall submit those drawings requested prior to erection of the project.

1.04 QUALITY ASSURANCE:

A. Formwork: Design of formwork is the responsibility of the Contractor.

B. Standards: Comply with all applicable provisions of ACI 347.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Form Materials:

1. Construct formwork for exposed concrete surfaces with smooth-faced undamaged plywood, undented metal, or other panel-type materials acceptable to the DNR Construction Inspector, to provide continuous, straight, plumb, smooth cast surface, furnish in largest practical sizes to minimize number of joints.

2. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without reflection or bowing.

B. Form Ties:

1. Provide factory-fabricated, adjustable length removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete surfaces upon removal.

2. Provide ties so that portion remaining within concrete after removal of exterior parts is at least 1-1/2" from the outer concrete surface.

3. Form ties shall not leave a hole larger than 1" diameter in the concrete surface.

C. Form Coating: Provide commercial formulated form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces requiring bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.

2.02 DESIGN OF FORMWORK:

A. General:

1. Design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied, until such loads can be supported by the concrete structure.

2. Carry vertical and lateral loads to ground by formwork system and in-place construction that has attained adequate strength for that purpose.

3. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position.

4. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of structure during construction.

5. Provide shore and struts with positive means of adjustment capable of taking up formwork settlement during concrete placing operations, using wedges or jacks or a combination thereof.

6. Provide trussed supports when adequate foundations for shores and struts cannot be secured.

7. Support form facing materials by structural members spaced sufficiently close to prevent objectionable deflection.

8. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within allowable tolerances.

9. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads.

10. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement.

11. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.

B. Earth Forms: Side forms of footings may be omitted and concrete placed directly against excavation only when requested by the Contractor and accepted by the DNR Construction Inspector.

1. When omission of forms is accepted, provide additional concrete 1" on each side of the minimum design profiles and dimensions shown.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine the substrate and conditions under which work of this section is to be performed.

B. Correct unsatisfactory conditions that would prevent proper and timely completion of the work.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 ERECTION:

A. General:

1. Construct forms complying with ACI 347, to the exact sizes, shapes, lines, and dimensions shown, and as required to obtain accurate alignment, location, grades, level, and plumb work in finish structures.

2. Provide for openings, offsets, sinkages, keyways, recesses, moldings, reglets, chamfers, blocking, screeds, bulkheads, anchorages, inserts, and other features required.

a. Use selected materials to obtain required finishes.

3. Forms for openings and construction which accommodates installation by other trades whose materials and products must be fabricated before the opportunity exists to verify the measurements of adjacent construction which effects such installations, shall be accurately sized and located as dimensioned on the Drawings.

4. In the event that deviation from the Drawing dimensions results in problems in the field, the Contractor shall be responsible for resolution of the conditions as approved by the Architect, without additional expense to the Owner.

B. Fabrication:

1. Fabricate forms for easy removal without hammering or prying against concrete surfaces.

2. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces.

3. Provide top forms for inclined surfaces where the slope is too steep to place concrete with bottom forms only.

4. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.

5. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete.

6. Brace temporary closures and set tightly to temporary openings on forms in as inconspicuous locations as possible, consistent with design requirements.

7. Form intersecting planes to provide true, clean cut corners.

C. Falsework:

1. Erect falsework and support, brace and maintain it to safely support vertical, lateral, and asymmetrical loads applied until such loads can be supported by in-place construction.

2. Construct falsework so that adjustments can be made for take-up and settlement.

3. Provide wedges, jacks, or camber strips to facilitate vertical adjustments.

4. Carefully inspect falsework and formwork during and after concrete placement operations to determine abnormal deflection or signs of failure; make necessary adjustments to produce work of required dimensions.

D. Forms for Exposed Concrete:

1. Drill forms to suit ties used and to prevent leakage of concrete mortar around tie holes.
2. Do not splinter forms by driving ties through improperly prepared holes.
3. Provide sharp, clean corners at intersecting planes, without visible edges or offsets.
4. Back joints with extra studs or girts to maintain true, square intersections.
5. Use extra studs, walers, and bracing to prevent objectionable bowing of forms between studs and to avoid bowed appearance in concrete.
6. Do not use narrow strips of form material which will produce bow.
7. Assemble forms so they may be readily removed without damage to exposed concrete surfaces.

E. Corner Treatment: Unless shown otherwise, form chamfers with 3/4" x 3/4" strips, accurately formed and surfaced to produce uniformly straight lines and tight edge joints on exposed concrete.
1. Extend terminal edges to required limit and miter chamfer strips at changes in direction.

F. Control Joints: Locate as directed by DNR Construction Inspector or as indicated on the Drawings.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades.
1. Verify size and location of openings, recesses and chases with the trade requiring such items.
2. Accurately place and securely support items to be built into forms.

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete.
1. Remove chips, wood, sawdust, dirt, and other debris just before concrete is placed.
2. Retighten forms immediately after concrete placement as required to eliminate mortar leaks.

3.03 INSTALLATION:

A. Embedded Items:
1. General: Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete.
2. Use setting drawings, diagrams, instructions and directions provided by suppliers of the items to be attached thereto.
3. Edge Forms and Screeds: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in the finished slab surface.
4. Provide and secure units to support types of screeds required.

B. Shores and Supports: Comply with ACI 347 for shoring construction, and as herein specified.
1. Submit a shore removal and reshoring schedule and drawings for the DNR Construction Inspector review before proceeding with this work.
2. Do not proceed until schedule and drawings have been reviewed.

3.04 APPLICATION:

A. Form Coating: Coat form contact surfaces with form-coating compound before reinforcement is placed.

1. Do not allow excess form coating material to accumulate in the forms or to come in contact with surfaces which will be bonded to fresh concrete.

2. Apply in compliance with manufacturer's instructions.

3.05 FIELD QUALITY CONTROL:

A. Inspection: Concrete shall not be placed in forms until inspected by DNR Construction Inspector and permission is given to start placing concrete.

3.06 CLEANING:

A. General: Formwork not supporting concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 10 degrees C (50 degrees F) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operation, and provided that curing and protection operations are maintained.

B. Formwork: Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements may not be removed in less than 14 days, and not until concrete has attained design minimum 28-day compressive strength.

1. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of the concrete location or members, as specified in other sections.

C. Form-Facing Material: Form-facing material may be removed four days after placement, only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

D. Reuse of Forms: Clean and repair surfaces of forms to be reused in the work.

1. Split, frayed, delaminated or otherwise damaged form-facing material will not be acceptable.

2. Apply new form-coating compound material to concrete contact surfaces as specified for new formwork.

3. When forms are reused for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints.

4. Align and secure joints to avoid offsets.

END OF SECTION 031000

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: All reinforcing steel, steel mesh, and accessories and the installation of these items for all concrete reinforcement for this project.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 031000 Concrete Forming and Accessories
Section 033000 Cast-In-Place Concrete

1.02 REFERENCES:

A. Comply with all applicable provisions of the following standards:

1. CRSI "Manual of Standard Practice"
2. ACI 315 "Details and Detailing of Concrete Reinforcement"
3. ACI 318 "Building Code Requirements for Reinforced Concrete"
4. ASTM A82 "Standard Specifications for Cold Drawn Steel Wire For Concrete Reinforcement"
5. ASTM A185 "Standard Specifications for Welded Steel Wire Fabric For Concrete Reinforcement"
6. ASTM A615 "Standard Specifications for Deformed and Plain Billet-Steel Bars For Concrete Reinforcement"

1.03 SUBMITTALS:

A. Shop Drawings: Submit complete shop drawings of all materials proposed to be furnished and installed under this section in accordance with ACI "Manual of Standard Practice for Detailing Concrete Structure," ACI 315. Show:

1. Bar schedule, stirrup spacing, diagrams of bent bars, and arrangements and assemblies.
2. Review shop drawings requirements with DNR Construction Inspector before ordering shop drawings.

B. Mill Certificates: Submit steel producer's certificates of mill analysis, tensile and bend tests for reinforcing steel.

1. Submit certificates showing conformity with these requirements and those of ASTM A615 to the Architect for each melt.

1.04 DELIVERY, STORAGE AND HANDLING:

A. Delivery: Deliver reinforcement to the job site bundled, tagged, and marked.

1. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

B. Storage: Store reinforcement at the job site in a manner to prevent damage and accumulation of dirt and excessive rust.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Steel and Wire Reinforcement:

1. Provide reinforcing steel consisting of deformed bars of the sizes shown on the Drawings.

2. Provide steel conforming to ASTM A615 Grade 60 with deformation conforming to ASTM A305.

3. Provide wire reinforcement conforming to ASTM A82 and welded wire fabric conforming to ASTM A185.

B. Wire Reinforcement: Provide in accordance with ASTM A82.

C. Welded Wire Fabric: Provide in accordance with ASTM A185.

1. Unless otherwise noted elswere, reinforce all sloabs with 6 x 6 - W 1.4 x W 1.4.

D. Tie Wire: No. 16 double annealed iron wire.

E. Accessories: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place:

1. Use wire bar-type supports complying with CRSI recommendations, unless otherwise indicated.

a. Do not use wood, brick and other such unacceptable materials.

2. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

3. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with either hot-dip galvanized or plastic protected legs.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine the substrate, formwork, and the conditions under which concrete reinforcement is to be placed, and correct conditions which would prevent proper and timely completion of the work.

B. Do not proceed with the work until satisfactory conditions have been corrected.

3.02 INSTALLATION:

A. General:

1. Comply with the specified standards for details and methods of reinforcement placement and supports, and as herein specified.

2. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.

3. Position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations.

4. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required.

5. Place reinforcement to obtain the minimum coverage for concrete protection.

6. Arrange, space, and securely tie bars and bar supports together with 16 gauge wire to hold reinforcement accurately in position during concrete placement operations.

7. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.

8. Install welded wire fabric in lengths as long as practicable.

9. Lap adjoining pieces at least one full mesh.

10. Provide sufficient numbers of supports and of strength to carry reinforcement.

11. Do not place reinforcing bars more than 2" beyond the last leg of any continuous bar support.

12. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

13. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact, and tightly wire tying.

    a. Lap horizontal splices a minimum of 18".

    b. Lap Vertical splices a minimum of 28".

    c. Place bars in contact and tightly tie wire.

END OF SECTION 032000

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: Provisions for all labor, materials and equipment required to construct all items classified as cast-in-place concrete.

1. All concrete foundations and slabs as shown on the foundation plan floor plans and building section, as well as all other concrete not specifically specified elsewhere, are classified as cast-in-place concrete.

2. All sidewalks and exterior slabs are specified in Division 32.

B. Related Sections: Drawings and General Provisions of the Contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 02200 - Earthwork
Section 031000 - Concrete Forming and Accessories
Section 032000 - Concrete Reinforcing

1.02 REFERENCES:

A. Codes and Standards: Comply with provisions of following codes, specifications and standards except where more stringent requirements are shown or specified.

1. Uniform Building Code, U.B.C., latest edition.

2. American Concrete Institute (ACI).

a. Manual of Concrete Practice.

b. ACI 301 - Specifications for Structural Concrete for Buildings.

c. ACI 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

d. ACI 305 - Hot Weather Concreting.

e. ACI 306 - Cold Weather Concreting.

f. ACI 308 - Standard Practice for Curing Concrete.

g. ACI 318 - Building Code Requirements for Reinforced Concrete.

3. American Society for Testing of Materials (ASTM).

a. ASTM C33 - Standard specification for concrete aggregates.

b. ASTM C31 - Making and curing compressive and flexural strength test specimens in the field.

c. ASTM C94 - Standard specification for ready-mixed

d. ASTM C138 - Test for unit weight, yield and air content of concrete.

e. ASTM C143 - Test for slump test of Portland cement concrete.

f. ASTM C150 - Standard specification for Portland cement.

g. ASTM C260 - Standard specification for air-entraining admixture for concrete.

h. ASTM C309 - Standard specification for liquid membrane-forming compounds for curing concrete.

i. ASTM C494 - Standard specification for chemical admixtures for concrete.

j. ASTM D994 - Standard specification for pre-formed expansion joint filler for concrete.

k. ASTM D1850 - Standard specification for concrete joint sealer, cold application type.

4. Concrete Reinforcing Steel Institute (CRSI).

a. Manual of Standard Practice.

5. Iowa State Building Code, latest edition.

1.03 SUBMITTALS:

A. Product Data: Submit to the Architect manufacturer's product data with application and installation instructions for proprietary materials and items, accessories, admixtures, patching compounds, water stops, joint systems, curing compounds, dry-shake finish materials, and others as requested by Architect.

B. Samples: Submit to the DNR Construction Inspector samples of materials specified, as requested, including names, sources and descriptions.

C. Quality Control Submittals:

1. Design Data: Submit data on proposed design mixes when trial batch method is used.

2. Test Reports: Employ, at Contractor's expense, a testing laboratory acceptable to the Architect to perform material evaluation tests and submit reports.

3. Material Certificates: Provide, in lieu of laboratory test reports when permitted by Architect, certificates signed by Manufacturer and Contractor verifying that each item complies with or exceeds specified requirements, .

1.04 QUALITY ASSURANCE:

A. Qualifications:

1. Provide at least one person, on site, thoroughly familiar with the specified requirements, completely trained, and experienced in the necessary skills, to direct all work performed under this section.

2. Use adequate numbers of skilled workers to ensure construction in strict accordance with the approved design.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the DNR Construction Inspector and at no additional cost to the Owner.

1.06 PROJECT/SITE CONDITIONS:

A. Environmental Requirements: Observe weather conditions. Attempt no work in frozen conditions without written approval from the DNR Construction Inspector.

B. Existing Conditions: Survey site conditions prior to commencing work.

1. Bring any discrepancies between existing work and the Drawings and Specifications to the attention of the Architect/DNR Construction Inspector.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Subject to compliance with requirements, products from the following manufacturers can be incorporated into the work of this section.

1. Euclid Chemical Co., 19218 Redwood Road, Cleveland, Ohio 44110.
2. Master Builders Co., Ltd., 79 Kincort Street, Toronto, Ontario M6M3E4.
3. Sika Chemical Corporation, P. O. Box 297, Lyndhurst, New Jersey 07071.
4. Chem-Master Corporation, 477 Industrial Parkway, Chagrin Falls, Ohio 44022.
5. W. R. Grace and Co., 62 Wittemore Avenue, Cambridge, Massachusetts 02140.
6. W. R. Meadows, Inc., P. O. Box 543, Elgin, Illinois 60120.
7. Protex Industries, Inc., 1331 West Evans Avenue, Denver, Colorado 80223.
8. Sonneborn Building Products, 7711 Computer Avenue, Minneapolis, Minnesota 55435.
9. Antihydro Co., 265 Badger Avenue, Newark, New Jersey 07108.
10. L & M Construction Chemicals, Inc., 8316 Blondo Street, Omaha, Nebraska 68134.
11. Glifford-Hill and Co., Inc., Woodland Green, Charlotte, North Carolina 28210.
12. The Celotex Corporation, 1500 North Dale Mabry Highway, Tampa, Florida 33607.
13. J & P Petroleum Products, Tex-Mastic Construction Materials, 2715 South Westmoreland, P. O. Box 4206, Dallas, Texas 75208.

2.02 MATERIALS:

A. Portland Cement: ANSI/ASTM C 150, Type I or Type III, high early-strength cements unless otherwise acceptable to Architect.

B. Normal Weight Aggregates: ANSI/ASTM C 33, and as herein specified.

1. Coarse aggregate crushed limestone.
2. Provide fine aggregate, regularly graded from coarse to fine, from source approved by Iowa D.O.T. Maximum size of aggregate not more than three-fourths minimum clear spacing between reinforcing bars and not more than one-fifth of smallest dimension of slab or member for which concrete is being used.
3. Aggregate for unreinforced slabs maximum size one-third of slab thickness.

C. Water: Provide clean, potable water for concrete, free from injurious amounts of foreign matter.

D. Water-Reducing Admixtures: ANSI/ASTM, C 494, Type A and contain not more than one percent (1%) chloride ions.

"Eucon WR-74;" Euclid Chemical Co.
"Pozzolith 322N;" Master Builders.
"Plastocrete 160;" Sika Chemical Corp.
"Chemtard;" Chem-Masters Corp.
or approved equal

E. Air-Entraining Admixture: ANSI/ASTM C 260, added to mixer in lieu of air-entrained cement.

"Darex (AEA);" W. R. Grace Co.
"Ad-Aire;" Carter-Waters Corp.
"Protex AES;" Protex Industries, Inc.
"Seal-Tight;" W. R. Meadows, Inc.

F. Liquid Membrane-Forming Curing Compound: Liquid type membrane-forming curing compound complying with ANSI/ASTM C 309, Type I, Class A.

"Masterseal;" Master Builders.
"A-H 3 Way;" Sealer' Anti-Hydro Waterproofing Co.
"Ecocure;" Euclid Chemical Co.
"Clear Seal;" W. R. Grace.
"Kure-N-Seal;" Sonneborn-Contech.
"Polyclear;" Upco Chemical/USM Corp.
"L & M Cure;" L & M Construction Materials.
"LR-151;" Protex Industries.
"Hardtop;" Glifford - Hill.

1. Curing compound: Provide a continuous, unbroken membrane adhering to moist concrete without disintegration, checking or peeling from the surface, nor showing signs of such deterioration within 30 days after application under actual working conditions.

   a. Provide a color free compound sufficiently transparent allowing no permanent change in concrete color.

   b. The compound may contain, however, a temporary dye of sufficient color to make the membrane clearly visible for a period of at least four hours after application.

2.03 EQUIPMENT:

A. Batching, Mixing, and Delivery Equipment: Use transit-mixed concrete from approved batching and mixing plant. Batch, mix, and transport concrete to site is accordance with ANSI/ASTM 94.

B. When air temperature is between 85°F. (30°C) and 90°F. (32°C), reduce mixing and delivery time from 1 1/2 hours to 75 minutes; and when air temperature is above 90°F. (32°C), reduce mixing and delivery time to 60 minutes.

2.04 ACCESSORIES:

A. Pre-formed Joint Filler: ASTM D 994 and as herein specified.

1. Pre-formed non extruding resilient material, one-half (1/2) inch wide depth required to bring surface to within one-half (1/2) inch of surface.

2. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:

"Flexcell;" Celotex Corporation.
"Sealtight;" W. R. Meadows, Inc.
"Tex Mastic;" J & P Petroleum Products.

B. Joint Sealer: ASTM D 1850 Concrete Joint Sealer, cold-application type.

C. Vapor Barrier: Under slabs on ground, 4 mil polyethylene film.

D. Storage: Store all cement materials in weather-tight enclosure, clear of ground, and protected from weather with suitable covering.

E. Embedded Items: Verify and coordinate embedded items furnished by other trades.

F. Admixtures: Use air-entraining admixture in exterior exposed concrete, unless otherwise indicated as determined by ANSI/ASTM C 138.

1. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having air content within following limits:

2. Concrete structures and slabs exposed to freezing and thawing or subjected to hydraulic pressure:

Maximum Size Aggregate	Amount of Air (%)
1 1/2" or 2"	5% + 1%
3/4" or 1"	6% + 1%
3/8" or 1/2"	7 1/2% + 1%

G. Under slab Insulation: Provide manufacturer standard lengths and width polystyrene board insulation where shown on the Drawings.

1. Rigid, close cell, extruded, expanded polystyrene board with integral high density skin; complying with FS HH-1-524 C, Type IV, minimum 20 PSI compressive strength, K-value of 0.20; 0.3% maximum water absorption; 1.1 perm.-inch maximum water vapor transmission.

2. Thickness: As shown on the Drawings.

2.05 MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301.

1. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs.

2. Do not use the same testing facility as used for field quality control testing without Architect's approval.

B. Design mixes to provide normal weight concrete with the following properties, as indicated on drawings and schedules:

1. 4,000 psi 28-day compressive strength; 560 lbs. cement per cubic yard minimum; W/C ratio, 0.44 maximum.

2. 3,000 psi 28-day compressive strength; 480 lbs. cement per cubic yard minimum; W/C ratio; 0.58 maximum.

C. Consistency: Determine the quantity of water required for proper consistency of concrete by slump test in accordance with ANSI/ASTM C 143.

1. For Vertical Wall Sections, Columns -- Maximum slump, 4 inches, plus or minus one inch tolerance.

2. For Footings, Beams, Slabs -- Maximum slump, 3 inches, plus or minus one inch tolerance.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.

B. Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast-in.

C. Notify other crafts to permit installation of their work; cooperate with other trades in setting such work.

D. Moisten wood forms immediately before placing concrete where form coatings are not used.

3.02 PREPARATION:

A. Drain and pump all water from excavations, forms, and any locations where concrete is to be placed.

1. Bottom of excavations shall be undisturbed earth free of frost or debris, level and compacted.

2. Do not place any concrete until the Architect or DNR Construction Inspector has inspected and approved forms and soil conditions, and until reinforcing, sleeves, and embedded items have been placed.

3. Clean all dirt and debris from transporting equipment. Clean reinforcement of all foreign matter. Clean forms and oil or wet (except in freezing conditions) surfaces.

4. Compact, level, and dampen base fill material under slabs on grade.

5. Prior to placing concrete, install polyethylene vapor barrier under interior slabs.

6. Do not puncture or otherwise damage vapor barrier or membrane waterproofing.

B. Transport concrete to prevent separation of materials in accordance with ACI practices.

1. Do not add water to concrete during transporting.

2. Handle from mixer to point of placement with carts, buggies, or conveyors.

3. Do not dump concrete from mixer or from transporting equipment with a free fall of more than three feet.

4. Clean transporting equipment at frequent intervals during placement.

5. Do no use partially hardened or contaminated concrete.

3.03 PLACEMENT OF CONCRETE:

A. Place concrete in accordance with ACI 304 "Recommended practice for measuring, mixing, transporting and placing concrete" and as herein specified.

B. Place concrete continuously or in layers of such thickness that no fresh concrete will be placed on concrete which as hardened sufficiently to cause the formation of seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as herein specified.

2. Deposit concrete as nearly as practicable to its final location to avoid segregation.

C. Work concrete into corners and around reinforcement.

1. Machine vibrate sufficiently to insure thorough compaction and complete embedment of reinforcing.

2. Stop placement at point of no shear, or where directed, and erect tight, plumb dams through forms.

3. Place concrete between construction joints in one continuous operation. Locate construction joints in slabs under partitions.

4. Brush on neat cement when pouring against hardened concrete.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints.

1. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

2. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping.

a. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.

3. Do not use vibrators to transport concrete inside forms.

a. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine.

b. Place vibrators to rapidly penetrate placed layer and at least six (6) inches into preceding layer.

c. Do not insert vibrators into lower layers of concrete that have begun to set.

d. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.

E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.

1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.

2. Bring slab surfaces to correct level with straight edge and strike off.

3. Use bull floats or darbies to smooth surface, free of humps or hollows.

4. Do not disturb slab surfaces prior to beginning finishing operations.

5. Maintain reinforcing in proper position during concrete placement operations.

F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306, "Cold Weather Concreting," and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40°F. (4°C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 40°F. (4°C), and not more than 80°F. (27°C) at point of placement, and maintain minimum temperature over the entire work for no less than 72 hours.

a. Do not use frozen materials or materials containing ice or snow.

b. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

c. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

G. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305, "Hot Weather Concreting," and as herein specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90°F. (32°C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing.

2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.

3. Wet forms thoroughly before placing concrete.

4. Use water-reducing retarding admixture (Type A) when required by high temperatures, low humidity, or other adverse placing conditions.

H. Expansion Joints: Unless otherwise specifically designated on the Drawings, install expansion joint filler where interior slabs abut exterior walls, interior bearing walls and columns, and at perimeter of concrete equipment pads.

1. Omit expansion joint filler and install 15 lb. felt, centered below door, to break bond at exterior doors with concrete platforms, unless otherwise shown on the Drawings.

I. Control Joints: Cut control joints 12 to 15 feet o.c. each way in all exposed concrete floor slabs on grade.

1. Locate in a uniform pattern within room spaces and centered below partitions separating spaces.

2. Locate at doorways between rooms, at centerlines of exposed columns and to divide areas of irregular-shaped rooms.

3. Verify location and cut to depth of one-sixth (1/6) of slab thickness with minimum of three-fourths (3/4) inch.

4. Cut with carborundum saw, approximately six (6) to twenty-four (24) hours after placing concrete and when a minimum amount of raveling occurs in concrete.

5. On exterior walks, score with one-fourth inch by one inch (1/4" x 1") deep control joints.

6. Use straight edge guide when scoring joints.

7. Where required depth of control joint cannot be made by scoring, cut joints with carborundum saw.

3.04 CONCRETE FINISHING:

A. Finish on Formed Surfaces: Verify that finished or formed surfaces conform accurately to the shape, alignment, grades and sections shown on the Drawings.

1. Finish surfaces free from fins, bulges, ridges, offsets, honeycombing or roughness, presenting a finished, continuous, hard surface.

2. Round and bevel all sharp angles, where required.

3. In accordance with coating manufacturer's specifications, do not permit the presence of any material detrimental to the specified paint or coating on any formed or finished surface to be painted or otherwise coated.

4. Rough Form Finish:

a. Provide as-cast rough form finish to formed concrete surfaces that are to be concealed in the finish work or by any other construction.

b. Standard rough form finish shall be the concrete surface having the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched, and all fins and other projections exceeding one-fourth inch (1/4") in height rubbed down or chipped off.

5. Smooth Form Finish:

a. Provide as-cast smooth form finish for formed concrete surfaces that are to be exposed to view, or that are to be covered with a coating material other than cement plaster applied directly to the concrete.

b. Produce smooth form finish by selecting form material to impart a smooth, hard, uniform texture and arranging them orderly and symmetrically with a minimum of seams.

c. Repair and patch defective areas with all fins and other projections completely removed and smoothed.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike off smooth and finish with a smooth troweled finish.

C. Slab and Floor Finished: Provide an adequate slope to the drains or to suitable points of disposal for all floor and flat roof surfaces and all exterior concrete floor, sidewalk and flat slab surfaces.

1. Provide the direction of slope and the amount of crowning as shown on the Drawings or as prescribed by the Architect or the DNR Construction Inspector. Do not allow dry topping on any of the finishes.

2. Scratch Finish:

a. Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds for tile and other bonded applied cementitious-finish flooring material.

b. After placing slabs, plane the surface to a tolerance not exceeding one-fourth inch (1/4") in twenty-four inches (24") when tested with a straight edge.

c. Slope surfaces uniformly to drains where required.

d. After leveling, roughen the surface before the final set by using stiff broom brush or rake.

3. Float Finish:

a. Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes hereinafter specified, and to slab surfaces which are to be covered with insulation, and as otherwise shown on the Drawings or in the schedules.

b. After placing concrete slabs, do not work the surface further until ready for floating.

c. Begin floating when the surface water has disappeared and when the concrete has stiffened sufficiently to permit operation of a power-driven float, hand float, or both.

d. Consolidate the surface with power-driven floats, or by hand-floating if area is small or inaccessible to power units.

e. Check and level the surface plane to a tolerance not exceeding one-fourth inch (1/4") in ten feet (10'-0") when tested with a ten-foot (10'-0") straight edge placed on the surface at not less than two different angles.

f. Cut down high spots and fill low spots.

g. Uniformly slope surfaces to drains where required.

h. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture.

4. Trowel Finish:

a. Apply trowel finish to monolithic slab surfaces that are to be exposed to view, unless otherwise shown, and to slab surfaces that are to be covered with resilient flooring, carpeting, paint, or other thin-film finish coating system.

b. After floating, begin the first trowel finish operation using a power-driven trowel. Begin final troweling when the surface produces a ringing sound as the trowel is moved over the surface.

c. Consolidate the concrete surface by the final hand troweling operation, free from trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding one-eighth inch (1/8") in ten feet (10'-0") when tested with a ten-foot (10'-0") straight edge.

d. Grind smooth those surface defects which would telegraph through applied floor covering system.

5. Nonslip Broom Finish:

a. Apply nonslip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as shown on the Drawings or in the schedules.

b. Immediately after trowel finishing, slightly roughen the concrete surface by brooming in the direction perpendicular to the main traffic route. Use a fiber bristle broom.

c. Coordinate the required finish with the Architect or DNR Construction Inspector prior to the application.

3.05 CONCRETE CURING:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing.

2. Weather permitting, keep continuously moist for not less than seven (7) days.

3. Begin final curing procedures immediately following initial curing and before concrete has dried.

4. Continue final curing for at least seven (7) days in accordance with ACI 308, "Standard Practice for Curing Concrete."

5. Avoid rapid drying at end of final curing period.

B. Curing Method: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof as herein specified.

1. Provide moisture curing by the following methods:

a. Keep concrete surface continuously wet by covering with water.

b. Continuous water-fog spray.

c. Covering concrete surface with specified absorbent cover, thoroughly saturating cover with water and keeping continuously wet.

d. Place absorbent cover to provide coverage of concrete surfaces and edges, with four-inch (4") lap over adjacent absorbent cover.

2. Provide moisture-cover curing as follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least three inches (3") and sealed by waterproof tape or adhesive.

a. Immediately repair any holes and tears during curing period using cover material and waterproof tape.

3. Apply curing compounds to slabs as follows:

a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within two [2] hours).

b. Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions.

c. Recoat areas subjected to heavy rainfall within three (3) hours after initial application.

d. Maintain continuity of coating and repair damage during curing period.

4. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, such as; liquid floor hardener, waterproofing, dampproofing, membrane roofing, flooring, painting, and other coatings and finish materials, unless otherwise acceptable to the coating manufacturer.

3.06 MISCELLANEOUS CONCRETE ITEMS:

A. Filling-In: Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place.

1. Mix, place, and cure concrete as herein specified to blend with in-place construction.

2. Provide other miscellaneous concrete filling shown or required to complete work.

B. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on the Drawings or required for the machine and equipment actually furnished.

1. Set anchor bolts for machines and equipment to template, at correct elevations, complying with certified diagrams or templates of the manufacturer furnishing the machines and equipment.

2. Provide isolation joints surrounding bases where indicated or required.

3.07 FIELD QUALITY CONTROL:

A. Test of Materials and Installed Work: Materials and installed work may require testing and retesting, as directed by Architect, at any time during progress of work.

1. Allow free access to material stockpiles and facilities.

2. Tests, not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.

3. Slump Tests: Take one slump test for each 20 yards, or as directed by Architect, of concrete placed at one operation in accordance with ASTM C 143. Keep job record of test results and location.

4. Control Tests: During placement of concrete, take three standard 6" test cylinders in accordance with ACI 318-63 and ASTM C 31 for each type of concrete used. Test one at seven (7) days and one at twenty-eight (28) days.

   a. Take one set for every 20 cubic yards and any fraction with a minimum of one set of three cylinders for each day's pour. Tag cylinders to show date and location of test cylinder.

   b. Have compressive strength tests made by independent laboratory and results sent directly to Architect.

   c. Hold remaining cylinders in case of breakage.

   d. Should retention at job site delay testing beyond seven (7) days, fourteen (14) day test is acceptable.

   e. Keep test cylinders shaded and damp until sent to laboratory.

3.08 REMEDIAL WORK:

A. General: Reinforce or replace deficient work as directed by the Architect or DNR Construction Inspector and at no additional cost to the Owner.

B. Patching: Repair defective areas and fill form-tie holes and similar defects in accordance with ACI 301.

   1. Where, in the opinion of the Architect or DNR Construction Inspector surface defects such as honeycomb occur, repair the defective areas as directed by the Architect or DNR Construction Inspector.

3.09 PROTECTION OF CONCRETE CONSTRUCTION:

A. All surfaces shall be protected against injury.

   1. During the first 72 hours after placing the concrete, any wheeling, working or walking on the concrete shall not be permitted.

   2. All slabs subject to wear shall be covered with a layer of sand or other suitable material as soon as the concrete has set.

   3. Sisalcraft paper or other similar tough waterproof paper may also be used, provided all joints between adjacent strips of paper are carefully sealed. This does not alter the requirements for proper curing.

B. Do not place concrete slabs or top surfaces of walls during rain unless acceptable protective shelter is provided; and during such weather, all concrete placed within the preceding 12 hours shall be protected with waterproof canvas or other suitable coverings. These shall be provided and kept ready at hand.

C. All concrete construction shall be protected from excessive loading.

D. Installation of mechanical and electrical equipment shall be accomplished by employing shores, bearing plates, frames, cranes and temporary beams.

END OF SECTION 033000

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: Provisions for all labor, materials and equipment required to provide stamped, textured and colored concrete where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections: Drawings and General Provisions of the Contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 02200 - Earthwork
Section 031000 - Concrete Formwork
Section 032000 - Concrete Reinforcement

1.02 SUBMITTALS:

A. Comply with pertinent provisions of Section 013300 - Submittals Procedures.

1. Provide submittals for approval of color and texture.

B. Test panel:

1. At a location approved by the Architect, provide an 8’ x 8’ test panel prior to start of other work of this Section.

2. Demonstrate in the test panel the pattern and finish proposed to be provided. Adjust as necessary to secure the Architect's approval.

3. Provide the work of this Section in accordance with the approved test panel.

1.03 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

B. Use a subcontractor who regularly has been engaged in the placement of stamped concrete for not less than two years immediately preceding this Work, and who has a record of successful installations and a certificate of training from the finishing system manufacturer acceptable to the Architect.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Provide the following materials as required:

1. Wire fabric: Comply with ASTM A185, welded steel.

2. Portland cement: Comply with ASTM C150, type I or II, low alkali.

3. Aggregate: Comply with ASTM C33, using aggregate of less than 3/8" dimension.

4. Admixtures:

a. Provide an air-entraining agent complying with ASTM C260, and/or a normal-set or retarded-set water-reducing admixture complying with ASTM C494, if these are standard with the approved subcontractor.

b. Do not use calcium chloride in the mix.

5. Water: Clean, fresh, and potable.

6. Stamped Concrete Tools: Provide “Increte Stamped Concrete Tools” as manufactured by Increte Systems, 8509 Sunstate Street, Tampa, FL 33634. Pattern to be selected by the Architect.

7. Dry Shake Coloring Agent: Provide "Increte Systems Color Hardener" as manufactured by Increte Systems, 8509 Sunstate Street, Tampa, FL 33634. Color to be selected by the Architect.

8. Pigmented Release Agent: Provide "Increte Systemd Release Agent" as manufactured by Increte Systems, 8509 Sunstate Street, Tampa, FL 33634.

9. Clear Protective Coating: Provide “Increte Systems Clear Seal” as manufactured by Increte Systems, 8509 Sunstate Street, Tampa, FL 33634. Color to be selected by the Architect.

B. Provide a minimum compressive strength at 28 days of 3000 psi, and provide advance evidence satisfactory to the Architect that this strength will be achieved.

2.02 OTHER MATERIALS:

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 SURFACE CONDITIONS:

A. Examine the areas and conditions under which work of this Section will be performed.

B. Correct conditions detrimental to timely and proper completion of the Work.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION:

A. General:

1. Place the welded wire fabric.

2. Place and screed the concrete mix to proper grade; wood float to a uniform surface.

3. Apply colored hardener evenly to the plastic surface by the dry-shake method, using a minimum of 60 LB per 100 sq Ft.

a. Apply in two shakes; wood float after each; and trowel only after final floating.

4. While concrete is still in the plastic stage of set, apply the forming tools to make the pattern called for on the Drawings.

5. Cut control joints no later than 12 hours after concrete has been placed.

6. Remove excess release agent in accordance with manufacturer’s specifications.

7. Seal with a minimum of one coat of specified sealer in accordance with product manufacturer’s instructions.

8. Polish the sealed surface with a fine brush, and remove residual dust and grout from the surface.

B. Protection:

1. Immediately upon completion of installation, install adequate protection.

2. Maintain protection in place until acceptance of this portion of the Work by the Owner.

END OF SECTION 035000

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Chemically stained concrete floor finish.
2. Sealer.

B. Related Sections:

1. Section 03300 “Cast-In-Place Concrete” for general concrete applications.
2. Section 07920 “Joint Sealants” for colored sealant installed in paving joints.

1.2 REFERENCES

A. ASTM International (ASTM):

1. ASTM C 171: Standard Specification for Sheet Materials for Curing Concrete.
2. ASTM C 309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
3. ASTM F 1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s technical data, including Material Safety Data Sheet (MSDS) and installation instructions, for each product specified.

B. Samples for Initial Selection: Manufacturer’s color charts showing full range of colors available.

C. Qualification Data: For manufacturer and Installer.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Minimum 10 years of documented experience producing the specified products.

B. Installer Qualifications: Minimum 5 years of documented experience with work of similar scope and complexity required by this Project and acceptable to, or certified by, concrete stain manufacturer.

C. Regulatory Requirements:

1. Products to comply with United States Clean Air Act for maximum Volatile Organic compound (VOC) content as specified in this Section.

D. Material Source: Obtain each specified material from the same source.

E. Notification: Give a minimum 7 calendar days' notice to manufacturer's authorized field representative before date established for commencement of concrete stain work.

F. Concrete Stain Mockups:

1. Construct a 5foot by 5 foot mockup at location selected by Architect.
2. Provide individual mockups for each color and pattern required.
3. Construct mockup using materials, processes, and techniques required for the work, including curing procedures. Incorporate representative control, construction, and expansion joints according to Project requirements. Installer for the work to construct mockup.
4. Mockup to be stained and sealed by the Installer who will actually perform the work for the Project. Record the amount of chemical stain needed per square foot of application to establish coverage rates for the work.
5. Notify Architect and Owner a minimum of seven calendar days in advance of the date scheduled for each mockup construction.
6. Obtain the Architect's and Owner's acceptance of each mockup prior to commencement of the work.
7. Each mockup to remain until completion of the work to serve as a quality control standard for the work. Provide suitable protections to preclude damage to mockup.

8. Demolish and remove each mockup from site when directed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original factory unopened, undamaged packaging bearing identification of product, manufacturer, batch number, and expiration date as applicable.

B. Store products in a location protected from damage, construction activity, and adverse environmental conditions, and away from combustible materials and sources of heat, according to manufacturer's printed instructions and current recommendations.

C. Handle products according to manufacturer's printed instructions.

1.6 PROJECT CONDITIONS

A. Environmental Conditions: Maintain an ambient temperature between 50 deg F and 90 deg F during application and at least 48 hours after application.

1.7 PREINSTALLATION CONFERENCE

A. Seven calendar days prior to scheduled date of installation, conduct a meeting at Project site to discuss requirements, including application methods. Attendees to include Architect, Owner, Contractor, Installer, and manufacturer's authorized field representative.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis of Design: Provide products specified herein manufactured by L. M. Scofield Company (Scofield).

2.2 MATERIALS

A. Reactive Chemical Concrete Stain: Reactive, water-based solution of metallic salts which react with calcium hydroxide in cured concrete substrates to produce permanent variegated or translucent color effects. Zero VOC content.

1. Product: Scofield's "LITHOCHROME Chemstain Classic."
2. Color(s): Submit Samples

B. Solvent Sealer:

1. Product: Scofield's "SCOFIELD Cureseal-S."
2. Two coats of high gloss sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which the concrete stain work will be performed and identify conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Interior Applications: Concrete substrates must have a moisture vapor emission rate of less than 5 lbs./1000 sq. ft. per 24 hour based on a 72 hour test period according to ASTM F 1869.

3.2 PREPARATION

A. New Concrete: Comply with the following:

1. Newly placed concrete to sufficiently cure for concrete to become reactive. Minimum cure time is 14 days.

2. Interior Applications: Minimum cure time of concrete is 30 to 60 days, or longer if necessary to meet the specified water vapor transmission requirements.
3. Do not use liquid curing materials. Cure concrete flatwork with new, unwrinkled, non-staining, high quality curing paper complying with ASTM C 171. Do not overlap curing paper.
4. Cure surfaces using the same method and different sections (pours) chemically stained when concrete is the same age.
5. Immediately prior to chemically staining, thoroughly clean concrete to remove any contaminants deleterious to subsequent chemical stain application. Sweep surfaces, then pressure wash or scrub using a rotary floor machine with a Mal-Grit Brush from the Malish Corporation. Use suitable, non-acidic, high quality commercial detergents to facilitate cleaning. Rinse surfaces after cleaning until rinse water is completely clean. Allow floor to dry completely prior to application of concrete stain.

    a. Pressure Washing: Use a pressure washer equipped with a fan tip and rated for a minimum pressure capability of 4000 psi.

B. Existing Concrete:

1. Clean concrete surfaces until completely penetrable before receiving the initial application of chemical stain. Test surfaces to receive stain by spotting with water. Water should immediately darken the substrate and be readily absorbed. If water beads and does not penetrate or only penetrates in some areas, perform additional surface preparation and testing. On denser concrete floors, sand lightly to open up surfaces. Retest and continue surface preparation until water spots immediately darken and uniformly penetrate concrete surfaces.
2. Cleaning method used depends on the condition of the concrete surface. To remove dirt and other contaminants, detergents and other commercial grade cleaners may be suitable subject to testing. Pressure washing or scrubbing with a rotary floor machine with a Mal-Grit Brush from the Malish Corporation is required, unless otherwise recommended by chemical stain manufacturer.

    a. Pressure Washing: Use a pressure washer equipped with a fan tip and rated for a minimum pressure capability of 4000 psi.

3. Rinse concrete substrates until rinse water is completely clean.

C. Scoring: Score decorative jointing in concrete surfaces 1/8 inch deep with diamond blades. Rinse until water is completely clean.

1. Single Color Stain Applications: Score after staining.
2. Multiple Color Stain Applications: Score before staining.

3.3 CHEMICAL STAIN APPLICATION

A. General: Comply with chemical stain manufacturer's printed instructions and current recommendations.

1. Do not mix the specified chemical stain with highly alkaline chemical stain materials. Doing so will result in a dangerous chemical reaction.

B. Protect surrounding areas, landscaping, and adjacent surfaces from overspray, runoff, and tracking. Divide surfaces into small work sections using walls, joint lines, or other stationary breaks as natural stopping points.

C. Apply two coats of chemical stain at the coverage rate recommended by the manufacturer and use application equipment according to the chemical stain manufacturer's printed instructions. Note the color of the liquid chemical stain will not be the final color produced on the concrete substrate.

D. Transfer chemical stain to the substrate by brush or spray and immediate scrub into surface. Reaction time depends on wind conditions, temperatures, and humidity levels.

E. When multiple coats of one or more colors are required, washing and drying between colors is desirable to evaluate the color prior to the next coat.

F. Rinsing: After the final coat of chemical stain has remained on the surface for a minimum of four hours, neutralize unreacted chemical stain residue and then remove completely prior to sealing. After neutralization, thoroughly rinse surface with clean water several times to remove soluble salts. While rinsing, lightly abrade surface using a low-speed floor machine and red pad to remove residue and weakened surface material. Runoff may stain the adjacent areas or harm plants. Collect rinse water by wet vacuuming or absorbing with an inert material.

1. Failure to completely remove all residue prior to sealing the surface will cause appearance defects, adhesion loss or peeling, reduced durability, and possible bonding failure and delamination of sealer.
2. All stain residue, runoff liquid, and rinse water must be collected and disposed of according to applicable Federal regulations and governing authorities having jurisdiction.

3.4 SEALING APPLICATION

A. Concrete substrate must be completely dry. Test surface for proper pH prior to applying sealer. A pH value of 7 or higher indicates all acid has been neutralized. If the tested pH value is less than 7, repeat neutralization step until the required pH value is achieved.

B. Conduct a moisture vapor emission test prior to applying any sealer. Refer to the specific sealer's Technical-Data Bulletin for acceptable MVER.

C. Apply two coats of sealer according the sealer manufacturer's printed instructions at a rate of 300 to 500 square feet per gallon per coat. Maintain a wet edge at all times.

D. Allow sealer to completely dry before applying additional coats.

E. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.

F. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.5 PROTECTION

A. Protect floor from traffic for at least 72 hours after final application of sealer.

3.6 MAINTENANCE

A. Maintain chemically stained and sealed floors by sweeping. Clean spills when they occur and rinse dirt off with water. Wet-clean heavily soiled areas by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high quality commercial detergent. Maintain interior floors that require polishing by using a compatible, premium-grade, emulsion-type, commercial floor polish, according to manufacturer's printed instructions and safety requirements.

END OF SECTION 03750

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: Provide all material, labor equipment and services necessary for the installation of the stone veneer as shown on the drawings and as specified herein.

B. Related Sections: Drawings and General Provisions of the Contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 02200 - Earthwork
Section 02150 – Concrete Sidewlaks and Aprons paving
Section 03300 - Cast-In-Place Concrete
Section 05500 - Metal Fabrications
Section 06100 - Rough Carpentry
Section 06200 - Finish Carpentry
Section 07900 - Joint Sealer

1.02 SUBMITTALS:

A. Submit representative samples of stone for approval.

B. See Section 01300 for additional requirements concerning submittals.

1.03 QUALITY ASSURANCE:

A. Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.04 DELIVERY, STORAGE AND HANDLING:

A. Protect materials during storage and construction from wetting by rain, snow, or ground water and from soilage or intermixture with earth or other materials.

1. Mortar material: Deliver in unbroken original containers, and place in off-ground storage, adequately covered and protected.

2. Masonry sand: Store in a manner approved to prevent inclusion of contaminates or foreign matter.

B. Prevent grout or mortar from staining the face of veneer to be left exposed.

1. Remove immediately grout or mortar in contact with such surfaces.

C. Protect floors from droppings of mortar.

D. Protect partially completed walls against weather, when work is not in progress, by covering top of walls with strong, waterproof, nonstaining membrane.

1. Extend membrane at least two feet down both sides of walls and anchor securely in place.

E. Protect stone against freezing when the temperature of the surrounding air is 40°F and falling.

1. Heat materials and provide temporary protection of completed portions of veneer work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Stone Wall Facing:

1. Obtain masonry stone, from one supplier, of uniform texture for each type required, for each continuous area and visually related.

2. Stone Brick: Random size buff colored limestone, varying from 2 1/2" to 2" in thickness. Submit samples to architect.

3. Pattern: As approved from patterns selected by masony contractor

a. Mortar joints thickness and variances to match stone pattern.

B. Mortar and Anchors:

1. Portland cement: Comply with ASTM C150, type II, low alkali.

2. Sand: Comply with ASTM C144, with no less than 5% passing the No. 100 sieve.

3. Hydrated lime: Comply with ASTM C207, type S, unless otherwise approved by the Architect.

4. Water: Provide clean, potable, and free of organic material.

5. Dovetail anchor slots: Provide dovetail anchor slots and ties manufactured by Burke Concrete Accessories, concrete ties, or equal.

a. Use 22 gauge galvanized steel for spacing at 24” on center.

b. Use 16 gage corrugated galvanized steel anchor ties mated to slots, with 3/16” raised spur for retaining wire. Comply with ASTM A82 for 9 gage galvanized wire.

6. Provide other material, not specifically described herein but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect/DNR Construction Inspector.

PART 3 - EXECUTION

3.01 INSPECTION:

A. Installer must examine the areas and conditions under which stone work is to be installed and notify the Contractor in writing of conditions detrimental to the proper and timely completion of the work.

B. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to installer.

3.02 INSTALLATION - GENERAL:

A. Build walls to the dimensions shown on the Drawings.

B. Leave openings for equipment to be installed before completion of stone work.

1. After installation of equipment, complete masonry work to match work immediately adjacent to opening.

C. Mortar:

1. Provide mortar consisting of one part partland cement, from 1/4 to 1/2 part hydrated lime, and clean well graded sand in the proportion of three times the sum of the cementitious material.

2. Mix in a batch mixer for not less than five minutes, and long enough for thorough intimate mixing of all ingredients.

3. Retempering:

a. Retemper on mortar boards by adding water within a basin formed with the mortar, and working the mortar into the water.

b. Do not dash or pour water over the mortar.

c. Do not use or retemper harsh nonplastic mortar.

D. Grout:

1. Provide mortar as specified above, with sufficient water added to make a pourable consistency; or

2. Provide a 1 : 1 ½ : 7 (cement, lime, sand)

E. Verify that dovetail anchor slots, if required, are installed in a manner to provide not less than the support shown on the Drawings, and in such a manner as to permit proper installation of ties, wires, mortar, and stone.

F. Setting: Before setting, stone shall be brushed free of dust or other foreign matter and wetted sufficiently to take up surface absorption. No stone shall be set with a film of water or frost on the surface.

1. All joints shall be uniform in depth and width. If necessary, to prevent displacement of mortar, plastic, or lead spacers may be used.

2. After setting, excess mortar shall be removed with a minimum of hand tooling.

3. The stone shall be sponged completely free of mortar immediately after setting.

G. Lay stone with not less than 3/8" nor more than 3/4" of the specified mortar between stone and the backing wall, and in accordance with the approved mock-up.

1. Cut, trim, fit, and balance the stone so it is at rest in its final position before mortar or grout is applied.

2. When dovetail anchors are used, place anchor ties in the anchor slots at not more than 12" on centers.

3. Loop the horizontal joint reinforcement wire through the supporting anchors:

a. Provide loops having legs not less than 15" long, so bent that each leg will lay in the mortar joint.

b. Bend the last 2" of each wire leg at right angle.

c. Conceal all wire within the mortar.

4. Unless specifically otherwise approved by the Architect, do not install stone in thickness exceeding 7” from the backing wall to the outside face of the stone.

3.03 CLEANING:

A. Stonework shall be kept as clean as possible as work progresses.

1. Use clean water and clean brushes or cloth and remove all mortar stains as the work progresses.

B. Upon completion, stone shall be thoroughly cleaned with soap and water and completely rinsed after scrubbing with fiber brushes.

C. If necessary, fine white sand may be added to water to aid in cleaning.

D. The use of acids or wire brushes will not be permitted.

END OF SECTION 04480

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: The furnishing and installation of all structural steel work, steel tubing, aluminum items, anchor bolts, steel bearing plates, and miscellaneous embedded and nonembedded metal work, as specified herein and as indicated on the Drawings.

B. Related Sections: Drawings and General Provisions of the Contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 06100 - Rough Carpentry
Section 09900 - Painting

1.02 SUBMITTALS:

A. Provide submittals in accordance with Section 01300.

B. Product Data: Submit manufacturer's specifications, anchor details and installation instructions for products used in miscellaneous metal fabrications, including paint products and grout.

C. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications.

1. Include plans, elevations and details of sections and connections.

2. Show anchorage and accessory items.

3. Provide templates for anchor and bolt installation by others.

4. Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computation, material properties and other information needed for structural analysis.

D. Samples: Submit two sets of representative samples of materials and finished products as may be requested by the Architect.

1.03 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this section.

B. Perform shop and/or field welding required in connection with the work of this section in strict accordance with pertinent recommendations of the American Welding Society.

C. Field Measurement: Take field measurements prior to preparation of shop drawings and fabrication, where possible.

1. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

D. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.

1.04 DELIVERY, STORAGE, AND HANDLING:

A. Protection: Use all means necessary to protect the materials of this section before, during and after installation and to protect the work and materials of all other trades.

B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Metal Surfaces, General: For fabrication of the work of this section which will be exposed to view, use only those materials which are smooth and free from surface blemishes including pitting, seams marks, roller marks, rolled trade names, and roughness.

B. Metal Standards: Provide materials complying with:

1. Steel plates, shapes, and bars: ASTM A36.

2. Steel plates to be bent or cold formed: ASTM A283, Grade C.

3. Steel tubing, cold formed, ASTM 500; or hot-rolled, ASTM A 501.

4. Gray iron castings: ASTM A48, Class 30.

5. Steel bars and bar-size shapes: ASTM A306, Grade 65, or ASTM A36.

6. Cold-finished steel bars: ASTM A108.

7. Cold-rolled carbon steel sheets: ASTM A336.

8. Galvanized carbon steel sheets: ASTM A526, with G90 zinc coating in accordance with ASTM A525.

9. Stainless steel sheets: AISI type 302 or 304, 24 gauge, with number 4 finish.

10. Malleable iron castings: ASTM A47, grade as selected by the fabricator.

11. Steel pipe: ASTM A53, type as selected, Grade A, black finish unless galvanizing is required, standard weight (Schedule 40), unless otherwise indicated.

12. Concrete inserts: Threaded or wedge type, galvanized ferrous castings, either malleable iron ASTM A47 or cast steel ASTM A27. Provide bolts, washers, and shims as required, hot-dip galvanized, ASTM A153.

C. Grout: Nonshrink Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with CE CRD-C588.

1. Provide grout specifically recommended by manufacturer for interior and exterior applications of type specified in this section.

D. Fasteners: General: Provide zinc-coated fasteners, for exterior use or where built into exterior walls, of the type, grade and class required, complying with:

1. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.

2. Lag Bolts: Square head type, FS FF-B-561.

3. Machine Screws: Cadmium plated steel, FS FF-S-92.

4. Wood Screws: Flat head carbon steel, FS FF-S-111.

5. Plain Washers: Round, carbon steel, FS FF-W-92.

6. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.

7. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.

8. Lock Washers: Helical spring type carbon steel, FS FF-W-84.

E. Paint:

1. Metal Primer Paint: Red lead mixed pigment, alkyd varnish, linseed oil paint, FS TT-P-86, Type II; or red lead iron oxide, raw linseed oil, alkyd paint, Steel Structures Painting Council (SSPC) Paint 2-64; or basic lead silicon chromate base iron oxide, linseed oil, alkyd paint, FS TT-P-615, Type II.

2. Primer selected must be compatible with finish coats of paint. Coordinate selection of metal primer with finish paint requirements specified in Division 9.

3. Galvanizing Repair Paint: High zinc dust content paint for re-galvanizing welds in galvanized steel, complying with the Military Specifications MIL-P-21035 (Ships).

4. Galvanized Primer: High zinc dust content primer to galvanize surfaces of metal fabrication specified as galvanized as an alternative to hot dipping, complying FS TT-P-641, Type II.

F. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the contractor subject to the approval of the Architect/DNR Construction Inspector.

2.02 MANUFACTURED UNITS:

A. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere, furnish steel washers.

B. Rough Hardware: Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures.

1. Straight bolts and other stock rough hardware items are specified in Division-6 sections.

C. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on concrete construction, made flat, free from warps or twists, and of required thickness and bearing area.

1. Drill plates to receive anchor bolts and for grouting as required.

D. Provide other manufactured units as shown on the Drawings, or if not shown on the Drawings, as required for a complete and proper installation.

2.03 FABRICATION:

A. Shop Assembly: Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended.

1. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support.

2. Use type of materials shown or specified for various components of work.

3. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

4. Ease exposed edges to a radius of approximately 1/32" unless otherwise shown.

5. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

6. Weld corners and seams continuously, complying with AWS recommendations.

7. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

8. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible.

9. Use exposed fasteners of type shown or, if not shown, Phillips flat-head (countersunk) screws or bolts.

10. Provide for anchorage of type shown, coordinated with supporting structure.

11. Fabricate and space anchoring devices to provide adequate support for intended use.

12. Cut, reinforce, drill and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

B. Shop/Factory Finishing: Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated.

1. Remove scale, rust and other deleterious materials before applying shop coat.

a. Clean off heavy rust and loose mill scale in accordance with SSPC SP-2 "Hand Tool Cleaning," or SSPC SP-3 "Power Tool Cleaning," or SSPC SP-7 "Brush-Off Blast Cleaning."

2. Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning."

3. Immediately after surface preparation, brush or spray on primer in accordance with manufacturer's instructions, and at a rate to provide uniform dry film thickness of 2.0 mils for each coat.

a. Use painting methods which will result in full coverage of joints, corners, edges and exposed surfaces.

4. Apply one shop coat to fabricated metal items, except apply two coats of paint to surfaces inaccessible after assembly or erection.

a. Change color of second coat to distinguish it from the first.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine the areas and conditions under which miscellaneous metal items are to be installed, and correct conditions detrimental to the proper and timely completion of the work.

B. Do not proceed until satisfactory conditions have been corrected.

3.02 PREPARATION:

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and

miscellaneous items having integral anchors, which are to be embedded in concrete or masonry construction.

B. Coordinate delivery of such items to project site.

3.03 INSTALLATION:

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including, threaded fasteners for concrete inserts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors as required.

B. Cutting, Fitting, and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications.

1. Set work accurately in location, alignment and elevation, plumb level, true and free of rack, measured from established lines and levels.

2. Provide temporary bracing or anchors in form work for items which are to be built into concrete, masonry or similar construction.

C. Fit exposed connections accurately together to form tight hairline joints.

1. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.

2. Grind exposed joints smooth and touch-up shop paint coat.

3. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication, and are intended for bolted or screwed field connections.

D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

E. Setting Loose Plates:

1. Clean concrete bearing surfaces of any bond-reducing materials, and roughen to improve bond to surfaces.

3. Clean bottom surface of bearing plates.

4. Set loose leveling and bearing plates on wedges, or other adjustable devices.

5. After the bearing members have been positioned and plumbed, tighten the anchor bolts.

6. Do not remove wedges or shims, but if protruding, cut-off flush with the edge of the bearing plate before packing with grout.

7. Use metallic nonshrink grout in concealed locations where not exposed to moisture; use nonmetallic nonshrink grout in exposed locations, unless otherwise indicated.

8. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

F. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications.

1. Set work accurately in location, alignment, and elevation, and make plumb, level, true, and free from rack, measured from established lines and levels.

2. Provide temporary bracing or anchors in form work for items which are to be built into concrete or similar construction.

3. Fit exposed connections accurately together to form tight hairline joints.

4. Grind exposed joints smooth, and touch-up shop paint coat.

5. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

5. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.

G. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting.

1. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

END OF SECTION 05500

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: Providing all labor, material and equipment necessary to accomplish all the carpentry work not otherwise included as part of other sections and which is generally not exposed except as otherwise indicated. Types of work in this section include, but are not limited to rough carpentry for:

1. Wood framing
2. Timber for posts and beams
3. Wood grounds, nailers, blocking, sleepers and furring
4. Sheathing
5. Nails, bolts, screws, and framing anchors
6. Rough hardware

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 03100 Concrete Formwork
Section 06134 Pole Building System
Section 06190 Wood Trusses
Section 06200 Finish Carpentry
Section 09120 Ceiling Suspension System
Section 09250 Gypsum Wallboard

1.02 REFERENCES:

A. Lumber Standards: Comply with applicable rules of the respective grading and inspecting agencies for species and products indicated, as well as with the latest edition of:

1. PS 20 American Softwood Lumber Standard, National Bureau of Standards

B. Plywood Product Standards: Comply with applicable America Plywood Standard (APA) Performance Standards for type of panel indicated. Also comply with the latest edition of:

1. PS 1 Plywood Standard (ANSI A 199.1), National Bureau of Standards

1.03 SUBMITTALS:

A. Provide submittals in accordance with Section 01300.

B. Material Certificates: Where dimensional lumber is provided to comply with minimum allowable unit stresses, submit listing of species and grade selected for each use, and submit evidence of compliance with specified requirements.

1. Compliance may be in form of a signed copy of applicable portion of lumber producer's grading rules showing design values for selected species and grade.

2. Design values shall be as approved by the Board of Review of American Lumber Standards Committee.

C. Wood Treatment Data: Submit treatment manufacturer's instructions for proper use of each type of treated material.

1. Pressure Treatment: For each type specified, include certification by treating plant stating chemicals and process used, net amount of preservative retained and conformance with applicable standards.

2. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with governing ordinances and that treatment will not bleed through finished surfaces.

3. For water-borne preservatives, include statement that moisture content of treated materials was reduced to a maximum of 15 percent prior to shipment to project site.

1.04 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this section.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Keep materials dry at all times.

B. Protect against exposure to weather and contact with damp or wet surfaces.

C. Stack lumber and plywood, and provide air circulation within stacks.

D. Deliver the materials to the job site and store, all in a safe area, out of the way of traffic, and shored up off the ground surface.

E. Identify all framing lumber as to grades, and store all grades separately from other grades.

F. Protect all metal products with adequate waterproof outer wrappings.

G. Use extreme care in the off-loading of lumber to prevent damage, splitting, and breaking of materials.

1.06 PROJECT/SITE CONDITIONS:

A. Fit carpentry work to other work; scribe and cope as required for accurate fit.

B. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

C. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Lumber, General:

1. Factory-mark each piece of lumber with type, grade, mill and grading agency, except omit marking from surfaces to be exposed with transparent finish or without finish.

2. Nominal sizes are indicated, except as shown by detail dimensions.

3. Provide actual sizes as required by PS 20, for moisture content specified for each use.

4. Identify all plywood as to species, grade, and blue type by the stamp of the American Plywood Association.

5. Provide dressed lumber, S4S, unless otherwise indicated.

6. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing.

B. Materials: All materials, unless otherwise specifically approved in advance by the Architect, shall meet or exceed the following:

	ITEM	SPECIES	GRADE
1.	Sills	Southern Yellow Pine	Standard or Better
2.	2 x 4 Studs	Douglas Fir Southern Pine	Standard or Better Standard or Better
3.	Joists and Planks	Douglas Fir Southern Pine	Number 2 or Better Number 1
4.	Posts and Beams	Douglas Fir Southern Pine	Number 1 Number 1
5.	All Other Horizontal Framing Members	Douglas Fir Southern Pine	Construction Construction
6.	All Other Vertical Framing Members	Douglas Fir Southern Pine	Standard or Better Standard or Better
7.	Exposed Framing	Douglas Fir	Appearance Framing

	Lumber	Southern Pine	Appearance Grade
8.	Exposed Boards	Redwood Cedar	Select Select
9.	Concealed Boards	Redwood Southern Pine	Construction Number 2
10.	Miscellaneous Lumber	Any Species	Construction
11.	Steel Hardware	ASTM A7 or A 36 (use galvanized at exterior locations)	
12.	Machine Bolts	ASTM 307	
13.	Lag Bolts	Fed. Spec. FF-13-561	
14.	Nails	Common (except as noted) Fed. Spec. FF-N-1-1 (use galvanized at exterior locations)	
15.	Timber Connectors	Simpson, Teco or Equal	

C. Plywood:

1. Trademark: Identify each plywood panel with appropriate APA trademark.

2. Concealed Performance-Rated Plywood: Where plywood panels will be used for the following concealed types of applications, provide APA Performance-Related Panels complying with requirements indicated for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.

    a. Wall Sheathing: APA Rated Sheathing, Exposure Durability Classification: Exposure 1, Span Rating: 16/0

D. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant treated plywood panels with grade designation, APA C-D PLUGGED INT with exterior glue, in thickness indicated, or if not otherwise indicated, not less than 1/2".

E. Miscellaneous Materials:

1. Fasteners and Anchorages: Size, type, material, and finish indicated and recommended by applicable standards and Federal Specifications for nails, staples, screws, bolts, nuts, washers, and anchoring devices.

    a. Provide metal hangers and framing anchors of the size and type recommended by the manufacturer for each use including recommending nails.

    b. Where rough carpentry work is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners and anchorages with a hot-dip zinc coating (ASTM A 153).

F. Wood Treatment/Preservative Treatment: Where lumber or plywood is indicated as "Trt-Wd" or "Treated," or is specified herein to be treated, comply with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB Standards listed below.

1. Mark each treated item with the AWPB Quality Mark Requirements.

2. Pressure-treat above-ground items with water-borne preservatives complying with AWPB LP-2.

3. After treatment, kiln-dry to a maximum moisture content of 15 percent.

4. Treat indicated items and the following:

   a. Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

   b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

   c. Wood framing members less than 18" above grade.

5. Pressure-treat the following with water-borne preservatives for ground contact use complying with AWPB LP-22:

   a. Wood members in contact with ground.

   b. Wood members in contact with fresh water.

6. Complete fabrication of treated items prior to treatment, where possible.

7. If cut after treatment, coat cut surfaces with heavy brush coat of same chemical used for treatment.

8. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine the substrate surfaces, conditions, and embedded attachments that carpentry work will be applied or attached to.

B. Any conditions that are incomplete or unsatisfactory shall be brought to the attention of the Architect or DNR Construction Inspector.

C. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.02 INSTALLATION:

A. Discard units of material with defects which might impair quality of work, and units which are too small to use in fabricating work with minimum joints or optimum joint arrangement.

B. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

C. Securely attach carpentry work to substrate by anchoring and fastening as shown and as required by recognized standards.

1. Countersink nail heads on exposed carpentry work and fill holes.

D. Use common wire nails, except as otherwise indicated. Use finishing nails for finish work.

1. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials.

2. Make tight connections between members.

3. Install fasteners without splitting of wood; predrill as required.

E. Carefully lay out, cut, fit, and install rough carpentry items.

1. Use sufficient nails, spikes, screws, and bolts to ensure rigidity and permanence.

2. Drive nails perpendicular to wood grain in lieu of toenailing, where feasible.

3. Provide for installation and support of plumbing, hearing, and ventilating and electrical work.

4. Take care to isolate acoustically from other members.

5. Install work to true lines, plumb, and level, unless indicated otherwise.

F. Develop full length and width of bearing intended at all supports.

1. Members cut too short, or for any other reason do not develop this bearing, will have to be replaced.

G. All sills, plates, and other wood in contact with masonry or under metal flashings shall be pressure preservative treated.

H. Provide framing members of sizes and on spacings shown, and frame openings as shown, or if not shown, comply with recommendations of "Manual for House Framing" of National Forest Products Association.

1. Do not splice structural members between supports.

I. Anchor and nail as shown, and to comply with "Recommended Nailing Schedule" of "Manual for House Framing" and other recommendations of N.F.P.A.

J. Firestop concealed spaces with wood blocking not less than 2" thick, if not blocked by other framing members.

1. Provide blocking at each building story level and at ends of joist spans.

K. Wood Grounds, Nailer, Blocking and Sleepers:

1. Provide wherever shown and where required for screeding or attachment of other work.

2. Form to shapes as shown and cut as required for true line and level of work to be attached.

3. Coordinate location with other work involved.

4. Attach to substrates as required to support applied loading.

a. Countersink bolts and nuts flush with surfaces, unless otherwise shown.

b. Build into masonry during installation of masonry work.

c. Where possible, anchor to formwork before concrete placement.

5. Provide permanent grounds of dressed, preservative treated, key-bevelled lumber not less than 1-1/2" wide and of thickness required to bring face of ground to exact thickness of finish material involved.

6. Remove temporary grounds when no longer required.

L. Wood Furring: Install plumb and level with closure strips at edges and openings.

1. Shim with wood as required for tolerance of finish work.

2. Secure to backing with approved-type fasteners.

M. Stud Framing: Provide stud framing where shown.

1. Unless otherwise shown, use 2" x 4" wood studs spaced 16" o.c. with 4" face perpendicular to direction of wall or partition.

2. Provide single-bottom plate and double-top plates 2" thick by width of studs; except single-top plate may be used for nonloadbearing partitions.

a. Nail or anchor plates to supporting construction. Construct corners and intersections with not less than three studs.

3. Provide miscellaneous blocking and framing as shown and as required for support of facing materials, fixtures, specialty items and trim.

4. For loadbearing partitions, provide double-jamb studs for openings six feet and less in width, and triple-jamb studs for wider openings.

a. Provide headers of depth shown, or if not shown, provide as recommended by N.F.P.A. "Manual for House Framing."

3. Provide diagonal bracing in stud framing of exterior walls, except as otherwise indicated.

a. Brace both walls at each external corner, full story height, at a 45ø angle, using either a let-in 1 x 4 or 2 x 4 blocking or metal diagonal bracing.

b. Omit bracing where following types of sheathing are indicated.

c. Plywood sheathing or corner bracing, 4' wide panels vertically.

d. Gypsum sheathing, 4' panels vertically.

e. Fiberboard sheathing, intermediate type, 4' panels vertically.

f. Diagonal board sheathing.

4. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs.

a. Set headers on edge and support on jamb studs.

b. For nonbearing partitions, provide double-jamb studs and headers not less than 4" deep for openings 3' and less in width, and not less than 6" deep for wider openings.

N. Joist Framing: Provide framing of sizes and spacings shown. Install with crown edge up and support ends of each member with not less than 1-1/2" of bearing on wood or metal, or 3" on masonry.

1. Attach to woodbearing members with metal connectors; frame to wood supporting members with wood ledgers as shown, or if not shown, with metal connectors.

2. Fire-cut members built into masonry (if any).

3. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 4'.

4. Do not notch in middle third of joists; limit notches to 1/6-depth of joist, 1/3 at ends.

5. Do not bore holes larger than 1/3-depth of joist or locate closer than 2" from top of bottom.

6. Provide solid blocking (2" thick by depth of joist) at ends of joists unless nailed to header or brand member.

7. Lap framing members from opposite sides of beams, girders or partitions not less than 4" or securely tie opposing members together.

8. Provide solid blocking (2" thick by depth of joist) over supports.

9. Provide bridging between joists where nominal depth-to-thickness ratio exceeds 4, at intervals of 8'.

    a. Use bevel cut 1" x 4" or 2" x #" wood bracing, double-crossed and nailed both ends to joists, or use solid wood bridging 2" thick by depth of joist, end nailed to joist.

O. Ceiling Joist Framing:

1. Provide member size and spacing shown, and as previously specified for joist framing.

    a. Face nail to ends of parallel rafters.

    b. Where principal ceiling joists are at right angles to rafters, frame as indicated with additional short joists from wall plate to first joist; nail to ends of rafters and to top plate and nail to long joists or anchor with framing anchors or metal straps.

    c. Provide 1 x 8 or 2 x 4 stringers spaced 4' o.c. crosswise over principal ceiling joists.

P. Provide special framing as shown for eaves, overhangs, corners and similar conditions, if any.

Q. Installation of Plywood: Comply with recommendations in Form No. E 304, :APA Design/Construction Guide- Residential and Commercial," for types of plywood products and applications indicated.

1. Fastening Methods: Fasten panels as indicated below:

    a. Sheathing: Nail to framing.

END OF SECTION 06100

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Structural insulated panels for wall applications.

B. Related Sections:
Section 06100 Rough Carpentry
Section 06190 Wood Trusses

1.2 REFERENCES

A. ASTM International (ASTM):
1. C578-06 - Standard Specification for Preformed Cellular Polystyrene Thermal Insulation.
2. D2559-03 - Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions.
3. E84-05 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. National Institute of Standards and Technology (NIST):
1. Product Standard PS 1-95 - Construction and Industrial Plywood.
2. Product Standard PS 2-04 - Performance Standards for Wood-Based Structural Use Panels.
3. Product Standard PS 20-05 - American Softwood Lumber Standard.

C. Western Wood Products Association (WWPA) G-5 - Western Lumber Grading Rules.

1.3 SYSTEM DESCRIPTION

A. Design Requirements: Panel system design performed by or under direct supervision of professional Structural Engineer with experience in work of this Section.

B. Performance Requirements; Design panel system to withstand:
1. Live and dead loads in accordance with applicable building code.

1.4 SUBMITTALS

A. Provide submittals in accordance with Section 00812 and section 01300.

B. Product Data: Submit manufacturer's product information, specifications and installation instructions for building components and accessories.

C. Shop Drawings: Submit four complete sets of erection drawing showing post spacing, endwall, sidewalls, transverse cross sections, installation details to clearly indicate

proper assembly of building components, and supporting engineering design calculation.

1. Drawings and calculations shall be stamped and certified by a structural engineer registered in the state of Iowa.

D. Certification: Submit written certification prepared and signed by a professional engineer registered to practice in the state of Iowa, verifying that building design meets indicated loading requirements and codes of authorities having jurisdiction.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Minimum 2 years experience in work of this Section.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver panels to site with manifest drawings containing following information:
1. Manufacturer.
2. Product standard and type.
3. Flame spread/smoke developed rating.
4. Identification of quality assurance agency.

B. Store panels flat, on level base, evenly supported.

C. Cover panels during transportation and storage with waterproof coverings, properly vented.

D. Protect panels from moisture absorption and exposure to sunlight.

E. When lifting panels by crane, support panels with straps or I-bolts.

1.7 SEQUENCING

A. Cover wall panels with moisture barrier or final wall cladding as soon as practical after erection.
B. Cover roof panels with water-resistant paper or roofing underlayment immediately after erection.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Contract Documents are based on products by Energy Panel Structures.

B. Substitutions: Approval by architect

2.2 MATERIALS

A. Insulation:
1. Expanded polystyrene, ASTM C578, Type I.
2. Minimum density: 0.90 pounds per cubic foot.
3. Maximum flame spread/smoke developed rating: 75/450, tested to ASTM E84.

B. Facings:

1. Plywood conforming to NIST PS 1 and PS 2.
2. Bear trademark or certification of inspecting agency in accordance with NIST PS 2.

C. Lumber Framing:
1. Species: Spruce-Pine-fir or equivalent.
2. Grade: WWPA No. 2.

D. Panel Finish: Prefinished steel sheet, 24 gauge thickness – Kynar 500 finish, Color TBD – submit samples – or otherwise noted on drawings

2.3 ACCESSORIES

A. Panel Adhesive: ASTM D2559, Type II, Class 2.

B. Panel Sealant: Type recommended by panel manufacturer.

C. Fasteners: Galvanized or corrosion resistant coated; types and sizes as recommended by panel manufacturer.

2.4 FABRICATION

A. Fabricate panels with 7/16 to 3/4 inch thick plywood facings of thickness to meet design criteria pressure laminated to insulation core using adhesive.
B. Finish exterior of panels with steel sheet siding.
C. Panel Thickness: Nominally 8-1/2 inches.

D. R-Value: 33.0

PART 3 - EXECUTION

3.1 INSTALLATION
Structural Insulated Panels 06 12 19-4 Energy Panel Structures 01/17/07

A. Install panel system in accordance with manufacturer's instructions and approved Shop Drawings.

B. Install continuous bottom plate of width equal to panel:

1. Attach bottom plates at exterior walls to concrete foundation with anchor bolts spaced maximum 6 feet on center and within 12 inches of ends of pieces, with minimum of two anchors per piece, or with foundation anchor straps.
2. Attach interior bottom plates to concrete foundation with approved anchors.

C. Install continuous top plates of width equal to panel. Overlap plates at corners, intersections and splines.

D. Drill 1-1/2 inch diameter access holes in splines to align with electrical chases.

E. Apply panel sealant in continuous beads to wood-to-wood, wood-to-insulation, and insulation-to-insulation joints per manufacturer's recommendations.

F. Fasten panels to framing through both facing surfaces unless otherwise indicated.

G. Provide temporary bracing during erection and until final connections are complete.

H. Do not install panels directly on concrete; use double plate sill detail or place sill sealer under panels.

I. Do not place plumbing in panels without approval of panel manufacturer.

J. Do not cut panel skins for electrical chases. Cut for electrical boxes as needed, but do not cut through to panel edges.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: Provide wood trusses where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following.

Section 06100 - Rough Carpentry
Section 06134 - Pole Building Systems

1.02 REFERENCES:

A. Compliance: Comply with the pertinent provisions of:

1. The American Institute of Timber Construction's "Timber Construction Standards."

2. The "Quality Control Manual" of the Truss Plate Institute.

3. The Uniform Building Code, UBC.

1.03 SUBMITTALS:

A. Provide submittals in accordance with Section 00812 and Section 01300.

B. Material List: Submit list of items to be provided under this section.

C. Product Data: Submit manufacturer's specifications and other data needed to prove compliance with the specified requirements.

D. Shop Drawings: Submit drawings showing species, sizes and stress grade of lumber proposed to be used; pitch, span, lumber configuration, and spacing of trusses; connector type, thickness, size, location, and design value; and bearing details.

1.04 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work in this section.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Keep materials dry at all times. Protect against exposure to weather and contact with damp or wet surfaces.

1. Stack lumber and plywood, and provide air circulation within stacks.

B. Deliver the materials to the job site and store, all in a safe area, out of the way of traffic, and shored up off the ground surfaces.

C. Use extreme care in the off-loading of lumber to prevent damage, splitting and breaking of materials.

D. Store trusses on temporary bearing support, braced in vertical position.

E. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 - PRODUCTS

2.01 WOOD TRUSSES:

A. Design: Provide the services of a structural engineer registered to practice in the state of Iowa, who shall design the wood trusses to sustain the indicated loads for the spans, profiles and arrangements shown on the Drawings.

1. Wood trusses and their installation must conform to Iowa State Building Code requirements regarding live loads.

2. Design roof trusses for a minimum 30 psf live load and 10 psf dead load for top chord and 10 psf for bottom chord.

3. Live load plus dead load for each truss is 50 psf.

4. Deflection for live load only is limited to L/360.

5. Submit drawings of trusses with certification of a professional engineer registered in the state of Iowa included on the drawings.

B. Fabrication: Fabricate in strict accordance with the shop drawings and other data approved by the Architect.

C. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine the areas and conditions under which work of this section will be performed and correct conditions detrimental to timely and proper completion of the work.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION:

A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this section.

B. Install the work of this section in strict accordance with the original design, the approved shop drawings, pertinent requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position for long life under hard use.

C. Hoist trusses into position with secured at designated lifting points and exercise care to keep out of place bending of trusses to a minimum.

D. Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing is installed.

E. Install permanent bracing and related components prior to application of loads to trusses and tighten all loose connectors.

F. Restrict construction loads and prevent overstressing of truss members and do not cut or remove truss members.

END OF SECTION 06190

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Providing all labor, material and equipment necessary to accomplish all the necessary work not otherwise included as part of other sections and which is non-structural and exposed to view.

2. Types of work of this section include, but are not limited to, finish carpentry for:

a. Interior running and standing trim.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 06100 Rough Carpentry
Section 07900 Joint Sealers
Section 08100 Metal Doors and Frames
Section 08200 Wood Doors
Section 08360 Sectional Overhead Doors
Section 08520 Aluminum Windows
Section 08700 Builder' s Hardware

1.02 REFERENCES:

A. Softwood Lumber Standards: Comply with applicable rules of the respective grading and inspecting agencies for species and product indicated, as well as with latest editions of:

1. PS 20 American Softwood Lumber Standard, National Bureau of Standards.

B. Plywood Products Standard: Comply with applicable American Plywood Association (APA) Performance Standards for type of panel indicated. Also comply with latest edition of:

1. PS 1 Plywood Standard - National Bureau of Standards.

2. PS 51 Hardwood Plywood Standard - National Bureau of Standards.

C. Hardwood Lumber Standards: Comply with National Hardwood Lumber Association (NHLA) rules.

D. Woodworking Standard: Where indicated for a specific product, comply with specified provision of the following:

1. Architectural Woodwork Institute (AWI) "Quality Standards."

E. In addition to complying with the pertinent codes and regulations of governmental agencies having jurisdiction, as well as the above, comply with the Standard Grading Rules for Western Lumber published by the Western Wood Product Association, wherever applicable, and the Grading Rules of the California Redwood Association.

1.03 SUBMITTALS:

A. Provide submittals in accordance with Section 01300.

B. Product Data: Submit manufacturer's specifications and installation instructions for each item of factory-fabricated siding and paneling.

C. Samples: Submit the following samples for each species and cut or pattern of finish carpentry.

1. Standing and running trim for transparent finish: set of three (3) pieces for boards and for each type of worked product (molding) required, 2'-0" long x full board or molding width, finished on one side and one edge.

2. Standing and running trim for paint finish; set of three (3) pieces for each type of work and product required, 2'-0" long x full board or molding width, unfinished.

1.04 QUALITY ASSURANCE:

A. Grade Stamps: Factory-mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish, and submit mill certificate that material has been inspected and graded in accordance with requirements if it cannot be marked on a concealed surface.

B. Throughout progress of the work of this section, provide at least one person who shall be thoroughly familiar with the specified requirements, completely trained and experienced in the necessary skills, and who shall be present at the site and shall direct all work performed under this section.

C. In actual installation of the work of this section, use adequate numbers of skilled workers to ensure installation in strict accordance with the approved design and the approved recommendations of the materials manufacturers.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Protect finish carpentry materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

B. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations which could damage, soil or deteriorate woodwork have been completed in installation areas.

C. If, due to unforeseen circumstances, finish carpentry materials must be stored in other than installation areas, store only in areas meeting requirements specified for installation areas.

D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

1.06 PROJECT/SITE CONDITIONS:

A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for finish carpentry installation areas.

1. Do not install finish carpentry until required temperatures and relative humidity have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation areas as required to maintain moisture content of installed finish carpentry within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period.

1. The fabricator of woodwork shall determine optimum moisture content and required temperature and humidity conditions.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.

B. Moisture Content of Softwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation not greater than values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated.

C. Moisture Content of Hardwood Lumber: Provide kiln-dried (KD) lumber having a moisture content from time of manufacture until time of installation within the ranges required in the referenced woodworking standard.

D. Lumber for Transparent Finish: Use pieces made of solid lumber stock.

E. Lumber for Painted Finish: At Contractor's option, use pieces which are either glued-up lumber or made of solid lumber stock.

F. Interior Finish Carpentry:

1. Standing and Running Trim for Transparent Finish: Plain Sawn Hard Maple manufactured to sizes and patterns (profile) shown from select First Grade lumber (NHLA); complying with following grade requirements of referenced woodworking standard, for quality of materials and manufacture:

a. Grade: A

b. Finish: Two coats polyurethane.

G. Miscellaneous Materials:

1. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of the proper type, size, material and finish for application indicated to provide secure attachment, concealed where possible, and complying with applicable federal specifications.

a. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with stainless steel nails.

2. Screen for Soffit Vents: 18 x 16 or 18 x 14 mesh of plastic coated fiber threads, complying with FS L-S-25, with black or dark gray finish.

H. Wood Treatment/Preservative Treatment: Following basic fabrication, provide 3-minute dip treatment of finish carpentry items in 5 percent solution of pentachlorophenol, with vehicle which will not interfere with finish application and will produce minimum effect upon appearance.

1. Apply brush coat on surfaces cut after treatment.

I. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine the areas and conditions under which work of this section will be performed.

B. Correct conditions detrimental to the proper and timely completion of the work.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION:

A. Pre-Installation Meeting: Meet at project site prior to delivery of finish carpentry materials and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work.

1. Include in meeting the Contractor; Architect and other Owner Representatives (if any); Installers of finish carpentry, wet work including plastering, other finishes, painting, mechanical work and electrical work; and firms and persons responsible for continued operation (where temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions.

2. Proceed with finish carpentry on interior only when everyone concerned agrees that required ambient conditions can be properly maintained.

B. Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.

C. Backprime lumber for painted finish exposed on the exterior, or where indicated, to moisture and high relative humidities on the interior.

1. Comply with requirements of section on painting within Division 9 for primers and their application.

3.03 INSTALLATION:

A. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacturer with respect to surfaces, sizes or patterns.

B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims.

1. Install to a tolerance of 1/8" in 8'-0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces.

C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible.

1. Stagger joints in adjacent and related members.

2. Cope at returns, miter at corners, to produce tight-fitting joints with full surface contact throughout length of joint.

3. Use scarf joints for end-to-end joints.

4. Make exterior joints water-resistant by careful fitting.

E. Anchor finish carpentry work to anchorage devices or blocking built-in or directly attached to substrates.

1. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.

2. Except where prefinished matching fastener heads are required, use fine finishing nail for exposed nailings, countersunk and filled flush with finished surface, and matching final finish where transparent is indicated.

3.04 ADJUSTING:

A. Repair damaged and defective finish carpentry work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork.

B. Adjust joinery for uniform appearance.

3.05 CLEANING:

A. Clean finish carpentry work on exposed and semi-exposed surfaces.

B. Touch-up shop-applied finishes to restore damaged or soiled areas.

C. Refer to Division 9 sections for final finishing of installed finish carpentry work.

3.06 PROTECTION:

A. Installer of finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 06200

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: Provide all labor, materials, equipment, and related services necessary to furnish and install all architectural casework where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited, to the following:

Section 06100 Rough Carpentry
Section 06200 Finish Carpentry

1.02 REFERENCES:

A. Lumber grading rules and species shall be in conformance with Voluntary Products Standard PS 20-70. Grading rules of the following associations apply to materials furnished.

1. WWPA - Western Wood Products Association
2. WCLIP - West Coast Lumber Inspection Bureau
3. SPIB - Southern Pine Inspection Bureau
4. NLGA - National Lumber Grades Authority
5. RIS - Redwood Inspection Service

B. Plywood Grading Rules and Recommendations:

1. PS 1-74 - For Soft Plywood
2. PS 51-71 - For Hard Plywood
3. APA - American Plywood Association

C. Requirements of Regulatory Agencies:

1. AWPB - American Wood Preservers Bureau
2. ALSL - American Lumber Standards Committee
3. FS - Federal Specifications
4. NEMA - National Electrical Manufacturer Association

D. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with applicable standards of the Architectural Woodwork Institute.

1.03 SUBMITTALS:

A. Provide submittals in accordance with this Section and Section 01300.

B. Product Data: Submit full information on all materials proposed for use in the work of this section, prior to procurement of said material, for Architect's review.

1. Do not purchase or install material until approved by the Architect.

2. Materials list of items proposed to be provided under this section.

3. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

C. Shop Drawings: Submit shop drawings for fabrication and erection. Include plans, elevation, details of sections and connections.

1. Show anchorage and accessory items.

2. Provide templates for anchor and bolt installation.

3. Review shop drawings requirements with DNR Construction Inspector before ordering shop drawings.

D. Samples: Submit, for verification purposes, samples of each type of material, to be used in the work of this section, requested by the Architect.

1. Include in each set of samples the full range of color and texture to be expected in the completed work.

1.04 QUALITY ASSURANCE:

A. Qualification of Workers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the requirements and the methods needed for proper performance of the work of this section.

B. Provide one skilled individual who shall be present at all times during execution of this portion of the work and who shall personally direct all work performed under this section.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Except as otherwise approved by the Architect, determine and comply with manufacturer's recommendations on product handling, storage and protection.

B. Protect materials during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

C. Do not deliver materials of this section until painting, wet work, grinding and similar operations of other trades, which could damage, soil or deteriorate casework, have been completed in installation area.

D. In the event of damage, promptly remove damaged material and unsuitable items from the job site.

1. Immediately make all repairs and replacement necessary to the approval of the Architect/DNR Construction Inspector with materials meeting the specified requirements at no additional cost to the Owner.

E. Additional time required to secure replacements and to make repairs will not be considered to justify an extension in the Contract time of completion.

1.06 PROJECT/SITE CONDITIONS:

A. Conditioning: Installer shall advise Contractor of temperature and humidity requirements for casework installation areas.

1. Do not install finish casework until required temperatures and relative humidity have been stabilized and will be maintained in installation areas.

B. Maintain temperature and humidity in installation areas as required to maintain moisture content of installed casework within a 1.0 percent tolerance of optimum moisture content, from date of installation through remainder of construction period.

1. The fabricator of casework shall determine optimum moisture content and required temperature and humidity conditions.

C. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible.

1. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. General: Fabricate architectural casework to “Premium Grade” standard of the "Architectural Woodwork Institute."

B. Cabinets and Shelves: Fabricate flush face-type cabinets on site or mill in accordance with approved shop drawings, the Architect's Drawings, and as specified herein.

1. Doors and drawer front: 3/4 thick Hard Maple.

2. Cabinet boxes: ¾” Plywood with Hard Maple Veneer

2. Drawers: 3/4 Hard Maple draw faces and wood veneer cabinet liner sides.

C. Countertops: Shop fabricate countertop and splashes to type and dimensions shown on the Drawings.

1. Where splashes are called for, provide 4" high cover splash and no drip leading edge.

2. Colors and Pattern: Selected by the Architect colors and finishes of the approved manufacturer. Countertops to be quartz by Cambria.

a. Countertop: Color & Pattern TBD.

E. Adhesives: For installation of veneer, use only low-VOC adhesives with NO Added Urea Formaldehyde (NAUF).

1. Do not use so called "contact" adhesive.

F. Hardware: Unless provided as part of prefabricated casework, install hardware as specified herein and in Section 8700 of these specifications.

1. Provide drawer guides, recessed hinges, pulls, shelf supports, magnetic or mechanical catches as shown, or if not shown, as selected by the Contractor subject to the approval of the Architect/DNR Construction Inspector.

G. Color and Finishes: Decorative Black Wire Pulls.

H. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Architect.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine the areas and conditions under which work of this section will be performed.

B. Correct conditions detrimental to timely and proper completion of the work.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 INSTALLATION:

A. Fabricate and install the work of this section in accordance with the approved shop drawings and the referenced standards.

B. All workmanship shall be of the highest grade, put together with concealed fasteners or interlocking joints and glued under pressure so as not to show shrinkage, slips or open joints.

C. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacture with respect to surfaces, sizes or patterns.

D. Install the work plumb, level, true and straight with no distortions.

1. Shim as required using concealed shims.

2. Install to a tolerance of 1/8" in 8'-0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces.

E. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

F. No exposed fasteners will be permitted except screws for hardware.

G. Cut openings for sinks, ranges, etc. in countertops for fixtures to be installed by the Mechanical Contractor.

1. Verify dimensions prior to fabrication of cabinet work.

3.03 ADJUSTING:

A. Repair damaged and defective casework wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace casework.

1. Adjust joinery for uniform appearance.

3.04 CLEANING:

A. Clean finish casework on exposed and semi-exposed surfaces.

B. Touch-up shop-applied finishes to restore damaged or soiled areas.

3.05 PROTECTION:

A. Installer of casework shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

END OF SECTION 06410

PART 1 – GENERAL

1.1 SUMMARY

A. Products Supplied Under This Section

1. Vapor Barrier, seam tape, pipe boots, detail strip for installation under concrete slabs.

B. RELATED SECTIONS

1. Section 03300 Cast-in-place Structural Concrete
2. Section 07260 Under-Slab Vapor Retarder

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM E 1745-97 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil
   Or Granular Fill Under Concrete Slabs
2. ASTM E 154-88 Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
3. ASTM E 96-95 Standard Test Methods for Water Vapor Transmission of Materials
4. ASTM E 1643-98 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

B. American Concrete Institute (ACI)

1. ACI 302.1R-96 Vapor Barrier Component (plastic membrane) is not less than 10 mils thick

1.3 SUBMITTALS

A. Quality Control / Assurance

1. Independent laboratory test results showing compliance with ASTM & ACI Standards.
2. Manufacturer's samples, literature
3. Manufacturer's installation instructions for placement, seaming and pipe boot installation

PART 2 – PRODUCTS

2.1 MATERIALS

A. Extremely low permeance vapor barriers for critically sensitive, low permeance floor coverings. Includes floor coverings of rubber, vinyl, urethane, epoxy and methyl methacrylate, as well as linoleum and wood.

1. Vapor Barrier must have the following qualities
   a. Minimum WVTR as tested by ASTM E96 of 0.008
2. Vapor Barriers
   a. Stego Wrap (15 mil) Vapor Barrier by STEGO INDUSTRIES LLC, San Juan Capistrano, CA
      (877) 464-7834 www.stegoindustries.com
   b. W.R. Meadown Premoulded Membrane with Plasmatic Core.
   c. Vaporguard by Reef industries.

2.2 ACCESSORIES

A. Seam Tape

1. High Density Polyethylene Tape with pressure sensitive adhesive. Minimum width 4 inches.

B. Pipe Boots

1. Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

PART 3 – EXECUTION

3.1 PREPARATION

A. Ensure that subsoil is approved by architect

1. Level and tamp or roll aggregate, sand or tamped earth base.

3.2 INSTALLATION

A. Install Vapor Barrier:

1. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643–98.

A. Unroll Vapor Barrier with the longest dimension parallel with the direction of the pour.
B. Lap Vapor Barrier over footings and seal to foundation walls.
C. Overlap joints 6 inches and seal with manufacturer's tape.
D. Seal all penetrations (including pipes) with manufacturer's pipe boot.
E. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
F. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Extent of insulation work is shown on Drawings and indicated by provisions of this section.

2. Where insulation is required, provide insulation of the type specified as indicated, in sufficient quantities to meet or exceed building code requirements.

3. Applications of insulation specified in this section include the following:

a. Insulation under slabs-on-grade.
b. Foundation wall insulation.
c. Board-type building insulation, concealed.
d. Blanket-type building insulation.
e. Loose-fill building insulation.

B. Related Sections: Drawings and General Provisions of the Contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 06100 Rough Carpentry
Section 15400 Plumbing
Section 15500 Heating, Ventilating, and Air Conditioning

1.02 REFERENCES:

A. ASTM E 84 - Standard specification for surface burning characteristics of building material.

B. ASTM C 549 - Standard specification for perlite loose-fill insulation.

C. ASTM C 516 - Standard specification for vermiculite loose-fill insulation.

D. FS HH-I-524C - Polystyrene board insulation.

E. FS HH-I-521 - Mineral fiber blanket insulation.

F. FS HH-I-1030 - Mineral fiber, loose-fill insulation.

1.03 SUBMITTALS:

A. Provide submittals in accordance with Section 01300.

B. Product Data: Submit manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required.

1. Certified Tests: With product data, submit copies of certified test report showing compliance with specified performance values, including k-values (aged values for plastic insulations), densities, compression strengths, burning characteristics, perm ratings, water absorption ratings, and similar ratings.

1.04 QUALITY ASSURANCE:

A. Federal Specifications: Where compliance with FS standard is indicated, specified requirements for marking individual boards/batts/blankets are waived, provided packages of units are labeled to show compliances.

B. Thermal Conductivity: Thicknesses indicated are for thermal conductivity (k-value at 75°F. or 24°C) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity.

1. Where insulation is identified by "R" value, provide thickness required to achieve indicated value.

C. Fire and Insurance Ratings: Comply with fire-resistance, flammability and insurance ratings indicated, and comply with regulations as interpreted by governing authorities.

D. Labels: Manufacturer's labels required on each piece or package of insulation.

1. Do not remove labels or open packages until inspected and approved by the DNR Construction Inspector.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. General Protection: Protect insulations from physical damage and from becoming wet, soiled, or covered with ice or snow.

1. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Polystyrene Board Insulation: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Dow Chemical Company; Midland, Michigan
2. UC Industries/U.S. Gypsum; Chicago, Illinois
3. or equal as approved by the Architect

2.02 MATERIALS: *Note: All insulation must have a low – VOC certification

Install insulation per R-values shown on drawings.

A. Extruded Polystyrene Board Insulation: Rigid, closed-cell, density skin; complying with FS HH-1-524C, Type IV, min. 40 psi compressive strength, k-value of 0.20; 0.3% maximum water absorption; 1.1 perm-inch maximum water vapor transmission; manufacturer's standard lengths and widths.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Installer must examine substrates and conditions under which insulation work is to be performed, and must notify Contractor in writing of unsatisfactory conditions.

B. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.02 PREPARATION:

A. Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections which might puncture vapor barriers.

B. Close off openings in cavities to receive poured-in-place insulation, sufficiently to prevent escape of insulation.

1. Provide bronze or stainless steel screen (inside) where openings must be maintained for drainage or ventilation.

3.03 INSTALLATION:

A. Comply with manufacturer's instructions for particular conditions of installation in each case.

1. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

B. Extend insulation full thickness as shown over entire area to be insulated.

1. Cut and fit tightly around obstructions, and fill voids with insulation.

2. Remove projections which interfere with placement.

C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

D. Perimeter and Under-Slab Insulation: On vertical surfaces, set units in adhesive applied in accordance with manufacturer's instructions.

1. Use type adhesive recommended by manufacturer of insulation.

2. Do not place polystyrene foam on solvent base waterproofing until waterproofing is well cured to avoid chemical reaction of foam with solvent.

E. General Building Insulation:

1. Apply insulation units to substrate by method indicated, complying with manufacturer's recommendations.

2. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

3. Set vapor barrier faced units with vapor barrier to warm side of construction, except as otherwise shown.

   a. Do not obstruct ventilation spaces, except for fire stopping.

   b. Tape joints and ruptures in vapor barriers, and seal each continuous area of insulation to surrounding construction to ensure vapor-tight installation.

4. Place loose fiber insulation into spaces and onto surfaces as shown, either by pouring or by machine-blowing.

   a. Level horizontal applications to uniform thickness as indicated, lightly settled to uniform density, but not excessively compacted.

5. Stuff loose mineral fiber insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40% of normal maximum volume (to a density of approximately 2.5 lbs. per cubic foot).

F. Vapor Barrier Installation: General: Extend vapor barriers to extremities of areas to be protected from vapor transmission.

1. Secure in place with adhesives or other anchorage system as indicated.

2. Extend vapor barriers to cover miscellaneous voids in insulated substrates, including those which have been stuffed with loose fiber-type insulation.

3. Seal joints/seams in vapor barriers, seal to objects penetrating barriers, and seal to other surfaces at extremities of coverage by lapping with adhesive or taping to form a continuous barrier.

4. Repair punctures and tears in vapor barriers, immediately before concealment by other work.

5. Cover with adhesively applied vapor barrier material or with self-adhesive vapor barrier type.

3.04 PROTECTION:

A. General: Protect installed insulation and vapor barriers from harmful weather exposures and from possible physical abuses, where possible by nondelayed installation of concealing work or, where that is not possible, by temporary covering or enclosure.

B. Installer shall advise Contractor of exposure hazards, as well as of possible sources of deterioration and fire hazards.

END OF SECTION 07200

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Acoustic Insulation

B. Vapor Retarder

1.2 RELATED SECTIONS

A. Section 07100 - Dampproofing and Waterproofing: Insulation installed with waterproofing systems.

B. Section 07260 - Vapor Retarders: Vapor retarder materials to adjacent insulation.

C. Section 07270 - Air Barriers: Air seal materials to adjacent insulation.

D. Section 07810 - Fire and Smoke Protection: Insulation installed in conjunction with firestopping or smoke containment systems.

E. Section 09200 - Plaster and Gypsum Board: Insulation installed in conjunction with interior wall and ceiling finish systems.

F. Section 15810 - Ducts: Insulation to surround HVAC ductwork.

1.3 REFERENCES

A. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

B. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.

C. ASTM C 553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.

D. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

E. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

F. ASTM C 764 - Standard. Specification for Mineral Fiber. Loose-Fill Thermal Insulation.

G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

H. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.

I. ASTM E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

J. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C.

K. ASTM E 814 - Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

L. Federal Specification HH-I-521F: Insulation Blankets, Thermal (Mineral Fiber, For Ambient Temperatures).

M. Federal Specification HH-I-558B: Insulation, Blocks, Blankets, Felts, Sleeving (Pipe and Tube Covering), and Pipe fitting Covering, Thermal (Mineral Fiber, Industrial Type)

N. National Fire Protection Association (NFPA) Life Safety Code

O. Underwriters Laboratories (UL) - UL 2079 Standard test method for fire resistance of Building Joint Systems.

1.4 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum of ten years experience manufacturing products in this section shall provide all products listed.

B. Installer Qualifications: Products listed in this section shall be installed by a single organization with at least five years experience successfully installing insulation on projects of similar type and scope as specified in this section.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Storage: Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling.

C. Handling: Handle materials to avoid damage.

1.7 SEQUENCING

A. Coordinate with the installation of vapor retarders and air seal materials specified is Section 07260 and Section 07270.

B. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: CertainTeed Corp., Insulation Group, which is located at: 750 E. Swedesford Rd. P. O. Box 860 ; Valley Forge, PA 19482-0860; Toll Free Tel: 800-233-8990; Fax: 610-341-7940; Email: request info; Web: certainteed.com/CertainTeed/Pro/Design+Professional/Insulation

B. Substitutions: Submit for approval by architect

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 APPLICATIONS

A. Acoustical/Thermal Insulation: Certainteed Acoustical Ceiling NoiseReducer Batts. Fiber glass acoustical insulation for ceilings. Complies with ASTM C 665; preformed glass fiber batt insulation:
   1. Facing: ASTM C 665, Type 1, Unfaced.
      a. Fire Hazard Classification: ASTM E 84:
         1) Maximum Flame Spread Index; 25.
         2) Maximum Smoke Developed Index; 50.
      b. Noncombustibility: ASTM E 136, passes.
      c. Thermal Resistance: R of 11 (RSI 1.9).
         1) Thickness: 3-1/2 inches (89 mm).
         2) Width: 24 inches (610 mm).

2.3 VAPOR RETARDER

A. Sheet Retarder: Certainteed MemBrain, The SMART Vapor Retarder. Polyimide film vapor retarder for use with unfaced, vapor permeable glass fiber and mineral wool insulation in wall and ceiling cavities. Material has a permeance of 1 perm or less when tested to ASTM E 86, dry cup method and increases to greater than 10 perms using the wet cup method.
   1. Water Vapor Permeance:
      a. ASTM E 86, dry cup method: 1.0 perms (57ng/Pa*s*m2).
      b. ASTM E 86, wet cup method: 10.0 perms (1144ng/Pa*s*m2).
   2. Fire Hazard Classification: ASTM E 84:
      a. Maximum Flame Spread Index; 20.
      b. Maximum Smoke Developed Index; 55.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify that all exterior and interior wall, partition, and floor/ceiling assembly construction has been completed to the point where the insulation may correctly be installed.

C. Verify that mechanical and electrical services in ceilings, walls and floors have been installed and tested and, if appropriate, verify that adjacent materials are dry and ready to receive insulation.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in exterior spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

E. Install insulation with vapor barrier installed facing the warm side. Seal or tape joints as required.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Siding panels.

B. Soffit panels.

C. Accessories and trim.

1.2 RELATED SECTIONS

A. Section 06100 - Rough Carpentry: Framing and Sheathing.

B. Section 07900 - Joint Sealers.

1.3 REFERENCES

A. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 1998.

B. ASTM C 1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards; 1999.

C. ASTM C 1186 - Standard Specification for Flat Non-Asbestos Fiber Cement Sheets; 1999.

D. ASTM E 72 - Standard Test Methods of Conducting Strength Tests of Panels for Building Construction; 1998.

E. ASTM E 84 -- Standard Test Method for Surface Burning Characteristics of Building Materials; 1999.

F. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 1995.

G. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace At 750 Degrees C; 1999.

H. ASTM E 228 - Standard Test Method for Linear Thermal Expansion of Solid Materials With a Vitreous Silica Dilatometer; 1995.

I. ASTM G 26 - Standard Practice for Operating Light-Exposure Apparatus (Xenon-Arc Type) With and Without Water for Exposure of Nonmetallic Materials; 1996.

1.4 SUBMITTALS

A. Make submittals under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.

2. Storage and handling requirements and recommendations.
3. Installation methods, including nailing patterns.
4. Applicable model code authority evaluation report (ICC, CCMC, etc.)

A. Siding manufacturer's requirements for vapor retarders, primer, paint, etc., to be installed by others.

C. Maintenance and periodic inspection recommendations.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Provide installer with not less than three years of experience with products similar to those specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products off the ground, on a flat surface, and under a roof or separate waterproof covering.

1.7 WARRANTY

A. Provide WeatherBoards 50 year limited siding warranty.

B. CertainTeed ColorMax Finish – provide 15 year limited paint warranty

C. CertainTeed Premium Stain Finish – provide 12 year limited coating warranty

D. Register manufacturer's warranty, made out in Owner's name, with copy to Owner.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. CertainTeed Corporation, Siding Products Group, P.O. Box 860, Valley Forge, Pennsylvania 19482. ASD. Tel: (800) 233-8990 (professional) or (800) 782-8777 (consumer). www.certainteed.com.

B. Substitutions: Not permitted.

2.2 PANELS

A. Fiber Cement Board Panels - General: CertainTeed Color Max Fiber Cement Board Panels consist of cement, fly ash and cellulose fiber formed under high pressure into boards with integral surface texture; complying with ASTM C 1186 Type A Grade II; machined edges; for nail attachment.
1. Surface Burning Characteristics: Flame spread index of 0, smoke developed index of 5, maximum; when tested in accordance with ASTM E 84 (Class I/A).
2. Flammability: Noncombustible, when tested in accordance with ASTM E 136.

3. Flexural Strength: At least 1450 psi (10 MPa) when in equilibrium condition, and at least 1015 psi (7 MPa) when in wet condition, tested in accordance with ASTM C 1185.
4. Coefficient of Thermal Expansion: Less than 1 x 10^-5/inch/inch/degree F (0.5 x 10^-5/degree C), when tested in accordance with ASTM E 228.
5. Freeze Thaw Resistance: At least 80 percent flexural strength retained, when tested in accordance with ASTM C 1185.
6. UV Resistance: No cracking, checking, or erosion, when tested for 2000 hours in accordance with ASTM G 26.
7. Water Tightness: No water droplets on underside, when tested in accordance with ASTM C 1185.

B. Horizontal Siding: CertainTeed Color Max – Cedar Lap Siding.
1. Thickness: 5/16 inch (7.9 mm), plus or minus .04 inch (1 mm).
2. Length: 12 feet (3657 mm), plus 0, minus 1/8 inch (3 mm).
3. Style: Cedar lap siding.
   a. Width: 6-1/4 inches (210 mm) wide.
4. Factory Stain Finish: Factory applied CertainTeed Fiber Cement Siding Premium Stain color as follows: TBD – Submit Samples

2.3 ACCESSORIES

A. Trim: CertainTeed ColorMax Trim
1. Size:
   a. Thickness 7/16 inch (11 mm) plus or minus (1 mm).
   b. Width:
      1) 5-1/2 inch (140 mm).
   c. Length: 12 feet (3.657 m) plus or minus 1/8 inch (3.17 mm).

2. Sealant/Primer: FiberTect Sealant/Primer.

B. Provide the following trim:
1. Starter strip for lap siding.
2. Outside corners, butted to siding.
3. Outside corners, overlapping siding.
4. Fascia board.
5. Exterior Window/Door Trim.

C. Sealant: Paintable, 100 percent acrylic latex caulk complying with ASTM C 920.

D. Sheet Metal Flashing: Minimum 26 gauge hot-dipped galvanized steel sheet, or coated aluminum.

E. Nails: Length as required to penetrate minimum 1-1/4 inch (32mm) into solid backing; hot-dipped galvanized or stainless steel.

F. Building Paper: Kraft or bituminous paper; not polyethylene or foil.

G. Field Finish Paint: 100 percent acrylic latex as specified in Section 099000: Color TBD

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to commencing installation, verify governing dimensions of building and condition of substrate.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Examine, clean, and repair as necessary any substrate conditions that would be detrimental to proper installation.

B. Do not begin installation until unacceptable conditions have been corrected.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and Drawing details.
   1. Read warranty and comply with all terms necessary to maintain warranty coverage.
   2. Install in accordance with conditions stated in model code evaluation report applicable to location of project.
   3. Use trim details indicated on drawings.
   4. Touch up all field cut edges before installing.
   5. Pre-drill nail holes if necessary to prevent breakage.

B. Allow space between both ends of siding panels that butt against trim for thermal movement; seal joint between panel and trim with exterior grade sealant.

C. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

D. Joints in Vertical Siding: Install Z-flashing in horizontal joints between successive courses of vertical siding.

E. Furred Installation: Leave space at top and bottom open; top may be behind soffit; at bottom install insect screen over opening by wrapping a strip of screen over bottom ends of vertical furring strips.

F. Install sheet metal flashing above door and window casings and horizontal trim in field of siding.

G. Do not install siding less than 6 inches (150 mm) from surface of ground nor closer than 1 inch (25 mm) to roofs, patios, porches, and other surfaces where water may collect.

H. After installation, seal all joints except lap joints of lap siding. Seal around all penetrations. Paint all exposed cut edges.

3.4 CLEANING

A. At completion of work, remove debris caused by siding installation from project site.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes:

1. The extent of each type of flashing and sheet metal work is indicated on the Drawings and by provisions of this section.

2. The types of work specified in this section may include but is not necessarely limited to, the following:

a. Metal counter flashing; and base flashing (if any).

b. Metal wall flashing and expansion joints.

c. Built-in metal gutters and scuppers.

d. Gutters and downspouts (rain drainage).

e. Miscellaneous sheet metal accessories.

f. Integral masonry flashings are specified as masonry work in sections of Division 4.

g. Roofing accessories, not including roof accessories, are specified in roofing system sections as roofing work.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 07310 Asphalt Shingles
Section 07900 Joint Sealers
Section 15400 Plumbing

C. Roof accessoiries and skylights are specified elsewhere, in division 7.

1.02 REFERENCES:

A. Standards: Comply with standards specified in this section and the provisions of SMACNA "Architectural Sheet Metal Manual."

1.03 SUBMITTALS:

A. Provide submittals in accordance with Section 01300.

B. Product Data: Submit manufacturer's product specifications, installation instructions and general recommendations for each specified sheet material and fabricated product.

C. Samples: Submit two (2), eight-inch (8") square samples of specified sheet materials to be exposed as finished surfaces.

1. Submit two (2), twelve-inch (12") long completely finished units of specified factory-fabricated products exposed as finished work.

D. Shop Drawings: Submit shop drawings showing layout, joining, profiles, and anchorages of fabricated work, including major counter flashings, trim/fiscia units, gutters, downspouts, scuppers and expansion joint systems; layouts at one-quarter (1/4") scale, details at three-inch (3") scale.

1.04 QUALITY ASSURANCE:

A. Qualifications of Installers: Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.05 PROJECT/SITE CONDITIONS:

A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of the work and protection of materials and finishes.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Sheet Metal Flashing/Trim:

1. Zinc-Coated Steel: Commercial quality with 1.20 percent galvanized, mill phosphatized where indicated for painting (Pnt); 0.0359" thick (20 gauge) except as otherwise indicated.

2. Copper: ASTM B 370, cold-rolled except where soft temper is required for forming; 16 oz. (0.0216" thick) except as otherwise indicated.

B. Miscellaneous Materials and Accessories:

1. Solder: For use with steel or copper, provide 50-50 tin/lead solder (ASTM B 32), with rosin flux.

2. Fasteners: Same metal as flashing/sheet metal or, other noncorrosive metal as recommended by sheet manufacturer.

a. Match finish of exposed heads with material being fastened.

3. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.

4. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet.

5. 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 gauge required for performance.

6. Roof Cement: ASTM D 2822, asphaltic.

7. Reglets: Metal of type and profile indicated, compatible with flashing indicated, size and gauge required for performance.

2.02 MANUFACTURED UNITS:

A. Gutters: "K" style 2 3/8" x 4«" seamless, continuous, preprimed, aluminum, .032" thick.

B. Downspouts: Corrugated, preprimed, rectangular shape aluminum, .025" thick.

C. Drip Edge: Preprimed, preshaped aluminum.

2.03 FABRICATION:

A. Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance; with expansion provisions for running work, sufficient to permanently prevent leakage, damage or deterioration of the work.

1. Form work to fit substrates.

2. Comply with material manufacturer instruction and recommendations.

3. Form exposed sheet metal work without excessive oil-canning, buckling and tool marks, true to line and levels as indicated, with exposed edges folded back to form hems.

B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams.

1. For metal other than aluminum, tin edges to be seamed, form seams, and solder.

2. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.

C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used, or would not be sufficiently water/weatherproof, form expansion joints of intermeshing hooked flanges, not less than one-inch (1") deep, filled with mastic sealant (concealed within joints).

D. Sealant Joints: Where movable, nonexpansion-type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with industry standards.

E. Separations: Provide for separation of metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine the areas and conditions under which work of this section will be installed.

B. Correct conditions detrimental to the proper and timely completion of the work.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.02 INSTALLATION:

A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "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.

1. Install work with laps, joints and seams which will be permanently watertight and weatherproof.

B. Form all sheet metal accurately and to the dimensions and shapes required, finishing all molded and broken surfaces with true, sharp, and straight lines and angles and, where intercepting other members, coping to an accurate fit, soldering securely.

C. Expansion: Form, fabricate, and install all sheet metal so as to adequately provide for expansion and contraction in the finished work.

D. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a course of paper slip sheet and a course of polyethylene underlayment.

E. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.

F. Install reglets to receive counter flashing in manner and by methods indicated.

1. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections.

2. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.

3. Install counterflashing in reglets, either by snap-in seal arrangement, or by wedging in place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on degree of sealant exposure.

G. Weatherproofing:

1. Finish watertight and weathertight where so required.

2. Make all lock seam work flat and true to line, sweating full of solder.

3. Make all lock seams and lap seams, when soldered, at least one-half inch (1/2") wide.

4. Where lap seams are not soldered, lap according to pitch but in no case less than three inches (3").

5. Make all flat and lap seams in direction of flow.

H. Nailing:

1. Whenever possible, secure metal by means of clips or cleats without nailing through the metal.

2. In general, space all nails, rivets, and screws not more than 20 cm (8") apart and, where exposed to the weather, use lead washers.

3. For nailing into wood, use barbed roofing nails 32 mm (1-1/2") long by 11 gauge.

4. For nailing into concrete, use drilled plugholes and plugs.

I. Install continuous gutter guards on gutters, arranged as hinged units to swing open for cleaning gutters.

1. Install beehive-type strainer-guard at conductor heads, removable for cleaning downspouts.

J. Embedment: Embed all metal in connection with roofs in a solid bed of sealant using materials and methods approved in advance by the Architect or DNR Construction Inspector.

K. Soldering:

1. Thoroughly clean and tin all joint materials prior to soldering.

2. Perform all soldering slowly with a well-heated copper in order to heat the seams thoroughly and to completely fill them with solder.

3. Perform all soldering with a heavy soldering copper of blunt design, properly tinned for use.

4. Make all exposed soldering on finished surfaces neat, full flowing, and smooth.

5. After soldering, thoroughly wash acid flux with a soda solution.

6. Upon request of the DNR Construction Inspector, demonstrate by hose or standing water that all flashing and sheet metal is completely watertight.

3.03 CLEANING:

A. Clean exposed metal surfaces, removing substances which might cause corrosion of meal or deterioration of finishes.

3.04 PROTECTION:

A. Installer shall advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration, other than natural weathering, at time of substantial completion.

END OF SECTION 07600

SECTION 07712
MANUFACTURED GUTTERS AND DOWNSPOUTS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Gutters and downspouts, the extent of which is shown on the Drawings and includes:

1. Gutters and downspouts with built-in leaf protection.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1. Section 077123 – Manufactured Gutters and Downspouts.

1.02 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit manufacturer's product data for specified products.

C. Samples: Submit selection and verification samples for finishes, colors and textures.

1. Selection Samples: For each product requiring color selection, 2 sets of manufacturer's sample chips representing full range of colors and finishes available.

2. Verification Samples: For each color and finish selected, 2 chips indicating match to selected color and finish.

D. Quality Assurance Submittals: Submit the following:

1. Manufacturer's Instructions: Manufacturer's installation instructions.

E. Closeout Submittals: Submit the following:

1. Warranty: Warranty documents specified herein.

2. Record Documents: Project record documents for installed materials in accordance with Division 1 Closeout Submittals (Project Record Documents) Section.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Installer experienced in performing work of this section who has specialized in the installation of work similar to that required for this project.

B. Preinstallation Meetings: Conduct preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements.

1.04 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Requirements Sections.

1. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

B. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact. Identify fabricated components with UL 90 label where appropriate.

C. Storage and Protection: Store materials protected from exposure to harmful conditions. Store material in dry, above-ground location.

1. Stack prefinished material to prevent twisting, bending, abrasion, scratching and denting.

1.05 PROJECT CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.06 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Architect's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

1. Gutters and Downspouts: In addition to the manufacturer' standard guarantees, provide the manufacturer' standard lifetime warranty on baked on finish.

PART 2 - PRODUCTS

2.01 GUTTERS AND DOWNSPOUTS

A. Gutters: Provide seamless, rolled-formed, .032 aluminum, one piece gutter units designed to prevent built-up of leaves within the gutters, provide superior protection against wind and storm damage, and eliminates the possibility of debris entering the gutter from behind.

1. Screw gutters to the fascia board every 2 feet with internal hanging brackets. Do not attach with spikes.

2. Do not provide units with multiple parts, multi-piece gutters and separate leaf-shedding covers unless otherwise approved by the Architect.

3. Finish: Baked-on enamel.

4. Color: As selected by the Architect from manufacturer' standard colors matching roofing system.

B. Downspouts: Corrugated, prepainted, rectangular shape aluminum, .025" thick (minimun).

1. Finish: Baked-on enamel.

2. Color: As selected by the Architect from manufacturer' standard colors.

C. Manufacturer; Provide units with leaf protection such as Englert Leafguard. 1200 Amboy Avenue, Perth Amboy, NJ 08861, 1-800- LEAFGUARD, www.leafguard.com .

D. Local Dealers/Contractor: Leafguard of Central Iowa, Inc. 1814 Main St, P.O. Box 542, Granger, IA 50109, Phone**:** (515)999-2896, Toll Free**:** (800)532-3482 Fax**:** (515)999-2904 central_iowa@leafguard.com

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, recommendations and installations instructions for substrate verification, preparation requirements and installation.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's

instructions.

1. Installer's Examination:

   a. Have installer of this section examine conditions under which construction activities of this section are to be performed, then submit written notification if such conditions are unacceptable.

   b. Transmit 2 copies of installer's report to Architect/DNR Construction Inspector within 24 hours of receipt.

   c. Delay construction activities of this section until unacceptable conditions have been corrected.

   d. Beginning construction activities of this section indicates installer's acceptance of conditions.

3.03 PREPARATION

A. Coordination: Coordinate with other work including drainage, flashing and trim, walls and other adjoining work to provide a noncorrosive and leakproof installation.

B. Dissimilar Metals: Prevent galvanic action of dissimilar metals if any.

3.04 INSTALLATION

A. General: Install gutters and ownspouting profiles, patterns and drainage indicated and required for leakproof installation. Seal joints for leakproof installation.

1. Fasteners: Conceal fasteners where possible in exposed work. Cover and seal fasteners and anchors for watertight and leakproof installation.

2. Sealant-Type Joints: Provide sealant-type joint where indicated. Form joints to conceal sealant. Comply with Division 7 Joint Sealants Section for sealant installation.

3.05 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to DNR Construction Inspector's acceptance. Remove construction debris from project site and legally dispose of debris.

3.06 PROTECTION

A. Protection: Protect installed product's finish surfaces from damage during construction.

1. Replace products having damage other than minor finish damage.

2. Repair products having minor damage to finish in accordance with panel manufacturer's recommendations.

3. The DNR Construction Inspector shall be sole judge of acceptability of repair to damaged finishes; replace products having rejected repairs.

END OF SECTION 077123

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

B. Related Sections:

1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. LEED Submittals:

1. Product Data for Credit IEQ 4.1: For penetration firestopping sealants and sealant primers, documentation including printed statement of VOC content.
2. Laboratory Test Reports for Credit IEQ 4: For penetration firestopping sealants and sealant primers, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

    a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
    b. Classification markings on penetration firestopping correspond to designations listed by the following:

        1) UL in its "Fire Resistance Directory."
        2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
        3) FM Global in its "Building Materials Approval Guide."

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Hilti, Inc. or comparable product by one of the following:

1. A/D Fire Protection Systems Inc.
2. Grace Construction Products.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Fire-resistance-rated walls include [**fire walls**] [**fire-barrier walls**] [**smoke-barrier walls**] [**and**] [**fire partitions**].
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Horizontal assemblies include [**floors**] [**floor/ceiling assemblies**] [**and**] [**ceiling membranes of roof/ceiling assemblies**].
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

4. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested in accordance with UL 1479

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

E. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

G. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

H. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G21.

I. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

a. Slag-wool-fiber or rock-wool-fiber insulation.
b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
c. Fire-rated form board.
d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic or plastic sleeve lined with an intumescent strip, an

extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

1. Hilti Cast-In-Place Firestop Device (CP 680 M/P).

B. Acrylic Sealants: acrylic (water) based firestop sealant containing no halogens, solvents, asbestos or silicone compounds.

1. Hilti Flexible Firestop Sealant (CP 606)

C. Firestop Devices: Factory-assembled devices formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

1. Hilti Speed Sleeve (CP 653) for use with cable/pipe penetrations.
2. Hilti Drop In Device (CFS-DID).

D. Firestop Collars: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

1. Hilti Firestop Collar (CP 643N).
2. Hilti Firestop Collar (CP 644).

E. Intumescent Composite Board: Rigid panels consisting of a lightweight, polyurethane foam material.

1. Hilti Firestop Board (CP675T).

F. Intumescent Sealants: water based intumescent acrylic dispersion containing no halogens, solvents, or asbestos.

1. Hilti Intumescent Firestop Sealant (FS-ONE).

G. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

1. Hilti Firestop Putty Pad (CP 617).
2. Hilti Firestop Putty Stick (CP 618).

H. Intumescent Wrap Strips: Single-component intumescent elastomeric strips with aluminum foil on one side.

1. Hilti Firestop Wrap Strip (CP 648S).
2. Hilti Firestop Wrap Strip (CP 648E).

I. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

1. Hilti Firestop Mortar (CP637).

J. Blocks/Plugs: Intumescent flexible block/plug suitable for reuse in re-penetration of openings.

1. Hilti Firestop Block (CFS-BL)
2. Hilti Firestop Plug (CFS-PL)

K. Foams: Multicomponent, polyurethane foam that, when mixed, expand and cure in place to produce a nonshrinking foam.

1. Hilti Fire Foam (CP 620)

L. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Hilti Elastomeric Firestop Sealant (CP 601S)

2. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

a. Hilti Self-Leveling Firestop Sealant (CP 604)

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

B. Where Intertek ETL SEMKO-listed systems are indicated, they refer to design numbers in Intertek ETL SEMKO's "Directory of Listed Building Products" under "Firestop Systems."

C. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."

D. Firestopping with No Penetrating Items[**FS-**<**#**>]:

1. UL-Classified Systems: [**C-AJ-0055**] [**C-AJ-0090**] [**F-A-0005**] [**F-A-0012**] [**F-A-0014**] [**W-L-0014**].
2. Intertek ETL SEMKO-Listed Systems: <**Insert design numbers**>.
3. FM Global-Approved Systems: <**Insert design numbers**>.
4. F-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
5. T-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
6. L-Rating at Ambient: Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
7. L-Rating at 400 deg F (204 deg C): Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials:
    a. Silicone sealant.
    b. Intumescent sealant.
    c. Mortar.
    d. Firestop device.
    e. <Insert material.>

E. Firestopping for Metallic Pipes, Conduit, or Tubing[**FS-**<#>]:

1. UL-Classified Systems: [**C-AJ-1149**] [**C-AJ-1291**] [**C-AJ-1226**] [**F-A-1016**] [**F-A-1017**] [**W-L-1054**] [**W-L-1206**] [**W-L-1297**] [**C-BJ-1046**].
2. Intertek ETL SEMKO-Listed Systems: <**Insert design number**>.
3. FM Global-Approved Systems: <**Insert design number**>.
4. F-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
5. T-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
6. L-Rating at Ambient: Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
7. L-Rating at 400 deg F (204 deg C): Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials:

    a. Silicone sealant.
    b. Acrylic sealant.
    c. Intumescent sealant.
    d. Firestop device.
    e. Cast-in-place firestop device.
    f. <Insert material.>

F. Firestopping for Nonmetallic Pipe, Conduit, or Tubing[**FS-**<#>]:

1. UL-Classified Systems: [**F-A-2053**] [**F-A-2054**] [**F-A-2066**] [**F-A-2103**] [**W-L-2128**] [**C-AJ-2567**].
2. Intertek ETL SEMKO-Listed Systems: <**Insert design number**>.
3. FM Global-Approved Systems: <**Insert design number**>.
4. F-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
5. T-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
6. L-Rating at Ambient: Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
7. L-Rating at 400 deg F (204 deg C): Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials:

    a. Intumescent sealant.
    b. Intumescent wrap strip.
    c. Firestop collar.
    d. Firestop device.
    e. Cast-in-place firestop device.
    f. <Insert material.>

G. Firestopping for Electrical Cables[**FS-**<#>]:

1. UL-Classified Systems: [**C-AJ-3180**] [**C-AJ-3095**] [**W-J-3060**] [**F-C-3012**] [**F-C-3044**] [**W-L-3161**].
2. Intertek ETL SEMKO-Listed Systems: <**Insert design number**>.
3. FM Global-Approved Systems: <**Insert design number**>.
4. F-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
5. T-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
6. L-Rating at Ambient: Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
7. L-Rating at 400 deg F (204 deg C): Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
8. W-Rating: No leakage of water at completion of water leakage testing.

9. Type of Fill Materials:

    a. Intumescent sealant.
    b. Intumescent putties.
    c. Block/plug.
    d. Firestop device.
    e. Silicone foam.
    f. **<Insert material>**

H. Firestopping for Cable Trays with Electric Cables[**FS-**<#>]:

1. UL-Classified Systems: [**C-AJ-4034**] [**C-AJ-4071**] [**W-J-4048**] [**W-J-4050**] [**W-L-4011**] [**W-L-4038**] [**W-L-4050**].
2. Intertek ETL SEMKO-Listed Systems: <**Insert design number**>.
3. FM Global-Approved Systems: <**Insert design number**>.
4. F-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
5. T-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
6. L-Rating at Ambient: Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
7. L-Rating at 400 deg F (204 deg C): Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials:

    a. Intumescent sealant.
    b. Block/plug.
    c. Mortar.
    d. Intumescent composite sheet.
    e. <Insert material>

I. Firestopping for Insulated Pipes[**FS-**<#>]:

1. UL-Classified Systems: [**C-AJ-5048**] [**C-AJ-5091**] [**F-A-5017**] [**W-J-5042**] [**W-L-5029**] [**W-L-5257**] [**W-L-5244**].
2. Intertek ETL SEMKO-Listed Systems: <**Insert design number**>.
3. FM Global-Approved Systems: <**Insert design number**>.
4. F-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
5. T-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
6. L-Rating at Ambient: Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
7. L-Rating at 400 deg F (204 deg C): Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials:

    a. Intumescent sealant.
    b. Intumescent wrap strip.
    c. Firestop collar.
    d. Firestop device.
    e. Cast-in-place firestop device.
    f. <Insert material>

J. Firestopping for Miscellaneous Electrical Penetrants[**FS-**<#>]:

1. UL-Classified Systems: [**C-AJ-6006**] [**C-AJ-6017**] [**W-L-6019**].

2. Intertek ETL SEMKO-Listed Systems: <**Insert design number**>.
3. FM Global-Approved Systems: <**Insert design number**>.
4. F-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
5. T-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
6. L-Rating at Ambient: Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
7. L-Rating at 400 deg F (204 deg C): Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials:

    a. Intumescent sealant.
    b. Intumescent putties.
    c. Mortar.
    d. Firestop devices.
    e. <Insert material>

K. Firestopping for Miscellaneous Mechanical Penetrants[**FS-**<#>]:

1. UL-Classified Systems: [**C-AJ-7051**] [**C-AJ-7084**] [**W-L-7155**] [**W-L-7042**].
2. Intertek ETL SEMKO-Listed Systems: <**Insert design number**>.
3. FM Global-Approved Systems: <**Insert design number**>.
4. F-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
5. T-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
6. L-Rating at Ambient: Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
7. L-Rating at 400 deg F (204 deg C): Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials:

    a. Acrylic sealant.
    b. Intumescent sealant.
    c. Silicone sealant.
    d. <Insert material>

L. Firestopping for Groupings of Penetrants[**FS-**<#>]:

1. UL-Classified Systems: [**C-AJ-8099**] [**C-AJ-8143**] [**F-A-1022**] [**F-A-1023**] [**F-A-1066**] [**F-A-8016**] [**W-L-8065**] [**W-L-8071**].
2. Intertek ETL SEMKO-Listed Systems: <**Insert design number**>.
3. FM Global-Approved Systems: <**Insert design number**>.
4. F-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
5. T-Rating: [**1 hour**] [**2 hours**] <**Insert number of hours**>.
6. L-Rating at Ambient: Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
7. L-Rating at 400 deg F (204 deg C): Less than <**Insert cfm/sq. ft. (cu. m/s per sq. m)**>.
8. W-Rating: No leakage of water at completion of water leakage testing.
9. Type of Fill Materials:

    a. Intumescent sealant.
    b. Blocks/plugs.
    c. Mortar.
    d. Intumescent wrap strip.
    e. Firestop device.
    f. Intumescent composite sheet.

g. <Insert material>

END OF SECTION 078413

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: Furnishing of all materials and labor to complete caulking and sealing of all joints which require caulking or sealing.

B. Spaces noted on the Drawings to be caulked or sealed to make weathertight or neat appearing are included herein.

1. The extent of each form and type of joint sealer is indicated on Drawings and by provisions of this section.

2. The applications for joint sealers as work of this section include the following:

a. Pavement and sidewalk joints.
b. Concrete construction joints.
c. Floor joints (interior).
d. Wall joints (exterior).
e. Flashing and coping joints.
f. Interior wall/ceiling joints.
g. Gasketing of assemblies.

3. Refer to Division 8 sections for glazing requirements; not work of this section.

4. Refer to sections of Divisions 15 and 16 for joint sealers in mechanical and electrical work; not work of this section.

5. General Performance: Except as otherwise indicated, joint sealers are required to establish and maintain air-tight and waterproof continuous seals on a permanent basis, within recognized limitations of wear and aging as indicated for each application.

a. Failures of installed sealers to comply with this requirement will be recognized as failures of material and workmanship.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 02500 Paving and Surfacing
Section 03300 Cast-In-Place Concrete
Section 06100 Rough Carpentry
Section 06200 Finish Carpentry

1.02 SUBMITTALS:

A. Provide submittals in accordance with Section 01300.

B. Product Data: Submit manufacturer's product information, specifications, handling, installation and curing instructions, and performance tested data sheets for each elastomeric product required.

1.03 QUALITY ASSURANCE:

A. Qualifications of Manufacturers: Products used in the work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

B. Qualifications of Installers: Proper caulking and proper installation of sealants require that installers be thoroughly trained and experienced in the necessary skills and thoroughly familiar with the specified requirements.

C. For caulking and installation of sealants throughout the work, use only personnel who have been specifically trained in such procedures and who are completely familiar with the joint details shown on the Drawings and the installation requirements called for in this section.

1.04 PROJECT/SITE CONDITIONS:

A. Weather Conditions: Do not proceed with installation of liquid sealants under unfavorable weather conditions.

B. Install elastomeric sealants when temperature is in lower third of temperature range recommended by manufacturer for installation.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. General: Manufacturers listed in this article include those known to product the indicated category of prime joint sealer material, either as a nominally pure generic product or as an equivalent-performance modification thereof or proprietary product.

B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Manufacturers of acrylic latex sealant compounds:

a. VIP Enterprises, Inc.; Miami, FL
b. Sonneborn/Contech, Inc.; Minneapolis, MN
c. Gibson-Homans Co.; Cleveland, OH
d. W. R. Meadows, Inc.; Elgin, IL
e. Thoro Systems Products

2. Manufacturers of elastomeric sealants:

a. Dow Corning Corp.; Midland, MI
b. Gibson-Homans Co.; Cleveland, OH
c. Pecora Corp.; Harleysville, PA
d. Sonneborn/Contech, Inc.; Minneapolis, MN
e. Thoro Systems Products
f. Woodmont Products, Inc.; Huntington Valley, PA

3. Manufacturers of nonelastomeric sealants/caulks:

a. Gibson-Homans Co.; Cleveland, OH
b. W. R. Meadows, Inc.; Elgin, IL
c. Pecora Corp.; Harleysville, PA
d. Sonneborn/Contech, Inc.; Minneapolis, MN
e. Tremco, Inc.; Miami, FL

4. Manufacturers of joint fillers/sealant backers:

a. Dow Chemical Co.; Midland, MI
b. J & P Petroleum Products, Inc.; Dallas, TX
c. W. R. Meadows, Inc.; Elgin, IL
d. Sonneborn/Contech, Inc.; Minneapolis, MN
e. Williams Products, Inc.; Troy, MI

2.02 MATERIALS: *Note – All interior sealants must have low – VOC certification

A. General Sealer Requirements: Provide colors indicated or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

B. Type A, Single-Component Polysulfide Sealant: Except as otherwise indicated, provide manufacturer's standard, nonmodified, one-part, polysulfide-based, air-curing, elastomeric sealant; complying with either ASTM C 920 Type S Class 25, or FS TT-S-00230C Class A; self-leveling grade/type where used in joints of surfaces subject to traffic, otherwise nonsag grade/type.

C. Type B, Single-Component Polyurethane Sealant: Except as otherwise indicated, provide manufacturer's standard, nonmodified, one-part, polyurethane-based, air-curing, elastomeric sealant; complying with either ASTM C 920 Type S Class 25, or FS TT-S-00230C Class A; self-leveling grade/type where used in joints of surfaces subject to traffic, otherwise nonsag grade/type.

1. Bituminous Modification: Where joint surfaces contain or are contaminated with bituminous materials, provide manufacturer's modified type sealant compatible with joint surfaces (modified with coal tar or asphalt as required).

D. Type C, Single-Component Silicon Rubber Sealant: Except as otherwise indicated, provide manufacturer's standard, nonmodified, one-part, silicone-rubber-based, air-curing, nonsag, elastomeric sealant; complying with either ASTM C 920 Type S Class 25 Grade NS, or FS TT-S-001543A Class A Type Nonsag.

1. Sanitary Interior Type: Where indicated and where applied in high-humidity or wet service, provide manufacturer's mold/mildew-resistant, acid type sealants for application to nonporous sealant bond surfaces.

E. Type D, Acrylic-Emulsion Sealant: Provide acrylic-emulsion or latex-rubber-modified acrylic-emulsion sealant compound, permanently flexible, nonstaining and nonbleeding; recommended by manufacturer for protected exterior exposure and general interior exposure.

F. Bituminous and Fiber Joint Filler: Provide resilient and nonextruding type premolded bituminous-impregnated fiberboard units complying with ASTM D 1751; FS HH-F-341, Type I; or AASHTO M 213.

G. Joint Primer/Sealer: Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.

H. Bond Breaker Tape: Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant.

1. Provide self-adhesive tape where applicable.

I. Sealant Backer Rod: Provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant.

1. Where used with hot-applied sealant, provide heat-resistant type, which will not be deteriorated by sealant application temperature, as indicated.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Installer must examine substrates (joint surfaces) and conditions under which joint sealer work is to be performed, and must notify Contractor in writing of unsatisfactory conditions.

B. Do not proceed with joint sealer work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.02 PREPARATION:

A. Clean joint surfaces immediately before installation of gaskets, sealants or caulking compounds.

1. Remove dirt, insecure coatings, moisture and other substrates which could interfere with seal of gasket or bond of sealant or caulking compound.

2. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer.

3. Roughen vitreous and glazed joint surfaces as recommended by sealant manufacturer.

B. Prime or seal joint surfaces where indicated, and where recommended by sealant manufacturer.

C. Confine primer/sealer to areas of sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.03 INSTALLATION:

A. Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.

B. Set joint filler units at depth or position in joint as indicated to coordinate with other work, including installation of bond breakers, backer rods and sealants.

1. Do not leave voids or gaps between ends of joint filler units.

C. Install sealant backer rod for liquid-applied sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for application indicated.

D. Install bond breaker tape where indicated and where required by manufacturer's recommendations to ensure that liquid-applied sealants will perform as intended.

E. Employ only proven installation techniques, which will ensure that sealants are deposited in uniform, continuous ribbons without gaps or air pockets, with complete "wetting" of joint bond surfaces equally on opposite sides.

1. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slighting below adjoining surfaces.

2. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove so that joint will not trap moisture and dirt.

F. Install liquid-applied sealant to depths as shown; or, if not shown, as recommended by sealant manufacturer, but within the following general limitations, measured at center (thin) section of beads (not applicable to sealants in lapped joints).

1. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.

2. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.

3. For joints sealed with nonelastomeric sealants and caulking compounds, fill joints to a depth in range of 75% to 125% of joint width.

G. Spillage: Do not allow sealants or compounds to overflow from confines of joints, or to spill onto adjoining work, or to migrate into voids of exposed finishes.

1. Clean adjoining surfaces by whatever means may be necessary to eliminate evidence of spillage.

3.04 APPLICATION:

A. Type A, Polysulfide Sealant: Apply in accordance with manufacturer's instructions for sealing cracks or joints on masonry, concrete, bricks, stone, tile, glass, aluminum, or stainless steel.

B. Type B, Polyurethane Sealant: Apply in accordance with manufacturer's instructions instead of Type A on similar material where Type A can be used.

C. Type C, Silicone Rubber Sealant: Use various categories of this type for above ground applications in accordance with manufacturer's instructions.

D. Type D, Acrylic Type Sealant: Use this type to caulk surfaces which are slated to receive paint finish.

1. Apply as recommended by product manufacturer.

3.05 PROTECTION:

A. Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability.

B. Advise Contractor of procedures required for cure and protection of joint sealers during construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at time of substantial completion.

C. Cure and protect sealants in a manner which will minimize increases in modulus of elasticity and other accelerated aging effects.

D. Replace or restore sealants which are damaged or deteriorated during construction period.

END OF SECTION 07900

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: Furnish and install all wood doors, complete in place with finish hardware and accessories installed, as specified herein and as required for a complete and proper installation. See the drawings for door locations and door schedule.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following:

Section 06200 Finish Carpentry
Section 08100 Metal Doors and Frames
Section 08700 Builders Hardware

1.02 REFERENCES:

A. Codes and Standards: Comply with provisions of the following codes, specifications and standards except where more stringent requirements are shown or specified.

1. Uniform Building Code (UBC), latest edition.

2. Iowa State Building Code, latest edition.

3. National Wood Windows and Door Association (NWWDA) standards.

a. General requirements for wood flush doors I.S.1.1.

b. Solid core wood flush doors I.S.1.2.

c. Hollow core wood flush doors I.S.1.3.

d. Special construction wood flush doors I.S.1.4.

e. Specified options for wood flush doors I.S.1.5.

f. Testing and inspection requirements for wood flush doors I.S.1.6.

g. Hardware location for wood flush doors I.S.1.7.

4. Underwriter's Laboratories.

1.03 SUBMITTALS:

A. Provide submittals in accordance with Section 01300.

B. Product Data: Submit manufacturer's specifications for fabrications and installation, including data substantiating that products comply with requirements.

C. Shop Drawings: Submit for fabrication and installation of wood 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 finish hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.

1.04 QUALITY ASSURANCE:

A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

B. In addition to complying with pertinent codes and regulations of governmental agencies having jurisdiction, comply with:

1. "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute, for the grade or grades specified.

2. Certification and stamps will not be required.

1.05 DELIVERY, STORAGE, AND HANDLING:

A. Delivery:

1. Deliver doors to site after plaster and cement are dry, and after the building has reached average prevailing humidity of its locality.

2. Deliver prefinished doors in manufacturer's original containers, clearly marked with manufacturer's name, brand name, size, thickness, and identifying symbol on the covering.

3. Seal all four edges of unfinished doors when delivered to the job site.

B. Storage:

1. Stack flat on 2" x 4" lumber, laid 12" from ends and across center.

2. Under bottom door and over top of stack, provide plywood or corrugated cardboard to protect door surfaces.

3. Store doors in clean area where there will be no great variations in heat, dryness, and humidity.

4. If they are to be stored for an extended period of time, seal doors with a non-water base sealer or primer.

C. Handling:

1. Do not expose to excessive moisture, heat, dryness, or direct sunlight.

2. Handle with clean hands or with clean gloves.

3. Do not drag doors across one another; lift doors and carry them into position.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Subject to compliance with requirements, products manufactured by, but not limited to, the following may be incorporated in the work of this section.

1. Georgia-Pacific
2. Eggers Industries
3. Glen-Mar Door Manufacturing Company
4. IPIK Door Company, Inc.
5. Weyerhauser Company
6. Graham Manufacturing Corporation, Marshfield, WI
7. Haley Bros. Inc. Buena Park, CA.
8. Mohawk Flush Doors Inc., South Bend IN.

2.02 MATERIALS:

A. Provide panel wood doors of the types, designs, and thicknesses shown on the Door Schedule in the Drawings, labeled or non-labeled as indicated and required, and in solid core or hollow core as shown on the Door Schedule.

1. Solid Core: At Contractor's option provide mat-formed wood particle board core, other mat-formed particleboard core, glued block core, framed block glued core, framed block non-glued core, or stile and rail core.

B. Grade: Except as may be shown otherwise on the Drawings, fabricate the work of this section to "custom grade" standards of the referenced organization.

D. Species:

1. Provide Grade “A” Custom Hard Maple faces for clear finish.

E. Site finish or mill finish wood doors in accordance with provisions of Section 09900 of these specifications.

2.03 FABRICATION:

A. Verify opening size, exact wall materials and partition thickness prior to frame fabrication.

B. Fabrication work to provide the following maximum clearances:

1. 1/8 inch between doors and side and head jamb members.
2. 1/16 inch between door hinge edge and jamb member.
3. 3/4 inch maximum between door and floor.
4. 1/4 inch above carpet.
5. 3/16 inch between door threshold or saddle or as required for weatherstripping at threshold.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Examine the areas and conditions under which work of this section will be performed.

B. Correct conditions detrimental to timely and proper completion of the work.

C. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION:

A. Field Finishing:

1. Insure that building atmosphere is dried to a normal, interior relative humidity.

2. Remove all handling marks, raised grain and other undesirable blemishes by sanding all surfaces with 100 to 150 fine grit abrasive.

3. Seal all exposed wood surfaces including top and bottom rails.

4. Apply finish specified in section 09900 in accordance with manufacturer's recommendation.

3.03 INSTALLATION:

A. Fitting and Machining:

1. Unless doors are completely fitted and machined at the mill, fit them for width by planing and fit them for height by sawing.

2. Machine doors for hardware in accordance with recommendations of the hardware manufacturers, upon approval of these recommendations by the Architect.

3. Do not impair utility or structural strength of door in fitting to opening, applying hardware, preparing for louvers or other detailing.

4. Unless otherwise specified elsewhere, apply sealer, primer or first coat of specific finish on exterior doors, immediately after fitting, cutting for hardware, weatherstripping, and other required items, and before the installation of these.

B. Receive and retain custody of finish hardware furnished for the work of this section under Section 08710 of thesespecifications and, except as otherwise directed by the Architect, install all such finish hardware in strict accordance with the recommendations of its manufacturer.

C. Replace or rehang doors which are hingebound and do not swing or operate freely.

3.04 SCHEDULES:

A. Interior solid core, flush wood doors: 1-3/4 inches thick for doors 2'-8" wide and wider and 1-3/8 inches thick for doors 2'-6" wide and narrower.

END OF SECTION 08210

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass double-hung windows.

1.2 RELATED SECTIONS

A. Section 07920 (079200) - Joint Sealants: Sealants and caulking.

1.3 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
   1. AAMA 502 - Voluntary Specification for Field Testing of Windows and Sliding Doors.
   2. AAMA 613 - Voluntary Performance Requirements and Test Procedures for Organic Coatings on Plastic Profiles.

B. American Society for Testing and Materials (ASTM):
   1. ASTM C 1036 - Flat Glass.
   2. ASTM C 1048 - Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass.
   3. ASTM D 3656 - Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns.
   4. ASTM E 283 - Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
   5. ASTM E 547 - Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Differential.

C. Screen Manufacturers Association (SMA):
   1. SMA 1201 - Specifications for Insect Screens for Windows, Sliding Doors and Swinging Doors.

D. Window and Door Manufacturers Association (WDMA):
   1. ANSI/AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors.

1.4 PERFORMANCE REQUIREMENTS

A. Windows shall meet Rating specifications in accordance with ANSI/AAMA/NWWDA 101/I.S.2.

B. Window Air Leakage, ASTM E 283: Window air leakage when tested at 1.57 psf (25 mph) shall be 0.25 cfm/ft^2 of frame or less.

C. Window Water Penetration, ASTM E 547: No water penetration through window when tested under static pressure of 4.5 psf (42 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 8 gallons per hour per square foot.

1.5 SUBMITTALS

A. Submit in accordance with Division 1 requirements.

B. Product Data: Submit manufacturer's product data, including installation instructions.

C. Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.

1.6 QUALITY ASSURANCE

A. Mockup:
   1. Provide sample installation for field testing window performance requirements and to determine acceptability of window installation methods.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site undamaged in manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.

B. Storage:
   1. Store materials in accordance with manufacturer's instructions.
   2. Store materials off ground and under cover.
   3. Protect materials from weather, direct sunlight, and construction activities.

C. Handling: Protect materials and finish during handling and installation to prevent damage.

PART 2 PRODUCTS

2.1 MANUFACTURER

A. Basis of Design: Pella Corporation, 102 Main Street, Pella, Iowa 50219. Toll Free (800) 54-PELLA. Phone (641) 621-1000. Website www.pella.com.

2.2 FIBERGLASS DOUBLE-HUNG WINDOWS

A. Double-Hung Windows: Pella Impervia.
   1. Factory-assembled window with sash installed in frame.
   2. Frame and Sash Material: Duracast. 5-layer, pultruded-fiberglass material, reinforced with interlocking mat.

B. Frame:
   1. Type: New construction frame
   2. Overall Frame Depth: 3 inches for Block frame and New Construction frame; 3-1/4 inches for Precision Fit frame.
   3. Nominal Wall Thickness of Fiberglass Members: 0.050 inch to 0.070 inch.
   4. Frame Corners:
      a. Mitered at head and jamb on 10 degree sill.
      b. Joined and bonded with nylon corner lock, with thermoset polyurethane adhesive and mechanically fastened.
   6. Jambs: Factory-drilled, counter-bored, installation screw holes.

C. Sash:
   1. Lower Sash: Lower sash vent, tilts for cleaning exterior glass.
   2. Upper Sash: Upper sash vent, tilts for cleaning exterior glass.
   3. Sash Corners:
      a. Mitered.
      b. Bonded and sealed with injected thermoset polyurethane adhesive.

E. Glazing:
   1. Float Glass: ASTM C 1036, Quality 1.
   2. Type: Tape-glazed, 11/16-inch thick, insulating glass, multi-layer Low-E coated with argon.

F. Weather Stripping:
   1. Vent Upper Sash: Fin-type pile on jambs, top rail and stile.
   2. Vent Lower Sash: Vinyl-wrapped foam at sill on frame and bottom rail.

2.3 OPTIONS

A. Grilles:
   1. Insulating Glass: Contain 3/4-inch, contoured, aluminum grilles between the glass.
   2. Finish: Factory-finished. Match window frame.

B. Insect Screens:
   1. Compliance: ASTM D 3656 and SMA 1201.
   2. Screen Cloth: Half- or full-size with black, vinyl-coated, 18/16 mesh, fiberglass screen cloth set in aluminum frame fitted to outside of window.
   3. Complete with necessary hardware.
   4. Screen Frame Finish: Baked enamel.
      a. Color: Match window exterior.

2.4 HARDWARE

A. Balances: Galvanized steel block-and-tackle balances.

B. Lock:
   1. Type: Self-aligning, cam-action lock.
   2. Windows 37 Inches Wide or Greater: 2 locks.
   3. Finish: BROWN.

C. Tilt Latches:
   1. Glass reinforced Nylon 6
   2. Integrated into sash corner
   3. Finish is matte gray

D. Lower Sash Lift: Integrated into Duracast checkrail.

E. Upper Sash Lift: Color-in ABS Resin.

2.5 TOLERANCES

A. Windows shall accommodate the following opening tolerances:
   1. Vertical Dimensions Between High and Low Points: Plus 1/4-inch, minus 0 inch.

2. Width Dimensions: Plus 1/4-inch, minus 0 inch.
3. Building Columns or Masonry Openings: Plus or minus 1/4-inch from plumb.

2.6 FINISH

A. Exterior and Interior Duracast Finish: Factory-applied powder-coat paint, comply with AAMA 613.

1. Color: BROWN.

2.7 INSTALLATION ACCESSORIES

A. Flashing/Sealant Tape: Pella SmartFlash.
1. Aluminum-foil-backed butyl window and door flashing tape.
2. Maximum Total Thickness: 0.013 inch.
3. UV resistant.
4. Verify sealant compatibility with sealant manufacturer.

B. Exterior Perimeter Sealant: Geocel Proflex Tripolymer Sealant.

C. Insulating-Foam Sealant: Dow Chemical Great Stuff Window and Door Insulating Foam Sealant.
1. Low-pressure, polyurethane window and door insulating-foam sealant.

2.8 SOURCE QUALITY CONTROL

A. Factory Testing: Factory test individual standard operable windows for air infiltration in accordance with ASTM E 283, to ensure compliance with this specification.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive windows. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install windows in accordance with manufacturer's instructions.

B. Install windows to be weather-tight and freely operating.

C. Maintain alignment with adjacent work.

D. Secure assembly to framed openings, plumb and square, without distortion.

E. Integrate window system installation with exterior water-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with water-resistant barrier using watershed principles in accordance with window manufacturer's instructions.

F. Place interior seal around window perimeter to maintain continuity of building thermal and air barrier using insulating-foam sealant.

G. Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly.

H. Leave windows closed and locked.

3.3 FIELD QUALITY CONTROL

A. Field Testing: Field-test windows in accordance with AAMA 502, Test Method A.

3.4 CLEANING

A. Clean window frames and glass in accordance with Division 1 requirements.

B. Do not use harsh cleaning materials or methods that would damage finish or glass.

C. Remove labels and visible markings.

3.5 PROTECTION

A. Protect installed windows to ensure that, except for normal weathering, windows will be without damage or deterioration at time of substantial completion.

END OF SECTION

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes: The furnishing of all materials and labor to install all Builders' Hardware with suitable fastenings for completed work in accordance with the Drawings and Specifications.

1. Quantities listed in each instance are for the Contractor's convenience only and are not guaranteed. Items not specifically mentioned but necessary to complete the work shall be furnished, matching in quality and finish the items specified for similar locations.

a. Should any item listed herein be incorrect due to construction details, it shall be the Hardware Supplier's responsibility to furnish the proper item at no additional cost to the Owner.

2. Types of items in this section may include, but are not necessarily limited to, the following:

a. Hinges
b. Pivots
c. Spring hinges
d. Lock cylinders and keys
e. Lock and latch sets
f. Bolts
g. Exit devices
h. Push/pull units
i. Sliding door equipment
j. Bi-fold door hardware
k. Closers
l. Overhead holders
m. Miscellaneous door control devices
n. Door trim units
o. Protection plates

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements as well as, but not necessarily limited to, the following.

Section 06200 Finish Carpentry
Section 08100 Metal Doors and Frames
Section 08200 Wood Doors
Section 08360 Sectional Overhead Doors

1.02 REFERENCES:

A. Builders' Hardware Manufacturer Association numbers taken from the following BHMA standards. Provide products complying with these standards and requirements specified elsewhere in this section.

1. Butts and Hinges: ANSI A156.1 (BHMA 101)
2. Locks and Lock Trim: ANSI A156.2 (BHMA 601)
3. Exit Devices: ANSI A156.3 (BHMA 701)
4. Door Controls - Closers: ANSI A156.5 (BHMA 501)
5. Auxiliary Locks: ANSI A 156.5 (BHMA 501)
6. Architectural Door Trim: ANSI A156.6 (BHMA 1001)
7. Template Hinge Dimensions: ANSI A156.7
8. Door Controls - Overhead Holders: ANSI A156.8 (BHMA 311)
9. Mortise Locks and Latches: ANSI A156.13 (BHMA 621)
10. Sliding and Folding Door Hardware: ANSI A1567.14 (BHMA 401)
11. Spring Hinges: BHMA 1101
12. Auxiliary Hardware: BHMA 1201

B. Federal Specification numbers taken from following federal specifications. Provide products complying with these specifications and requirements specified elsewhere in this section.

1. Locks and Door Trim: FS FF-H-106
2. Hinges: FS FF-H-116
3. Shelf & Miscellaneous Builders' Hardware: FS FF-H-111
4. Door Closers: FS FF-H-121

C. American National Standard Institute (ANSI)

1. ANSI A117.1 - Specifications for making buildings and facilities accessible to, and usable by, physically handicapped people.

1.03 DEFINITIONS:

A. Definition: "Builders' Hardware" includes items known commercially as builders' hardware which are required for swing, sliding and folding doors, except special types of unique and nonmatching hardware specified in the same section as the door and door frame.

1.04 SUBMITTALS:

A. Provide submittals in accordance with Section 01300.

B. Product Data: Submit manufacturer's technical information for each item of hardware, including whatever information may be necessary to show compliance with requirements, and instructions for installation and for maintenance of operating parts and finish.

C. Hardware Schedule: Submit final hardware schedule in manner indicated below, for coordination of work.

D. Final Hardware Schedule Content: Based on builders' hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening, including the following information:

1. Type, style, function, size and finish of each hardware item.

2. Name and manufacturer of each item.

3. Fastenings and other pertinent information.

4. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.

5. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.

6. Mounting locations for hardware.

7. Door and frame sizes and materials.

8. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instruction on keying of locks has been fulfilled.

E. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of builders' hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule.

1. Samples will be returned to the supplier.

2. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

1.05 QUALITY ASSURANCE:

A. Manufacturer: Obtain each kind of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: A recognized builders' hardware supplier who has been furnishing hardware in the project's vicinity for a period of not less than two (2) years, and who is or employs an experienced hardware consultant who is available at reasonable times during the course of the work for consultation about project's hardware requirements to Owner, Architect, and Contractor.

C. Installer: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Packaging of hardware on a set-by-set basis is the responsibility of the supplier.

1. As material is received by the hardware supplier from the various manufacturers, sort and repackage in containers marked with the hardware set number.

2. Two or more identical sets may be packed in the same container.

B. Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

C. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control handling and installation of hardware items which are not immediately replaceable so that the completion of the work will not be delayed by hardware losses both before and after installation.

1.07 SEQUENCING AND SCHEDULING:

A. Coordination: Coordinate hardware with other work. Tag each item or package separately with identification related to the final hardware schedule, and include basic installation instructions in the package.

1. Furnish hardware items of proper design for use on doors and frames of the thicknesses, profile, swing, security and similar requirements indicated as necessary for proper installation and function.

2. Deliver individually-packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

B. Templates: Furnish hardware templates to each fabricator of doors, frames, and other work to be factory-prepared for the installation of hardware.

1. Upon request, check the Shop Drawings of such other work to confirm that adequate provisions are made for the proper installation of hardware.

1.08 MAINTENANCE:

A. Instruct Owner's personnel in proper adjustment and maintenance of hardware and hardware finishes during the final adjustment of hardware.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Subject to compliance with the requirements, products from, but not limited to, the following can be incorporated in the work of this section: Refer to sheet A-600

B. Hardware Manufacturer Designation: Listed names of manufacturers and products, names and numbers in "schedule" are used to establish minimum requirements for design, grade, function, finish, size, and other distinctive quality for each type of buildings' hardware specified for this project.

1. Provide the product designated or comparable product from another manufacturer complying with requirements including those specified elsewhere in this section.

C. Selected Manufacturers: Refer to Sheet A-600

2.02 MATERIALS:

A. General:

1. Hand of Door: The Drawings show the direction of slide, swing or hand of each door leaf.

a. Furnish each item of hardware for proper installation and operation of the door movement as shown.

2. Base Metals: Produce hardware units of the basic metal and forming method indicated, using the manufacturer's standard metal alloy, composition, temper and hardness, but in no case of lesser (commercially recognized) quality than specified for the applicable hardware units by FS FF-H-106, FS FF-G-111, FS FF-H-116 and FS FF-H-121.

a. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.

3. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation.

a. Do not provide hardware which has been prepared for self-tapping sheet metal screws, ubless specifically indicated.

4. Furnish screws for installation with each hardware item.

a. Provide Phillips flat-head screws except as otherwise indicated.

b. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

5. Provide concealed fasteners for hardware units which are exposed when the door is closed, except to the extent no standard units of the type specified are available with concealed fasteners.

a. Do not use through bolts for installation where the bolt head or the nut on the opposite face is exposed in other work, except where it is not feasible to adequately reinforce the work.

6. Tools for Maintenance: Furnish a complete set of specialized tools as needed for Owner's continued adjustment, maintenance, and removal and replacement of builders' hardware.

B. Hinges, Butts, and Pivots:

1. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

2. Screws: Furnish Phillips flat-head all-purpose or machine screws for installation of units, except furnish Phillips flat-head all-purpose or wood screws for installation of units into wood.

a. Finish screw heads to match surface of hinges or pivots.

3. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

a. Steel Hinges: Steel pins.

b. Nonferrous Hinges: Stainless steel pins.

c. Exterior Doors: Nonremovable pins.

d. Out-Swing Corridor Doors: Nonremovable pins.

e. Interior Doors: Nonrising pins.

f. Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.

g. Number of Hinges: Provide number of hinges indicated, but not less than three (3) hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.

C. Lock Cylinders and Keying:

1. Standard System: Except as otherwise indicated, provide new masterkey system for project.

2. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), either new or integrated with Owner's existing system.

3. Equip locks with manufacturer's standard six-pin tumbler cylinders.

4. Comply with Owner's instructions for masterkeying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

5. Key Material: Provide keys of nickel silver only.

6. Key Quantity: Furnish three (3) change keys for each lock; five (5) master keys for each master system; and five (5) grandmaster keys for each grandmaster system.

7. Deliver keys to Owner's representative.

D. Locks, Latches and Bolts:

1. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

   a. Provide standard (open) strike plates for interior doors of residential units where wood door frames are used.

2. Lock Throw: Provide five-eighths inch (5/8") minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings.

   a. Provide one-half inch (1/2") minimum throw on other latch and deadlock bolts.

3. Flush Bolt Heads: Minimum of one-half inch (1/2") diameter rods of brass, bronze or stainless steel, with minimum of twelve-inch (12") long rod.

4. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation; through-bolted for matched pairs, but not for single units.

E. Closers:

1. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

   a. Where parallel arms are indicated for closures, provide closer unit one size larger than recommended for use with standard arms.

   b. Provide parallel arms for all overhead closers, except as otherwise indicated.

2. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A 117.1 provisions for door opening force and delayed action closing.

3. Provide matching finishes for hardware units at each door or opening to the greatest extent possible and except as otherwise indicated.

   a. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening.

   b. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

4. Provide finishes which match those established by BHMA or, if none established, match the Architect's sample.

    a. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.

5. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze and aluminum except as otherwise indicated.

    a. The suffix "-NL" is used with standard finish designations to indicate "No Lacquer."

6. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in "Materials and Finishes Standard 1301" by BHMA, including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Mount hardware units at heights indicated in "Recommended Locations for Builders' Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by the Architect.

B. Mount hardware units at heights indicated in "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by the Architect.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations.

1. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division sections.

2. Do not install surface-mounted items until finishes have been completed on the substrate.

D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

E. Drill and countersink units which are not factory-prepared for anchorage fasteners.

1. Space fasteners and anchors in accordance with industry standards.

3.02 ADJUSTING:

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit.

B. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

3.03 SCHEDULES: Refer to Sheet A-600

END OF SECTION 08700

PART 1 - GENERAL

1.01 SUMMARY:

A. Section Includes:

1. Extent of painting work is shown on Drawings and Schedules, and as herein specified.

2. The work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, as indicated on the Drawings.

a. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

B. The work of this section also includes backpriming of non-exposed surfaces where shown and as specified herein.

3. Paint exposed surfaces whether or not colors are designated in "schedules," except where natural finish of material is specifically noted as a surface not to be painted.

a. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas.

b. If color or finish is not designated, Architect will select these from standard colors available for materials systems specified.

4. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items.

a. Also, for fabricated components such as architectural woodwork, wood casework, and factory-built or shop-fabricated mechanical and electrical equipment or accessories.

5. Prefinished Items: Unless otherwise indicated, do not include painting when factory finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment including light fixtures, switchgear and distribution cabinets, elevator entrance frames, doors and equipment.

6. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as wells or ceilings in concealed areas and generally inaccessible areas, foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts, and elevator shafts.

7. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting, unless otherwise indicated.

8. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting, unless otherwise indicated.

9. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

B. Related Sections: Drawings and General Provisions of the contract, including the General Covenants and Provisions, Supplementary Covenants and Provisions and General Requirements.

1.02 DEFINITIONS:

A. "Paint," as used herein, means coating systems materials including primers, emulsions, epoxy, enamels, sealer, fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.03 SYSTEM DESCRIPTION:

A. Review Finish Schedule Sheet A-600

1.04 SUBMITTALS:

A. Provide submittals in accordance with Section 01300.

B. Product Data: Submit manufacturer's technical information including paint label analysis, color selection catalogs and application instructions for each material proposed for use.

C. Samples: Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

D. On 12" x 12" hardboard, provide two samples of each color and material, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved.

E. On actual wood surfaces, provide two 4" x 8" samples of natural and stained wood finish. Label and identify each as to location and application.

1.05 QUALITY ASSURANCE:

A. Qualification of Manufacturer: Products used in the work of this section shall be produced by manufacturers regularly engaged in manufacture of similar items and with a history of successful production acceptable to the Architect.

B. Qualification of Workers:

1. Provide at least one person who shall be present at all times during execution of the work of this section, who shall be thoroughly familiar with the specified requirements and the materials and methods needed for their execution, and who shall direct all work performed under this section.

2. Provide adequate numbers of workers skilled in the necessary crafts and properly informed of the methods and materials to be used.

3. In acceptance or rejection of the work of this section, the Architect will make no allowance for lack of skill on the part of workers.

1.06 DELIVERY, STORAGE, AND HANDLING:

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

1. Name or title of material.
2. Fed. Spec. Number, if applicable.
3. Manufacturer's stock number and date of manufacturer.
4. Manufacturer's name.
5. Contents by volume, for major pigment and vehicle constituents.
6. Thinning instructions.
7. Application instructions.
8. Color name and number.

B. Material delivered damaged, open, or in containers not properly labeled will be rejected by the DNR Construction Inspector.

C. Promptly remove unacceptable material from the job site, and promptly replace with material meeting the specified requirements, at no additional cost to the Owner.

1.07 PROJECT/SITE CONDITIONS:

A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50°F. (10°C) and 90°F. (32°C), unless otherwise permitted by paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45°F. (7°C) and 95°F. (35°C), unless otherwise permitted by paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist; or when relative humidity exceed 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.

D. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

1.08 SEQUENCING AND SCHEDULING:

A. Coordination with other trades: Do not start work of this section until the work of other trades, unless otherwise specified, has been completed in the areas to be painted.

B. Follow manufacturer's instructions and schedule sufficient drying time between coats to achieve maximum thickness.

1. Exterior System: Unless otherwise recommended by paint system manufacturer, do not apply second and third coats until a minimum of 16 hours has elapsed since preceding application.

2. Interior System: Unless otherwise recommended by the paint system manufacturer, do not apply the second and third coats, if any, until a minimum of 34 hours has elapsed since preceding application.

C. The DNR Construction Inspector may require notification of starting and finishing times for each coat in order to verify complete and proper application of each system under this contract.

1.09 MAINTENANCE:

A. Provide manufacturer recommended maintenance instructions in accordance with Section 01730.

B. Maintenance by Owner: In addition to following the recommended maintenance instruction provided by the Contractor, the owner representative will:

1. Unless otherwise indicated in the manufacturer's instruction, recoat exterior wood every three (3) years, as follows;

a. Power wash exterior structure as specified in part 3 of this section and in accordance with the manufacturer's recommended procedures.

b. Allow wood to dry for three (3) Days.

c. Unless otherwise recommended, apply one coat of the same product used as third coat in the initial application.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work of this section include:

1. ICI Delux Paints, Cleveland, OH
2. Iowa Paint Manufacturing Co., Des Moines, IA
3. Fuller-O'Brien Paints and Coatings, San Francisco, CA
4. Diamond Vogel Paint, Marshalltown, IA
5. Sherwin-Williams Co., Cleveland, OH
6. Pittsburg Paints, PPG Industries, Inc., Pittsburg, PA

7. Sikkens Woodfinishes, Division of Akzo Coatings Inc., Troy, Michigan
8. Enviro-Chem, Inc., Walla Walla, Washington

2.02 MATERIALS:

A. Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Provide undercoat paint produced by same manufacturer as finish coats.

1. Use only thinners approved by paint manufacturer, and use only within recommended limits.

C. Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates.

1. Upon request from other trades, furnish information on characteristics of finish materials proposed for use, to ensure compatible prime coats are used.

2. Provide barrier coats over incompatible primers or remove and reprime as required.

3. Notify Architect in writing of any anticipated problems using specified coating systems with substrates primed by others.

D. Color Pigments: Pure, nonfading, applicable types to suit substrates and service indicated.

1. Lead content in pigment, if any, is limited to contain not more than 0.5% lead, as lead metal based on the total nonvolatile (dry-film) of paint by weight.

2. This limitation is extended to interior surfaces and those exterior surfaces, such as stairs, decks, porches, railings, windows, and doors which are readily accessible to children under seven years of age.

E. Schedules: Paint colors, surface treatments, and finishes are indicated in "schedules" of the contract documents. Except as noted, listed coating names, numbers, and colors are used to establish the quality, type and color of coating.

1. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

2. Manufacturer's products which comply with coating qualitative requirements of applicable Federal Specifications, yet differ in quantitative requirements, may be considered for use when acceptable to Architect.

a. Furnish material data and manufacturer's certificate of performance to Architect for any proposed substitutions.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work.

1. Do not proceed with work until satisfactory conditions have been corrected in a manner acceptable to Applicator.

B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.02 PREPARATION:

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instruction and as herein specified, for each particular substrate condition.

B. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations.

1. Remove, if necessary, for complete painting of items and adjacent surfaces.

2. Following completion of painting of each space or area, reinstall removed items.

C. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning.

1. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly painted surfaces.

D. Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests.

1. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint.

2. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

E. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required.

1. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat.

2. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler and sandpaper smooth when dried.

G. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, and paneling.

H. When transparent finish is required, use spar varnish for backpriming.

I. Backprime paneling on interior partitions only where masonry, plaster, or other wet wall construction occurs on backside.

J. Seal tops, bottoms, and cut-outs of unprimed wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to job.

K. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning.

1. Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications.

2. Clean and touch-up with same type of shop primer.

L. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent.

M. Material:

1. Mix and prepare painting materials in accordance with manufacturer's directions.

2. Store materials not in actual use in tightly covered containers.

3. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

4. Stir materials before application to produce a mixture of uniform density, and stir as required during application.

5. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.03 APPLICATION:

A. General: Apply paint in accordance with manufacturer's directions.

1. Use applicators and techniques best suited for substrate and type of material being applied.

B. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color, and appearance.

1. Pay special attention to ensure that surfaces, including edges, corners, crevices welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

C. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces.

1. Paint surfaces behind permanently fixed equipment of furniture with prime coat only before final installation of equipment.

D. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.

E. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.

F. Sand lightly between each succeeding enamel or varnish coat.

G. Unless otherwise indicated, omit primer coat on metal surfaces which have been shop-primed and touch-up painted,

H. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

I. Allow sufficient time between successive coatings to permit proper drying.

1. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

J. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

K. Prime Coats: Apply prime coat on material required to be painted, and which has not been prime coated by others.

L. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

M. Completed Work: Match approved samples for color, texture, and coverage.

1. Remove, refinish or repaint work not in compliance with specified requirements.

3.04 CLEANING:

A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each workday.

B. Upon completion of painting work, clean window glass and other paint-spattered surfaces.

1. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.05 PROTECTION:

A. Protect work of other trade, whether to be painted or not, against damage by painting and finishing work.

1. Correct any damage by cleaning, repairing or replacing, and repainting as acceptable to Architect.

B. Provide "Wet Paint" signs as required to protect newly painted finishes.

1. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

3.06 SCHEDULES:

A. Provide the following paint finishes by ICI Delux Paints or other manufacturers of equal products as specified herein.

B. EPS-1: Exterior Alkyd Enamel - Ferrous Metals:

1st Coat -	Alkyd Metal Primer	Devoe DevGuard No. 4160
2nd Coat -	Alkyd Gloss Enamel	Devoe DevGuard No. 4308 Series
3rd Coat -	Alkyd Gloss Enamel	Devoe DevGuard No. 4308 Series

c. EPS-2: Exterior Alkyd Enamel - Galvanized and Aluminum Metals:

1st Coat -	Alkyd Metal Primer	Devoe DevGuard No. 4129
2nd Coat -	Alkyd Gloss Enamel	Devoe DevGuard No. 4308
3rd Coat -	Alkyd Gloss Enamel	Devoe DevGuard No. 4308

E. IPS-1: Interior Latex Emulsion (Semi-Gloss) - Gypsum Wallboard

1st Coat -	Primer Sealer	Ultra-Hide No. 1060
2nd Coat -	Latex Enamel	Ultra-Wall No. 1434
3rd Coat -	Latex Enamel	Ultra-Wall No. 1434

F. IPS-2: Interior Alkyd Enamel (Semi-Gloss) – Woodwork - Plywood

1st Coat -	Alkyd Primer	Ultra-Hide No. 1120
2nd Coat -	Alkyd Enamel	Ultra-Hide No. 1516
3rd Coat -	Alkyd Enamel	Ultra-Hide No. 1516

G. IPS-3: Interior Alkyd Enamel - Ferrous Metals:

1st Coat -	Alkyd Metal Primer	Devoe DevGuard No. 4160
2nd Coat -	Alkyd Gloss Enamel	Devoe DevGuard No. 4308 Series

3rd Coat -	Alkyd Gloss Enamel	Devoe DevGuard No. 4308 Series

H. IPS-4: Interior Alkyd Enamel - Galvanized and Aluminum Metals:

1st Coat -	Alkyd Metal Primer	Devoe DevGuard No. 4129
2nd Coat -	Alkyd Gloss Enamel	Devoe DevGuard No. 4308
3rd Coat -	Alkyd Gloss Enamel	Devoe DevGuard No. 4308

I. IPS-5: Interior Urethane Varnish (satin Sheen) - Protected Wood:

1st Coat -	Oil Stain Semi-Transp.	Woodpride No. 1700
2nd Coat -	Urethane Alkyd	Woodpride No. 1902
3rd Coat -	Urethane Alkyd	Woodpride No. 1902

END OF SECTION 09900

SECTION 15058

COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general requirements for single-phase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
   1. Motor controllers.
   2. Torque, speed, and horsepower requirements of the load.
   3. Ratings and characteristics of supply circuit and required control sequence.
   4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
   1. Permanent-split capacitor.
   2. Split phase.
   3. Capacitor start, inductor run.
   4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 15058

SECTION 15061

HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Metal pipe hangers and supports.
   2. Thermal-hanger shield inserts.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
   1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
   2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
   3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
   4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:
   1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
   2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
   3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig or ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

C. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

D. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

E. Install lateral bracing with pipe hangers and supports to prevent swaying.

F. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

G. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

H. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

I. Insulated Piping:
   1. Attach clamps and spacers to piping.
      a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
      b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
      c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
   2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
      a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
   4. Shield Dimensions for Pipe: Not less than the following:
      a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
      b. NPS 4: 12 inches long and 0.06 inch thick.
   5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.3 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
   2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
   3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
   4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
   5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
   6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
   9. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
   10. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
   11. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
   12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.

13. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
14. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
15. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
16. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
17. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
18. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
19. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
20. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.

6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

END OF SECTION 15061

SECTION 15076

IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Equipment labels.
   2. Pipe labels.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
   1. Material and Thickness: Brass, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
   2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   4. Fasteners: Stainless-steel rivets or self-tapping screws.
   5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
   2. Letter Color: Black.
   3. Background Color: White.
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as plenums; and exterior exposed locations as follows:
1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:
   1. Domestic Water Piping:
      a. Background Color: White.
      b. Letter Color: Black.
   2. Sanitary Waste Piping:
      a. Background Color: White.
      b. Letter Color: Black.

END OF SECTION 15076

SECTION 15077

IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Equipment labels.
   2. Pipe labels.

1.3 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:
   1. Material and Thickness: Brass, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
   2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
   3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
   4. Fasteners: Stainless-steel rivets or self-tapping screws.
   5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:
   1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
   2. Letter Color: Black.
   3. Background Color: White.
   4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
   5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts and plenums; and exterior exposed locations as follows:
1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.

4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.

B. Pipe Label Color Schedule:
   1. Heating Water Piping:
      a. Background Color: White.
      b. Letter Color: Black.
   2. Refrigerant Piping:
      a. Background Color: White.
      b. Letter Color: Black.

END OF SECTION 15077

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following plumbing piping services:
   1. Domestic cold-water piping.
   2. Domestic hot-water piping.
   3. Supplies and drains for handicap-accessible lavatories and sinks

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
   1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 15061 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for

installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General" and "Indoor Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber, Preformed Pipe Insulation:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Fibrex Insulations Inc.; Coreplus 1200.
      b. Johns Manville; Micro-Lok.
      c. Knauf Insulation; 1000-Degree Pipe Insulation.
      d. Manson Insulation Inc.; Alley-K.
      e. Owens Corning; Fiberglas Pipe Insulation.
   2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ramco Insulation, Inc.; Super-Stik.

B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
    d. Mon-Eco Industries, Inc.; 22-25.

C. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
    b. Eagle Bridges - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.
    d. Mon-Eco Industries, Inc.; 22-25.

D. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Dow Corning Corporation; 739, Dow Silicone.
    b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
    c. P.I.C. Plastics, Inc.; Welding Adhesive.
    d. Speedline Corporation; Polyco VP Adhesive.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
    b. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.

3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
b. Eagle Bridges - Marathon Industries; 501.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
d. Mon-Eco Industries, Inc.; 55-10.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
3. Service Temperature Range: 0 to 180 deg F.
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.
2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 SEALANTS

A. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Chil-Glas Number 10.

2.8 FIELD-APPLIED CLOTHS

A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 428 AWF ASJ.
      b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
      c. Compac Corporation; 104 and 105.
      d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
   2. Width: 3 inches.
   3. Thickness: 11.5 mils.
   4. Adhesion: 90 ounces force/inch in width.
   5. Elongation: 2 percent.
   6. Tensile Strength: 40 lbf/inch in width.
   7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. ABI, Ideal Tape Division; 370 White PVC tape.
      b. Compac Corporation; 130.
      c. Venture Tape; 1506 CW NS.
   2. Width: 2 inches.
   3. Thickness: 6 mils.
   4. Adhesion: 64 ounces force/inch in width.

5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

2.10 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Engineered Brass Company.
b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
c. McGuire Manufacturing.
d. Plumberex.
e. Truebro; a brand of IPS Corporation.
f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Truebro; a brand of IPS Corporation.
b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:
   1. Draw jacket tight and smooth.
   2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
   3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
      a. For below-ambient services, apply vapor-barrier mastic over staples.
   4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
   5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.
   4. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
   1. Seal penetrations with flashing sealant.
   2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant.
   3. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

C. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
   1. Comply with requirements in Section 07841 "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

D. Insulation Installation at Floor Penetrations:
   1. Pipe: Install insulation continuously through floor penetrations.
   2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07841 "Through-Penetration Firestop Systems."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
   1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
   2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.

3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached

insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
   3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
   4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:
   1. Install preformed pipe insulation to outer diameter of pipe flange.
   2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
   3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
   4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
   3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. Install insulation to flanges as specified for flange insulation application.

3.7 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Drainage piping located in crawl spaces.
   2. Underground piping.
   3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

C. All piping shall meet IECC 2012 insulation requirements.

3.8 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:
   1. NPS 1 and Smaller: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

B. Domestic Hot Water:
   1. NPS 1 and Smaller: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

D. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

END OF SECTION 15085

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:
   1. Condensate drain piping, indoors.
   2. Heating hot-water piping, indoors.
   3. Refrigerant suction and hot-gas piping, indoors and outdoors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," and "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber, Preformed Pipe Insulation:
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Fibrex Insulations Inc.; Coreplus 1200.
      b. Johns Manville; Micro-Lok.
      c. Knauf Insulation; 1000-Degree Pipe Insulation.
      d. Manson Insulation Inc.; Alley-K.
      e. Owens Corning; Fiberglas Pipe Insulation.
   2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Ramco Insulation, Inc.; Super-Stik.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    b. - Marathon Industries; 225.
    c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
    d. Mon-Eco Industries, Inc.; 22-25.

2.4 SECUREMENTS

A. Bands:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. ITW Insulation Systems; Gerrard Strapping and Seals.
    b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch thick, 1/2 inch wide with wing seal.
3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
   3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above-ambient services, do not install insulation to the following:
   1. Vibration-control devices.
   2. Testing agency labels and stamps.
   3. Nameplates and data plates.
   4. Manholes.
   5. Handholes.
   6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 07841 "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 07841 "Through-Penetration Firestop Systems."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to

fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
   1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
   2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
   3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
   4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:
   1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
   2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.

B. Insulation Installation on Pipe Fittings and Elbows:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

C. Insulation Installation on Valves and Pipe Specialties:
   1. Install preformed sections of same material as straight segments of pipe insulation when available.
   2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
   3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
   4. Install insulation to flanges as specified for flange insulation application.

3.7 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
   1. Drainage piping located in crawl spaces.
   2. Underground piping.
   3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

C. All piping shall be insulated to International Energy Conservation Code (IECC) 2012 minimum requirements.

3.8 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F:
   1. All Pipe Sizes: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

B. Heating-Hot-Water Supply and Return, 140 Deg F and Below:
   1. All sizes: Insulation shall be the following:
      a. Mineral-Fiber, Preformed Pipe, Type I: 1 inch thick.

C. Refrigerant Piping. Pipe insulation must comply with International Energy Conservation Code 2012.

END OF SECTION 15088

SECTION 15092

SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Sleeves.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
1. Only use PVC if allowed by AHJ.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
1. Only use PVC if allowed by AHJ.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Advance Products & Systems, Inc.

2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.
1. Cut sleeves to length for mounting flush with both surfaces.
2. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07920 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07841 "Through-Penetration Firestop Systems."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:
1. Concrete Slabs-on-Grade:
a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.
1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.
2. Interior Partitions:
a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or PVC-pipe sleeves. Verify PVC is acceptable with Fire AHJ before use.

END OF SECTION 15092

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Sleeves.
   2. Sleeve-seal systems.
   3. Sleeve-seal fittings.
   4. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
   1. Only use PVC if allowed by fire AHJ.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
   1. Only use PVC if allowed by fire AHJ.

2.2 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Advance Products & Systems, Inc.

2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07920 "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Section 07841 "Through-Penetration Firestop Systems."

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:
   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves, Galvanized-steel wall sleeves, Galvanized-steel-pipe sleeves or Sleeve-seal fittings.
2. Concrete Slabs-on-Grade:
   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system, Galvanized-steel wall sleeves with sleeve-seal system, or Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Interior Partitions:
   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves or PVC-pipe sleeves.

END OF SECTION 15093

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Brass ball valves.
   2. Bronze ball valves.
   3. Bronze swing check valves.
   4. Bronze gate valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
   2. ASME B31.1 for power piping valves.
   3. ASME B31.9 for building services piping valves.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set angle, gate, and globe valves closed to prevent rattling.

4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:
1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valves in Insulated Piping: With 2-inch stem extensions and the following features:
1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:
1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Threaded: With threads according to ASME B1.20.1.

F. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
d. Hammond Valve.
e. Jamesbury; a subsidiary of Metso Automation.
f. Kitz Corporation.
g. Marwin Valve; a division of Richards Industries.
h. Milwaukee Valve Company.
i. RuB Inc.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.

c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Lance Valves; a division of Advanced Thermal Systems, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

2.4 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

l. Zy-Tech Global Industries, Inc.

2. Description:
   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 200 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Crane Co.; Crane Valve Group; Crane Valves.
   b. Crane Co.; Crane Valve Group; Jenkins Valves.
   c. Crane Co.; Crane Valve Group; Stockham Division.
   d. Hammond Valve.
   e. Kitz Corporation.
   f. Milwaukee Valve Company.
   g. NIBCO INC.
   h. Red-White Valve Corporation.
   i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
   a. Standard: MSS SP-80, Type 4.
   b. CWP Rating: 200 psig.
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: PTFE or TFE.

2.5 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. American Valve, Inc.
   b. Crane Co.; Crane Valve Group; Crane Valves.
   c. Crane Co.; Crane Valve Group; Jenkins Valves.
   d. Crane Co.; Crane Valve Group; Stockham Division.
   e. Hammond Valve.
   f. Kitz Corporation.
   g. Milwaukee Valve Company.
   h. NIBCO INC.
   i. Powell Valves.
   j. Red-White Valve Corporation.
   k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   l. Zy-Tech Global Industries, Inc.

2. Description:
   a. Standard: MSS SP-80, Type 1.
   b. CWP Rating: 200 psig.

c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
1. Shutoff Service: Ball and gate valves.
2. Throttling Service: Ball valves.
3. Pump-Discharge Check Valves:

a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.
3. For Grooved-End Copper Tubing and Steel Piping except Steam and Steam Condensate Piping: Valve ends may be grooved.

3.5 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
1. Ball Valves: Two piece, full port, brass or bronze with stainless-steel trim.
2. Bronze Swing Check Valves: Class 125, bronze disc.
3. Bronze Gate Valves: Class 125, NRS.

END OF SECTION 15112

SECTION 15113

BALL VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Brass ball valves.
   2. Bronze ball valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, and soldered ends.
   3. Set ball valves open to minimize exposure of functional surfaces.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B1.20.1 for threads for threaded end valves.
   2. ASME B16.18 for solder-joint connections.
   3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:
   1. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:
   1. Include 2-inch stem extensions.
   2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
   3. Memory stops that are fully adjustable after insulation is applied.

2.2 BRASS BALL VALVES

A. Two-Piece, Brass Ball Valves with Full Port and Stainless-Steel Trim:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Kitz Corporation.
      b. Marwin Valve; a division of Richards Industries.
      c. Milwaukee Valve Company.
   2. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 600 psig.
      c. Body Design: Two piece.
      d. Body Material: Forged brass.
      e. Ends: Threaded and soldered.
      f. Seats: PTFE.
      g. Stem: Stainless steel.
      h. Ball: Stainless steel, vented.
      i. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Bronze Ball Valves with Full Port and Stainless-Steel Trim:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Conbraco Industries, Inc.; Apollo Valves.
      b. Crane Co.; Crane Valve Group; Crane Valves.
      c. Hammond Valve.
      d. Lance Valves; a division of Advanced Thermal Systems, Inc.
      e. Milwaukee Valve Company.
      f. NIBCO INC.
      g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   2. Description:
      a. Standard: MSS SP-110.
      b. CWP Rating: 600 psig.
      c. Body Design: Two piece.

d. Body Material: Bronze.
e. Ends: Threaded or soldered.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel, vented.
i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install valve tags. Comply with requirements in Section 15076 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:
1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:
   1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Two-piece, brass ball valves with full port and stainless-steel trim.
   3. Two-piece, bronze ball valves with full port and stainless-steel trim.

END OF SECTION 15113

SECTION 15115

CHECK VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Bronze swing check valves.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:
   1. Protect internal parts against rust and corrosion.
   2. Protect threads, flange faces, grooves, and weld ends.
   3. Set check valves in either closed or open position.

B. Use the following precautions during storage:
   1. Maintain valve end protection.
   2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:
   1. ASME B1.20.1 for threads for threaded end valves.
   2. ASME B16.18 for solder joint.
   3. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. NSF Compliance: NSF 61 and NSF 372 for valve materials for potable-water service.

E. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

F. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

G. Valve Sizes: Same as upstream piping unless otherwise indicated.

H. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE SWING CHECK VALVES

A. Class 125, Bronze, Swing Check Valves with Bronze Disc:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. American Valve, Inc.
      b. Crane Co.; Crane Valve Group; Crane Valves.
      c. Crane Co.; Crane Valve Group; Jenkins Valves.
      d. Crane Co.; Crane Valve Group; Stockham Valves.
      e. Hammond Valve.
      f. Kitz Corporation.
      g. The Macomb Groups.
      h. Milwaukee Valve Company.
      i. NIBCO INC.
      j. Powell Valves.
      k. Red-White Valve Corporation.
      l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   2. Description:
      a. Standard: MSS SP-80, Type 3.
      b. CWP Rating: 200 psig.
      c. Body Design: Horizontal flow.
      d. Body Material: ASTM B 62, bronze.
      e. Ends: Threaded or soldered. See valve schedule articles.
      f. Disc: Bronze.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:
   1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. End Connections:
   1. For Copper Tubing, NPS 2 and Smaller: Threaded.
   2. For Steel Piping, NPS 2 and Smaller: Threaded.
   3. For Grooved-End Copper Tubing and Steel Piping: Grooved.

3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller: Bronze swing check valves, Class 125, bronze disc with threaded end connections.

END OF SECTION 15115

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Liquid-in-glass thermometers.
   2. Thermowells.
   3. Test plugs.

PART 2 - PRODUCTS

2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Trerice, H. O. Co.
   2. Standard: ASME B40.200.
   3. Case: Cast aluminum; 6-inch nominal size.
   4. Case Form: Back angle unless otherwise indicated.
   5. Tube: Glass with magnifying lens and blue or red organic liquid.
   6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
   7. Window: Glass or plastic.
   8. Stem: Aluminum or brass and of length to suit installation.
      a. Design for Thermowell Installation: Bare stem.
   9. Connector: 3/4 inch, with ASME B1.1 screw threads.
   10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.2 THERMOWELLS

A. Thermowells:
   1. Standard: ASME B40.200.
   2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
   3. Material for Use with Copper Tubing: CNR.
   4. Material for Use with Steel Piping: CRES.
   5. Type: Stepped shank unless straight or tapered shank is indicated.
   6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.

7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.3 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Flow Design, Inc.
2. Miljoco Corporation.
3. Peterson Equipment Co., Inc.
4. Sisco Manufacturing Company, Inc.
5. Trerice, H. O. Co.
6. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
7. Weiss Instruments, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F.

F. Core Inserts: Chlorosulfonated polyethylene synthetic self-sealing rubber.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install test plugs in piping tees.

G. Install thermometers in the following locations:
   1. Outlet of each water heater.

3.2 CONNECTIONS

A. Install gages adjacent to machines and equipment to allow service and maintenance of gages, machines, and equipment.

3.3 ADJUSTING

A. Adjust faces of gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be the following:
   1. Liquid-filled, bimetallic-actuated type.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Hot-Water Piping: 30 to 240 deg F.

END OF SECTION 15126

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Aboveground domestic water pipes, tubes, and fittings inside buildings.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

2.2 PEX TUBE AND FITTINGS

A. PEX Distribution System: ASTM F 877, SDR 9 tubing.

B. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.

C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:
   1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
   2. Full-face or ring type unless otherwise indicated.

B. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.4 TRANSITION FITTINGS

A. General Requirements:
   1. Same size as pipes to be joined.
   2. Pressure rating at least equal to pipes to be joined.

3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cascade Waterworks Manufacturing.
      b. Dresser, Inc.; Piping Specialties Products.
      c. Ford Meter Box Company, Inc. (The).
      d. JCM Industries.
      e. Romac Industries, Inc.
      f. Smith-Blair, Inc.; a Sensus company.
      g. Viking Johnson.

D. Plastic-to-Metal Transition Fittings:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Charlotte Pipe and Foundry Company.
      b. Harvel Plastics, Inc.
      c. Spears Manufacturing Company.
   2. Description:
      a. One end with threaded brass insert and one threaded plastic end.

E. Plastic-to-Metal Transition Unions:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Colonial Engineering, Inc.
      b. NIBCO Inc.
      c. Spears Manufacturing Company.
   2. Description:
      a. Brass or stainless-steel threaded end.
      b. Threaded plastic end.
      c. Rubber O-ring.
      d. Union nut.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
      b. Central Plastics Company.
      c. Hart Industries International, Inc.

d. Jomar International.
e. Matco-Norca.
f. McDonald, A. Y. Mfg. Co.
g. Watts; a division of Watts Water Technologies, Inc.
h. Wilkins; a Zurn company.

2. Standard: ASSE 1079.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Elster Perfection Corporation.
   b. Grinnell Mechanical Products; Tyco Fire Products LP.
   c. Matco-Norca.
   d. Precision Plumbing Products, Inc.
   e. Victaulic Company.
2. Standard: IAPMO PS 66.
3. Electroplated steel nipple complying with ASTM F 1545.
4. Pressure Rating and Temperature: 300 psig at 225 deg F.
5. End Connections: Male threaded or grooved.
6. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for drain valves and strainers in Section 15145 "Domestic Water Piping Specialties."

C. Install shutoff valve immediately upstream of each dielectric fitting.

D. Install domestic water piping level with 0.25 percent slope downward toward drain and plumb.

E. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

F. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

G. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

H. Install piping to permit valve servicing.

I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

J. Install piping free of sags and bends.

K. Install fittings for changes in direction and branch connections.

L. Install PEX piping with loop at each change of direction of more than 90 degrees.

M. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

N. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

A. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

B. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

C. Joints for PEX Piping: Join according to ASTM F 1807.

D. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.3 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:
   1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

3.4 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger, support products, and installation in Section 15061 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Vertical Piping: MSS Type 8 or 42, clamps.
   2. Individual, Straight, Horizontal Piping Runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

D. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

E. Install hangers for vertical PEX piping every 48 inches.

F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
   1. Plumbing Fixtures: Cold-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
   2. Equipment: Cold-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

3.7 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 15076 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Piping Inspections:

a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:
a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 ADJUSTING

A. Perform the following adjustments before operation:
1. Close drain valves.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
5. Remove and clean strainer screens. Close drain valves and replace drain plugs.
6. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
7. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

A. Clean and disinfect potable domestic water piping as follows:
   1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
         2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
      c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
      d. Repeat procedures if biological examination shows contamination.
      e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Unions may be used for aboveground piping joints unless otherwise indicated.

C. Aboveground domestic water piping, NPS 1 and smaller, shall be one of the following:
   1. PEX tube, NPS 1 and smaller; fittings for PEX tube; and crimped joints (only after water entrance – refer to Domestic Water Riser Diagram on 1/P3.0 for details).
   2. Type L hard copper tube (only for water entrance – refer to Domestic Water Riser Diagram on 1/P3.0 for details).

3.12 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Shutoff Duty: Use ball or gate valves for piping NPS 2 and smaller.
   2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller.
   3. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 15140

SECTION 15145

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Vacuum breakers.
2. Backflow preventers.
3. Strainers.
4. Wall Hydrants.
5. Drain valves.
6. Water-hammer arresters.
7. Air Vents.

B. Related Requirements:
1. Section 15126 "Meters and Gages for Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.
2. Section 15140 "Domestic Water Piping" for water meters.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
      b. Cash Acme; a division of Reliance Worldwide Corporation.
      c. Conbraco Industries, Inc.
      d. FEBCO; a division of Watts Water Technologies, Inc.
      e. Rain Bird Corporation.
      f. Toro Company (The); Irrigation Div.
      g. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
      h. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.
   2. Standard: ASSE 1001.
   3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
   4. Body: Bronze.
   5. Inlet and Outlet Connections: Threaded.
   6. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Ames Fire & Waterworks; a division of Watts Water Technologies, Inc.
      b. Conbraco Industries, Inc.
      c. FEBCO; a division of Watts Water Technologies, Inc.
      d. Flomatic Corporation.
      e. Watts; a division of Watts Water Technologies, Inc.; Watts Regulator Company.
      f. Zurn Industries, LLC; Plumbing Products Group; Wilkins Water Control Products.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:
   1. Pressure Rating: 125 psig minimum unless otherwise indicated.
   2. Body: Bronze for NPS 2 and smaller.
   3. End Connections: Threaded for NPS 2 and smaller.
   4. Screen: Stainless steel with round perforations unless otherwise indicated.
   5. Perforation Size:
      a. Strainers NPS 2 and Smaller: 0.020 inch.
   6. Drain: Pipe plug.

2.6 WALL HYDRANTS

A. Indoor Wall Hydrants:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Josam Company.
b. MIFAB, Inc.
c. Prier Products, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Tyler Pipe; Wade Div.
f. Watts Drainage Products.
g. Woodford Manufacturing Company; a division of WCM Industries, Inc.
h. Zurn Industries, LLC; Plumbing Products Group; Light Commercial Products.
i. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:
1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.8 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. AMTROL, Inc.
b. Josam Company.
c. MIFAB, Inc.
d. Precision Plumbing Products, Inc.
e. Sioux Chief Manufacturing Company, Inc.
f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
g. Tyler Pipe; Wade Div.
h. Watts Drainage Products.
i. Zurn Industries, LLC; Plumbing Products Group; Specification Drainage Products.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

2.9 AIR VENTS

A. Bolted-Construction Automatic Air Vents:
1. Body: Bronze.
2. Pressure Rating and Temperature: 125-psig minimum pressure rating at 140 deg F.
3. Float: Replaceable, corrosion-resistant metal.
4. Mechanism and Seat: Stainless steel.

5. Size: NPS 1/2 minimum inlet.
6. Inlet and Vent Outlet End Connections: Threaded.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
   1. Locate backflow preventers in same room as connected equipment or system.
   2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
   3. Do not install bypass piping around backflow preventers.

B. Install Y-pattern strainers for water on supply side of each solenoid valve.

C. Install water-hammer arresters in water piping according to PDI-WH 201.

D. Install air vents at high points of water piping.

3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 16060 "Grounding and Bonding."

B. Fire-retardant-treated-wood blocking is specified in Section 16120 "Conductors and Cables" for electrical connections.

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
   1. Reduced-pressure-principle backflow preventers.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 15076 "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 15145

SECTION 15150

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Pipe, tube, and fittings.
   2. Specialty pipe fittings.

1.3 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
   1. Soil, Waste, and Vent Piping: 10-foot head of water.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

B. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

C. Adhesive Primer: ASTM F 656.

D. Solvent Cement: ASTM D 2564.

2.3 SPECIALTY PIPE FITTINGS

A. Transition Couplings:
   1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
   2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
   3. Shielded, Nonpressure Transition Couplings:
      a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
         1) Cascade Waterworks Mfg. Co.
         2) Mission Rubber Company; a division of MCP Industries, Inc.
      b. Standard: ASTM C 1460.
      c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Dielectric Fittings:
   1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
   2. Dielectric Unions:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Capitol Manufacturing Company.
         2) Central Plastics Company.
         3) Hart Industries International, Inc.
         4) Jomar International Ltd.
         5) Matco-Norca, Inc.
         6) McDonald, A. Y. Mfg. Co.
         7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
         8) Wilkins; a Zurn company.
      b. Description:
         1) Standard: ASSE 1079.
         2) Pressure Rating: 125 psig minimum at 180 deg F.
         3) End Connections: Solder-joint copper alloy and threaded ferrous.
   3. Dielectric Flanges:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Capitol Manufacturing Company.
         2) Central Plastics Company.
         3) Matco-Norca, Inc.
         4) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
         5) Wilkins; a Zurn company.
      b. Description:
         1) Standard: ASSE 1079.
         2) Factory-fabricated, bolted, companion-flange assembly.
         3) Pressure Rating: 125 psig minimum at 180 deg F.

4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:
   a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      1) Advance Products & Systems, Inc.
      2) Calpico, Inc.
      3) Central Plastics Company.
      4) Pipeline Seal and Insulator, Inc.
   b. Description:
      1) Nonconducting materials for field assembly of companion flanges.
      2) Pressure Rating: 150 psig.
      3) Gasket: Neoprene or phenolic.
      4) Bolt Sleeves: Phenolic or polyethylene.
      5) Washers: Phenolic with steel backing washers.
5. Dielectric Nipples:
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Elster Perfection.
      2) Grinnell Mechanical Products.
      3) Matco-Norca, Inc.
      4) Precision Plumbing Products, Inc.
      5) Victaulic Company.
   b. Description:
      1) Standard: IAPMO PS 66
      2) Electroplated steel nipple.
      3) Pressure Rating: 300 psig at 225 deg F.
      4) End Connections: Male threaded or grooved.
      5) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 02300 "Earthwork."

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

J. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

K. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
   1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
   2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
   3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

L. Install aboveground PVC piping according to ASTM D 2665.

M. Install underground PVC piping according to ASTM D 2321.

N. Plumbing Specialties:
   1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Comply with requirements for cleanouts specified in Section 15155 "Sanitary Waste Piping Specialties."
   2. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 15155 "Sanitary Waste Piping Specialties."

O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

P. Install sleeves for piping penetrations of walls, ceilings, and floors.

Q. Install sleeve seals for piping penetrations of concrete walls and slabs.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

A. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
   1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
   2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:
   1. Install transition couplings at joints of piping with small differences in OD's.
   2. In Drainage Piping: Shielded, nonpressure transition couplings.

B. Dielectric Fittings:
   1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
   2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.
   3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 15061 "Hangers and Supports for Plumbing Piping and Equipment."
   1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
   2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
   3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
   4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
   5. Vertical Piping: MSS Type 8 or Type 42, clamps.
   6. Install individual, straight, horizontal piping runs:
      a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
   7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
   8. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install supports for vertical copper tubing every 10 feet.

F. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
   1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
   2. NPS 3: 48 inches with 1/2-inch rod.
   3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.

G. Install supports for vertical PVC piping every 48 inches.

H. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:
   1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
   2. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
   3. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
   4. Comply with requirements for cleanouts and drains specified in Section 15155 "Sanitary Waste Piping Specialties."
   5. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:
   1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
   2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 15076 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
   1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
   2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
   1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
   2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
   4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
   5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
   6. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

A. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
   1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

B. Aboveground, vent piping NPS 4 and smaller shall be the following:
   1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

C. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:
   1. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
   2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 15150

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Cleanouts.
   2. Floor drains.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. HDPE: High-density polyethylene plastic.

C. PE: Polyethylene plastic.

D. PP: Polypropylene plastic.

E. PVC: Polyvinyl chloride plastic.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

1.7 COORDINATION

A. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Plastic Floor Cleanouts:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Canplas LLC.
      b. IPS Corporation.
      c. NDS Inc.
      d. Plastic Oddities.
      e. Sioux Chief Manufacturing Company, Inc.
      f. Zurn Plumbing Products Group; Light Commercial Operation.
   2. Size: Same as connected branch.
   3. Body: PVC.
   4. Closure Plug: PVC.
   5. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Commercial Enameling Co.
      b. Josam Company; Josam Div.
      c. MIFAB, Inc.
      d. Prier Products, Inc.
      e. Smith, Jay R. Mfg. Co.
      f. Tyler Pipe; Wade Div.
      g. Watts Drainage Products.
      h. Zurn Plumbing Products Group; Specification Drainage Operation.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
   1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
   2. Locate at each change in direction of piping greater than 45 degrees.
   3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
   4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
   1. Position floor drains for easy access and maintenance.
   2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
      a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
      b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
      c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
   3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
   4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

E. Install deep-seal traps on floor drains and other waste outlets, if indicated.

F. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

G. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Comply with requirements in Section 15150 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 15155

SECTION 15183

REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-410A:
   1. Suction Lines for Air-Conditioning Applications: 300 psig.
   2. Hot-Gas and Liquid Lines: 535 psig.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 280, Type ACR.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Solder Filler Metals: ASTM B 32. Use 95-5 tin antimony or alloy HB solder to join copper socket fittings on copper pipe.

E. Brazing Filler Metals: AWS A5.8.

F. Flexible Connectors:
   1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
   2. End Connections: Socket ends.
   3. Offset Performance: Capable of minimum 3/4-inch misalignment in minimum 7-inch-long assembly.
   4. Pressure Rating: Factory test at minimum 500 psig.
   5. Maximum Operating Temperature: 250 deg F.

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:
   1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
   2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
   3. Operator: Rising stem and hand wheel.
   4. Seat: Nylon.
   5. End Connections: Socket, union, or flanged.
   6. Working Pressure Rating: 500 psig.
   7. Maximum Operating Temperature: 275 deg F.

B. Check Valves:
   1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
   2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
   3. Piston: Removable polytetrafluoroethylene seat.
   4. Closing Spring: Stainless steel.
   5. End Connections: Socket, union, threaded, or flanged.
   6. Maximum Opening Pressure: 0.50 psig.
   7. Working Pressure Rating: 500 psig.
   8. Maximum Operating Temperature: 275 deg F.

C. Service Valves:
   1. Body: Forged brass with brass cap including key end to remove core.
   2. Core: Removable ball-type check valve with stainless-steel spring.
   3. Seat: Polytetrafluoroethylene.
   4. End Connections: Copper spring.
   5. Working Pressure Rating: 500 psig.

D. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
   1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
   2. Piston, Closing Spring, and Seat Insert: Stainless steel.
   3. Seat Disc: Polytetrafluoroethylene.
   4. End Connections: Threaded.
   5. Working Pressure Rating: 400 psig.
   6. Maximum Operating Temperature: 240 deg F.

E. Thermostatic Expansion Valves: Comply with ARI 750.
   1. Body, Bonnet, and Seal Cap: Forged brass or steel.
   2. Diaphragm, Piston, Closing Spring, and Seat Insert: Stainless steel.
   3. Packing and Gaskets: Non-asbestos.
   4. Capillary and Bulb: Copper tubing filled with refrigerant charge.
   5. Suction Temperature: 40 deg F.
   6. Superheat: Adjustable.
   7. Reverse-flow option (for heat-pump applications).
   8. End Connections: Socket, flare, or threaded union.
   9. Working Pressure Rating: 700 psig.

F. Straight-Type Strainers:
   1. Body: Welded steel with corrosion-resistant coating.
   2. Screen: 100-mesh stainless steel.
   3. End Connections: Socket or flare.
   4. Working Pressure Rating: 500 psig.
   5. Maximum Operating Temperature: 275 deg F.

G. Angle-Type Strainers:
   1. Body: Forged brass or cast bronze.
   2. Drain Plug: Brass hex plug.
   3. Screen: 100-mesh monel.
   4. End Connections: Socket or flare.
   5. Working Pressure Rating: 500 psig.
   6. Maximum Operating Temperature: 275 deg F.

H. Moisture/Liquid Indicators:
   1. Body: Forged brass.
   2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
   3. Indicator: Color coded to show moisture content in ppm.
   4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
   5. End Connections: Socket or flare.
   6. Working Pressure Rating: 500 psig.
   7. Maximum Operating Temperature: 240 deg F.

I. Replaceable-Core Filter Dryers: Comply with ARI 730.
   1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
   2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
   3. Desiccant Media: Activated alumina.
   4. End Connections: Socket.
   5. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
   6. Maximum Pressure Loss: 2 psig.
   7. Working Pressure Rating: 500 psig.
   8. Maximum Operating Temperature: 240 deg F.

J. Permanent Filter Dryers: Comply with ARI 730.
   1. Body and Cover: Painted-steel shell.
   2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.

3. Desiccant Media: Activated alumina.
4. End Connections: Socket.
5. Access Ports: NPS 1/4 connections at entering and leaving sides for pressure differential measurement.
6. Maximum Pressure Loss: 2 psig.
7. Working Pressure Rating: 500 psig.
8. Maximum Operating Temperature: 240 deg F.

2.3 REFRIGERANTS

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. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

B. ASHRAE 34, R-410A: Pentafluoroethane/Difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines NPS 1-1/2 and Smaller for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with brazed or soldered joints.

B. Hot-Gas and Liquid Lines: Copper, Type ACR, drawn-temper tubing and wrought-copper fittings with soldered joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type ACR, annealed- or drawn-temper tubing and wrought-copper fittings with brazed or soldered joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install diaphragm packless valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install diaphragm packless valves on inlet and outlet side of filter dryers.

E. Install thermostatic expansion valves as close as possible to distributors on evaporators.
1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.

3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

F. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

G. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

H. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:
1. Thermostatic expansion valves.
2. Compressor.

I. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

K. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Section 08311 "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

L. Install refrigerant piping in protective conduit where installed belowground.

M. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

N. Slope refrigerant piping as follows:
   1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
   2. Install horizontal suction lines with a uniform slope downward to compressor.
   3. Liquid lines may be installed level.

O. When brazing or soldering, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

P. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

Q. Install sleeves for piping penetrations of walls, ceilings, and floors.

R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Soldered Joints: Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook."

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
   1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
   2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Section 15062 "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:
   1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet long.
   2. Roller hangers and spring hangers for individual horizontal runs 20 feet or longer.
   3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
   4. Spring hangers to support vertical runs.
   5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:
   1. NPS 1/2: Maximum span, 60 inches; minimum rod size, 1/4 inch.
   2. NPS 5/8: Maximum span, 60 inches; minimum rod size, 1/4 inch.
   3. NPS 1: Maximum span, 72 inches; minimum rod size, 1/4 inch.
   4. NPS 1-1/4: Maximum span, 96 inches; minimum rod size, 3/8 inch.
   5. NPS 1-1/2: Maximum span, 96 inches; minimum rod size, 3/8 inch.

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. Comply with ASME B31.5, Chapter VI.
   2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
   3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.
      a. Fill system with nitrogen to the required test pressure.
      b. System shall maintain test pressure at the manifold gage throughout duration of test.
      c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.
      d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:
   1. Install core in filter dryers after leak test but before evacuation.
   2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers. If vacuum holds for 12 hours, system is ready for charging.
   3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig.
   4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:
   1. Open shutoff valves in condenser water circuit.

2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 15183

SECTION 15185

HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Close-coupled, in-line centrifugal pumps.

1.3 DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Ethylene propylene terpolymer.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of pump. Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Shop Drawings: For each pump.
   1. Show pump layout and connections.
   2. Include diagrams for power, signal, and control wiring.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Armstrong Pumps Inc.
   2. Grundfos Pumps Corporation.
   3. ITT Corporation; Bell & Gossett.
   4. PACO Pumps.
   5. Patterson Pump Co.; a subsidiary of the Gorman-Rupp Co.
   6. TACO Incorporated.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically.

C. Pump Construction:
   1. Casing: Radially split, cast iron, with threaded gage tappings at inlet and outlet and threaded companion-flange connections.
   2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. For constant-speed pumps, trim impeller to match specified performance.
   3. Pump Shaft: Stainless steel.
   4. Seal: Packing seal consisting of stuffing box with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
   5. Pump Bearings: Permanently lubricated ball bearings.

D. Motor: Single speed and rigidly mounted to pump casing.
   1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Comply with NEMA designation, temperature rating, service factor, and efficiency requirements for motors specified in Section 15058 "Common Motor Requirements for HVAC Equipment."
      a. Enclosure Materials: Cast iron.
      b. Motor Bearings: Permanently lubricated ball bearings.
      c. Efficiency: Premium efficient.

E. Capacities and Characteristics: Refer to schedule on drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install pumps to provide access for periodic maintenance including removing motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Equipment Mounting: Install in-line pumps with continuous-thread hanger rods and elastomeric hangers of size required to support weight of in-line pumps.

3.3 CONNECTIONS

A. Where installing piping adjacent to pump, allow space for service and maintenance.

B. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

C. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

D. Install check valve and throttling valve with memory stop on discharge side of pumps.

E. Install Y-type strainer and shutoff valve on suction side of pumps.

F. Install pressure gages on pump suction and discharge or at integral pressure-gage tapping, or install single gage with multiple-input selector valve.

G. Ground equipment according to Section 16060 "Grounding and Bonding."

H. Connect wiring according to Section 16120 "Conductors and Cables."

3.4 STARTUP SERVICE

A. Perform startup service.
   1. Complete installation and startup checks according to manufacturer's written instructions.
   2. Check piping connections for tightness.
   3. Clean strainers on suction piping.
   4. Perform the following startup checks for each pump before starting:
      a. Verify bearing lubrication.
      b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
      c. Verify that pump is rotating in the correct direction.
   5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
   6. Start motor.
   7. Open discharge valve slowly.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps.

END OF SECTION 15185

SECTION 15414

COMMERCIAL WATER CLOSETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Water closets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For plumbing fixtures and faucets to include in emergency, operation, and operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 WATER CLOSETS

A. Water Closets: Floor mounted, floor outlet, close coupled (gravity tank), vitreous china.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. American Standard America.
      b. Briggs Plumbing Products, Inc.
      c. Crane Plumbing, L.L.C.
      d. Ferguson Enterprises, Inc.; ProFlo Brand.
      e. Gerber Plumbing Fixtures LLC.
      f. Kohler Co.
      g. Mansfield Plumbing Products LLC.
      h. Peerless Pottery Sales, Inc.
      i. St. Thomas Creations.
      j. TOTO USA, INC.
      k. Zurn Industries, LLC; Commercial Brass and Fixtures.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing-fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install plumbing fixtures level and plumb according to roughing-in drawings.

B. Install floor-mounted water closets on closet flange attachments to drainage piping.

C. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
   1. Exception: Use ball valves if supply stops are not specified with fixture. Comply with valve requirements specified in Section 15113 "Ball Valves for Plumbing Piping".

D. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

E. Install toilet seats on water closets.

F. Install traps on fixture outlets.
   1. Exception: Omit trap on fixtures with integral traps.
   2. Exception: Omit trap on indirect wastes unless otherwise indicated.

G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

H. Seal joints between plumbing fixtures, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 15140 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 15150 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust plumbing fixtures and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

3.5 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damaged finishes.

B. Clean plumbing fixtures with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 15414

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Lavatories.
   2. Faucets.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for lavatories.
   2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 VITREOUS-CHINA, UNDERCOUNTER MOUNTED LAVATORIES

A. Lavatory:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. American Standard America.
      b. Crane Plumbing, L.L.C.
      c. Gerber Plumbing Fixtures LLC.
      d. Kohler Co.
      e. Mansfield Plumbing Products LLC.
      f. Peerless Pottery Sales, Inc.
      g. Zurn Industries, LLC; Commercial Brass and Fixtures.

2.2 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
    a. American Standard America.
    b. Bradley Corporation.
    c. Chicago Faucets.
    d. Delta Faucet Company.
    e. Elkay Manufacturing Co.
    f. Just Manufacturing.
    g. Kohler Co.
    h. Moen Incorporated.
    i. Speakman Company.
    j. T & S Brass and Bronze Works, Inc.
    k. Zurn Industries, LLC; Commercial Brass and Fixtures.
2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include cold and hot-water indicators; coordinate faucet inlets with supplies and counter hole punchings; coordinate outlet with spout and counter.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:
1. NPS 3/8.
2. Chrome-plated, rigid-copper-pipe and brass straight or offset tailpieces and ASME A112.18.6, braided- or corrugated-stainless-steel, flexible hose riser.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:
1. Size: NPS 1-1/2 by NPS 1-1/4.
2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated, brass or steel wall flange.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install with sealant and undercounter mounting kit for undercounter-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 15085 "Plumbing Piping Insulation."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 15140 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 15150 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 15421

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Utility sinks.
   2. Sink faucets.
   3. Supply fittings.
   4. Waste fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sinks.
   2. Include rated capacities, operating characteristics and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sinks to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 UTILITY SINKS

A. Utility Sinks: Stainless steel, undercounter mounted.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

      a. Advance Tabco.
      b. Eagle Group; Foodservice Equipment Division.
      c. Elkay Manufacturing Co.
      d. Griffin Products, Inc.
      e. Just Manufacturing.

   2. Fixture:
      a. Standard: ASME A112.19.3/CSA B45.4.
      b. Type: under counter.

2.2 SINK FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for faucet-spout materials that will be in contact with potable water.

B. Sink Faucets: Manual type, single-control mixing valve.
   1. Commercial, Solid-Brass Faucets.
      a. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

         1) American Standard America.
         2) Bradley Corporation.
         3) Chicago Faucets.
         4) Delta Faucet Company.
         5) Elkay Manufacturing Co.
         6) GROHE America, Inc.
         7) Just Manufacturing.
         8) Kohler Co.
         9) Moen Incorporated.
         10) Speakman Company.
         11) T & S Brass and Bronze Works, Inc.
         12) Zurn Plumbing Products Group.

   2. Standard: ASME A112.18.1/CSA B125.1.
   3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and counter hole punchings; coordinate outlet with spout and counter.

2.3 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Loose key.

F. Risers:
   1. NPS 3/8
   2. Chrome-plated, rigid-copper pipe or ASME A112.18.6, braided or corrugated stainless-steel flexible hose.

2.4 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/2 offset and straight tailpiece.

C. Trap:
   1. Size: NPS 1-1/2.
   2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated brass or steel wall flange.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before sink installation.

B. Examine walls, floors, and counters for suitable conditions where sinks will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install sinks level and plumb according to roughing-in drawings.

B. Install water-supply piping with stop on each supply to each sink faucet.
   1. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 15113 "Ball Valves for Plumbing Piping" and Section 15116 "Gate Valves for Plumbing Piping."
   2. Install stops in locations where they can be easily reached for operation.

C. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 15097 "Escutcheons for Plumbing Piping."

D. Seal joints between sinks and counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07920 "Joint Sealants."

3.3 CONNECTIONS

A. Connect sinks with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 15140 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 15150 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust sinks and controls. Replace damaged and malfunctioning sinks, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of sinks, inspect and repair damaged finishes.

B. Clean sinks, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed sinks and fittings.

D. Do not allow use of sinks for temporary facilities unless approved in writing by Owner.

END OF SECTION 15422

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Bathtubs.
   2. Shower/tub faucets.
   3. Grout.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for bathtubs.
   2. Include rated capacities, operating characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For shower faucets to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 BATHUBS

A. Bathtubs:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. Acryline USA, Inc.
      b. Aqua Bath Company, Inc.
      c. Aqua Glass Corporation.
      d. Aquatic Industries, Inc.
      e. Clarion Bathware.
      f. Crane Plumbing, L.L.C.
      g. Jacuzzi Inc.
      h. Kohler Co.
      i. LASCO Bathware.
      j. MAAX.
      k. Praxis Industries, LLC.; Aquarius Bathware.
   2. Standard: ANSI Z124.1.2.
   3. Bathing Surface: Slip resistant according to ASTM F 462.

2.2 SHOWER FAUCETS

A. NSF Standard: Comply with NSF 61, "Drinking Water System Components - Health Effects," for shower materials that will be in contact with potable water.

B. Shower Faucets:
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
      a. American Standard America.
      b. Chicago Faucets.
      c. Ferguson Enterprises, Inc.; ProFlo Brand.
      d. Kohler Co.
      e. Lawler Manufacturing Co., Inc.
      f. Leonard Valve Company.
      g. Matco-Norca.
      h. Moen Incorporated.
      i. Powers; a division of Watts Water Technologies, Inc.
      j. Speakman Company.
      k. Zurn Industries, LLC; AquaSpec Commercial Faucet Products.

   2. Standards: ASME A112.18.1/CSA B125.1 and ASSE 1016.

2.3 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in of water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before shower installation.

B. Examine walls and floors for suitable conditions where tub/showers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Assemble tub/shower components according to manufacturers' written instructions.

B. Install tub/showers level and plumb according to roughing-in drawings.

C. Install water-supply piping with stop on each supply to each shower faucet.

1. Exception: Use ball or gate valves if supply stops are not specified with shower. Comply with valve requirements specified in Section 15113 "Ball Valves for Plumbing Piping".
2. Install stops in locations where they can be easily reached for operation.

D. Install shower flow-control fittings with specified maximum flow rates in shower arms.

E. Set tub/shower receptors in leveling bed of cement grout.

F. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings.

G. Seal joints between showers and floors and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07920 "Joint Sealants."

3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 15140 "Domestic Water Piping."

C. Comply with traps and soil and waste piping requirements specified in Section 15150 "Sanitary Waste and Vent Piping."

3.4 ADJUSTING

A. Operate and adjust showers and controls. Replace damaged and malfunctioning showers, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

3.5 CLEANING AND PROTECTION

A. After completing installation of tub/showers, inspect and repair damaged finishes.

B. Clean showers, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed fixtures and fittings.

D. Do not allow use of tub/showers for temporary facilities unless approved in writing by Owner.

END OF SECTION 15423

SECTION 15519

ELECTRIC BOILERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes packaged, factory-fabricated and -assembled electric boilers, trim, and accessories for generating hot water.

1.3 ACTION SUBMITTALS

A. Product Data: Include performance data, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: For boilers, boiler trim, and accessories. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: Power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Source quality-control test reports.

B. Field quality-control test reports.

C. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For boilers, components, and accessories to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASME Compliance: Fabricate and label boilers to comply with ASME Boiler and Pressure Vessel Code.

C. NFPA Compliance: Design and fabricate boilers to comply with NFPA 70, "National Electrical Code," Article 424, Paragraphs G and H.

D. UL Compliance: Test boilers for compliance with UL 834, "Heating, Water Supply, and Power Boilers--Electric." Boilers shall be listed and labeled by a testing agency acceptable to authorities having jurisdiction.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace pressure vessels of boilers that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   1. Acme Engineering Prod. Inc.
   2. Bryan Steam LLC.
   3. Cleaver-Brooks.
   4. Fulton Boiler Works, Inc.
   5. Lattner Boiler Manufacturing.
   6. Lochinvar Corporation.
   7. Patterson-Kelley.
   8. Precision Boilers.
   9. PVI Industries, LLC.
   10. RECO USA.
   11. Reimers Electra Steam, Inc.
   12. Electro Industries, Inc.

2.2 MANUFACTURED UNITS

A. Description: Factory-fabricated, -assembled, and -tested electric boilers with trim and controls necessary to generate hot water.

B. Pressure Vessel: Carbon-steel pressure vessel to be wall mounted.

C. Nozzles: Flanges for water inlet and outlet and heating element inserts; threaded connections for trim and controls.

D. Insulation: One layer of minimum 1-inch- thick, glass-fiber insulation.

E. Jacket: Galvanized sheet metal casing with baked-enamel protective finish and removable panels with snap-in or interlocking closures for access to pressure vessel.

F. Heating Elements: Copper-sheathed, replaceable electric-resistance element, rated 20 kW maximum, with maximum 50 W/sq. in. over heat-transfer length.

2.3 TRIM

A. Safety Relief Valve: ASME rated.

B. Pressure and Temperature Gage: Minimum 3-1/2-inch- diameter, combination water-pressure and -temperature gage. Gages shall have operating-pressure and -temperature ranges so normal operating range is about 50 percent of full range.

C. Boiler Air Vent: Automatic.

D. Dip-tube in water outlet.

E. Drain Valve: Minimum NPS 3/4 hose-end ball valve sized per requirements of authorities having jurisdiction.

F. Tankless Heater: Carbon-steel header with copper-tube heat exchanger, mounted in an upper port of pressure vessel and sealed with fiber gasket.
   1. Tappings NPS 2 and Smaller: Threaded ends according to ASME B1.20.1 for pipe threads.

2.4 CONTROLS

A. Boiler operating controls shall include the following devices and features:
   1. Control transformer.
   2. Step controller.
   3. Recycling relay returns controller to off position after power failure.
   4. Multistage thermostat.
   5. Control circuit switch.
   6. Supply-voltage indicator.
   7. Set-Point Adjust: Set points shall be adjustable.
   8. Sequence of Operation: Electric, factory-fabricated and field-installed panel to control element sequence controller to maintain adjustable setpoint.

B. Safety Controls: To maintain safe operating conditions, safety controls limit boiler operation.
   1. High Cutoff: Manual reset stops boiler if operating conditions rise above set point or maximum boiler design temperature.
   2. Low-Water Cutoff Switch: Electronic probe shall prevent boiler operation on low water. Cutoff switch shall be manual-reset type.

2.5 ELECTRICAL POWER

A. Single-Point Field Power Connection: Factory-installed and -wired switches, transformers, and electrical devices necessary shall provide a single-point field power connection to boiler.

B. Electrical Enclosures: NEMA 250, Type 1 enclosure with hinged door and key-locking handle.

C. Install factory wiring outside of an enclosure in a metal raceway.

D. Comply with NFPA 70.
   1. Electrical Circuits: 48 A, maximum.

E. Connectors: Mechanical lugs bolted to copper bus bars or distribution blocks with pressure connectors.

F. Fuses: NEMA FU 1, Class J or K5; 60 A, maximum.

G. Contactors: 3-pole magnetic contactors, listed for 500,000 cycles at full load.

H. Factory-wired internal control devices and heating elements.
   1. Wiring shall be numbered and color coded to match the wiring diagram.

2.6 CAPACITIES AND CHARACTERISTICS

A. Refer to schedule on drawings.

2.7 SOURCE QUALITY CONTROL

A. Test and inspect factory-assembled boilers, before shipping, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatic Test: Factory test assembled boiler including hydrostatic test.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before boiler installation, examine roughing-in for concrete equipment bases, anchor-bolt sizes and locations, and piping and electrical connections to verify actual locations, sizes, and other conditions affecting boiler performance, maintenance, and operations.
   1. Final boiler locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

B. Examine mechanical spaces, including required space for element removal, for suitable conditions where boilers will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BOILER INSTALLATION

A. Install electrical devices furnished with boiler but not specified to be factory mounted.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to boiler to allow service and maintenance.

C. Connect hot-water piping to supply- and return-boiler tappings with shutoff valve and union or flange at each connection.

D. Install piping from safety relief valves to nearest floor drain.

E. Install piping from equipment drain connection to nearest floor drain. Piping shall be at least full size of connection. Provide an isolation valve if required.

F. Ground equipment according to Section 16060 "Grounding and Bonding."

G. Connect wiring according to Section 16120 "Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. Perform installation and startup checks according to manufacturer's written instructions.
   2. Leak Test: Hydrostatic test. Repair leaks and retest until no leaks exist.
   3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
      a. Check and adjust initial operating set points and high- and low-limit safety set points of water level and water temperature.
      b. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain boilers. Refer to Section 01820 "Demonstration and Training."

END OF SECTION 15519

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes split-system heat-pump units consisting of separate evaporator-fan and compressor-condenser components.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: For units with factory-applied color finishes.

1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For split-system air-conditioning units to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance:
   1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.

1.7 COORDINATION

A. Coordinate sizes and locations of equipment supports with actual equipment provided.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
   1. Warranty Period:
      a. For Compressor: Five year(s) from date of Substantial Completion.
      b. For Parts: One year(s) from date of Substantial Completion.
      c. For Labor: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
   2. Coleman Company Inc. (The).
   3. First Operations LP.
   4. Friedrich Air Conditioning Company.
   5. Koldwave, Inc.; a Mestek company.
   6. Lennox International Inc.
   7. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
   8. Mitsubishi Electric Sales Canada Inc.
   9. Mitsubishi Heavy Industries America, Inc.
   10. SANYO North America Corporation; SANYO Fisher Company.
   11. Trane; a business of American Standard companies.
   12. YORK; a Johnson Controls company.

2.2 INDOOR UNITS (5 TONS OR LESS)

A. Wall-Mounted, Evaporator-Fan Components:
   1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.
   2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 206/110.
   3. Fan: Direct drive, centrifugal.
   4. Fan Motors:
      a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Section 15058 "Common Motor Requirements for HVAC Equipment."
      b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
      c. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.

d. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in electrical Sections.
e. Mount unit-mounted disconnect switches on interior of unit.

5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
6. Condensate Drain Pans:
   a. Fabricated with one percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
      1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1.
      2) Depth: A minimum of 1 inch deep.
   b. Single-wall, stainless-steel sheet.
   c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on one end of pan.
      1) Minimum Connection Size: NPS 1.
   d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
7. Air Filtration Section:
   a. General Requirements for Air Filtration Section:
      1) Comply with NFPA 90A.
      2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
      3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.
   b. Disposable Panel Filters:
      1) Factory-fabricated, viscous-coated, flat-panel type.
      2) Merv according to ASHRAE 52.2: 5.
      3) Media: Interlaced glass fibers sprayed with nonflammable adhesive.
      4) Frame: Galvanized steel, with metal grid on outlet side, steel rod grid on inlet side, and hinged; with pull and retaining handles.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:
   1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
   2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
      a. Compressor Type: Scroll.
      b. Refrigerant Charge: R-410A.
      c. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 206/110.
   3. Heat-Pump Components: Reversing valve and low-temperature-air cutoff thermostat.
   4. Fan: Aluminum-propeller type, directly connected to motor.
   5. Motor: Permanently lubricated, with integral thermal-overload protection.
   6. Low Ambient Kit: Permits operation down to 45 deg F (cooling) and 17 deg F (heating).

7. Mounting Base: Polyethylene.

2.4 ACCESSORIES

A. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
   1. Compressor time delay.
   2. 24-hour time control of system stop and start.
   3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
   4. Fan-speed selection including auto setting.

B. Automatic-reset timer to prevent rapid cycling of compressor.

C. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.

D. Drain Hose: For condensate.

2.5 CAPACITIES AND CHARACTERISTICS

A. Refer to schedules on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units level and plumb.

B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.

C. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where piping is installed adjacent to unit, allow space for service and maintenance of unit.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:
   1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
   2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.

3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

D. Prepare test and inspection reports.

3.4 STARTUP SERVICE

A. Perform startup service.
1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 15738

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes radiant-heating piping, including pipes, fittings, and piping specialties.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. PEX: Crosslinked polyethylene.

C. PEX/AL/PEX: Crosslinked polyethylene/aluminum/crosslinked polyethylene.

D. PR-ET: Polyethylene of Raised Temperature.

E. PTFE: Polytetrafluoroethylene plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include data for piping, fittings, manifolds, specialties, and controls; include pressure and temperature ratings, oxygen-barrier performance, fire-performance characteristics, and water-flow and pressure-drop characteristics.

B. Shop Drawings: Show piping layout and details drawn to scale, including valves, manifolds, controls, and support assemblies, and their attachments to building structure.
   1. Shop Drawing Scale: 1/4 inch = 1 foot.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For radiant-heating piping valves and equipment to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PEX PIPE AND FITTINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. FloorHeat Company (The).
   2. Heat Innovations Inc.

3. HeatLink Group Inc.
4. Infloor Radiant Floor Heating.
5. IPEX Inc.
6. Mr Pex Systems Inc.
7. REHAU Incorporated.
8. Slant/Fin Corporation.
9. Uponor.
10. Viega.
11. Warmboard Inc.
12. Watts Radiant, inc.; a Watts Water Technologies company.
13. Zurn Industries, LLC; Zurn Pex, Inc.

B. Pipe Material: PEX plastic according to ASTM F 876.

C. Oxygen Barrier: Limit oxygen diffusion through the tube to maximum 0.10 mg per cu. m/day at 104 deg F according to DIN 4726.

D. Fittings: ASTM F 1807, metal insert and copper crimp rings.

E. Pressure/Temperature Rating: Minimum 100 psig and 180 deg F.

2.2 PE-RT PIPE AND FITTINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. FloorHeat Company (The).
2. Heat Innovations Inc.
3. HeatLink Group Inc.
4. Infloor Radiant Floor Heating.
5. IPEX Inc.
6. Mr Pex Systems Inc.
7. REHAU Incorporated.
8. Slant/Fin Corporation.
9. Uponor.
10. Viega.
11. Warmboard Inc.
12. Watts Radiant, inc.; a Watts Water Technologies company.
13. Zurn Industries, LLC; Zurn Pex, Inc.
14. Roth Industries, Inc.

B. Pipe Material: 5-layer PE-RT tubing per ASTM F2623.
1. Layers shall consist of the following:
a. Inner PE-RT layer
b. Adhesive layer
c. EVOH layer
d. Adhesive layer
e. Outer PE-RT layer

C. Oxygen Barrier: Limit oxygen diffusion through the tube to maximum 0.32 mg per cu. m/day at 104 deg F according to DIN 4726.

D. Fittings: Use fittings offered by PE-RT manufacturer certified by ASTM F877 AND F2098-08.

E. Pressure/Temperature Rating: Minimum 100 psig and 180 deg F.

2.3 DISTRIBUTION MANIFOLDS

A. Manifold: Minimum NPS 1, brass.

B. Main Shutoff Valves:
1. Factory installed on supply and return connections.
2. Two-piece body.
3. Body: Brass or bronze.
4. Ball: Chrome-plated bronze.
5. Seals: PTFE.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

C. Manual Air Vents:
1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Key furnished with valve, or screwdriver bit.
4. Inlet Connection: NPS 1/2.
5. Discharge Connection: NPS 1/8.
6. CWP Rating: 150 psig.
7. Maximum Operating Temperature: 225 deg F.

D. Balancing Valves:
1. Body: Plastic or bronze, ball or plug, or globe cartridge type.
2. Ball or Plug: Brass or stainless steel.
3. Globe Cartridge and Washer: Brass with EPDM composition washer.
4. Seat: PTFE.
5. Differential Pressure Gage Connections: Integral seals for portable meter to measure loss across calibrated orifice.
6. Handle Style: Lever or knob, with memory stop to retain set position if used for shutoff.
7. CWP Rating: Minimum 125 psig.
8. Maximum Operating Temperature: 250 deg F.

E. Thermometers:
1. Mount on supply and return connections.
2. Case: Dry type, metal or plastic, 2-inch diameter.
3. Element: Bourdon tube or other type of pressure element.
4. Movement: Mechanical, connecting element and pointer.
5. Dial: Satin-faced, nonreflective aluminum with permanently etched scale markings.
6. Pointer: Black metal.
7. Window: Plastic.
8. Connector: Rigid, back type.
9. Thermal System: Liquid- or mercury-filled bulb in copper-plated steel, aluminum, or brass stem.

10. Accuracy: Plus or minus 1 percent of range or plus or minus 1 scale division to maximum of 1.5 percent of range.

F. Mounting Brackets: Copper, or plastic- or copper-clad steel, where in contact with manifold.

2.4 PIPING SPECIALTIES

A. Floor Mounting Staples:
1. Steel, with corrosion-resistant coating and smooth finish without sharp edges.
2. Minimum Thickness: 3/32 inch.
3. Width: Minimum, wider than tubing.

B. Floor Mounting Clamps:
1. Two bolts, steel, with corrosion-resistant coating and smooth finish without sharp edges.
2. Minimum Thickness: 3/32 inch.
3. Width: Minimum, wider than tubing.

C. Floor Mounting Tracks:
1. Aluminum or plastic channel track with smooth finish and no sharp edges.
2. Minimum Thickness: 1/16 inch.
3. Slot Width: Snap fit to hold tubing.
4. Slot Spacing: 2-inch intervals.

D. Antifreeze (Glycol):
1. Antifreeze solutions shall meet local, DNR, and state requirements and be USDA approved food grade.
2. Solutions shall be acceptable by component manufacturers.
3. Sufficient solution for initial system startup and for preventive maintenance for one year from date of Substantial Completion.
4. Premixed 40% propylene glycol with corrosion inhibitors and environmental stabilizer additives to protect piping circuit and connected equipment from physical damage caused by freezing or corrosion.
5. Approved manufacturers:
   a. a. Dow
   b. b. Interstate Chemical
   c. c. Barsol
   d. d. Houghton

2.5 CONTROLS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Danfoss Inc.
2. HeatLink Group Inc.
3. Honeywell International Inc.
4. Infloor Radiant Floor Heating.
5. IPEX Inc.
6. REHAU Incorporated.
7. Slant/Fin Corporation.

8. tekmar Control Systems, Ltd.
9. Uponor.
10. Viega.
11. Watts Radiant, inc.; a Watts Water Technologies company.
12. Zurn Industries, LLC; Zurn Pex, Inc.
13. Roth Industries, Inc.

B. Wall-Mounted Thermostat:
1. Minimum temperature range from 50 to 90 deg F.
2. Manually operated with on-off switch.
3. Day and night setback and clock program with minimum four periods per day.
4. Operate pump if room temperature falls below the thermostat setting, and stop pump when room temperature rises above the thermostat setting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and substrates to receive radiant-heating piping for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
1. Ensure that surfaces and pipes in contact with radiant-heating piping are free of burrs and sharp protrusions.
2. Ensure that surfaces and substrates are level and plumb.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Install the following types of radiant-heating piping for the applications described:
1. Piping in Level Fill Concrete Floors (Not Reinforced): PEX or PE-RT.

3.3 INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings or coordination drawings.

B. Install radiant-heating piping continuous from the manifold through the heated panel and back to the manifold without piping joints in heated panels.

C. Connect radiant piping to manifold in a reverse-return arrangement.

D. Do not bend pipes in radii smaller than manufacturer's minimum bend radius dimensions.

E. Install manifolds in accessible locations, or install access panels to provide maintenance access as required in Section 08311 "Access Doors and Frames."

F. Fire- and Smoke-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials according to Section 07841 "Through-Penetration Firestop Systems."

G. Piping in Level Fill Concrete Floors (Not Reinforced):
   1. Secure piping in concrete floors by attaching pipes to subfloor using tracks, clamps, or staples.
   2. Space tracks, clamps, or staples a maximum of 18 inches o.c. and at center of turns or bends.
   3. Maintain 3/4-inch minimum cover.
   4. Install a sleeve of 3/8-inch- thick, foam-type insulation or PE pipe around tubing and extending for a minimum of 10 inches on each side of slab joints to protect the tubing passing through expansion or control joints. Anchor sleeve to slab form at control joints to provide maximum clearance for saw cut.
   5. Maintain minimum 40-psig pressure in piping during the concrete pour and continue for 24 hours during curing.

H. Revise locations and elevations from those indicated as required to suit field conditions and ensure integrity of piping and as approved by Architect.

I. After system balancing has been completed, mark balancing valves to permanently indicate final position.

J. Perform the following adjustments before operating the system:
   1. Open valves to fully open position.
   2. Check operation of automatic valves.
   3. Set temperature controls so all zones call for full flow.
   4. Purge air from piping.

K. After concrete or plaster heating panel has cured as recommended by concrete or plaster supplier, operate radiant-heating system as follows:
   1. Start system heating at a maximum of 10 deg F above the ambient radiant-panel temperature and increase 10 deg F each following day until design temperature is achieved.
   2. For freeze protection, operate at a minimum of 60 deg F supply-water temperature.

3.4 FIELD QUALITY CONTROL

A. Prepare radiant-heating piping for testing as follows:
   1. Open all isolation valves and close bypass valves.
   2. Open and verify operation of zone control valves.
   3. Flush with clean water and clean strainers.

B. Perform the following tests and inspections:
   1. Leak Test: After installation, charge system and test for leaks. Subject piping to hydrostatic test pressure that is not less than 1.5 times the design pressure but not more than 100 psig. Repair leaks and retest until no leaks exist.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Radiant-heating piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Protect hydronic piping system from damage during construction.

END OF SECTION 15772

SECTION 15838

POWER VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Ceiling-mounted ventilators.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
   1. Certified fan performance curves with system operating conditions indicated.
   2. Certified fan sound-power ratings.
   3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
   4. Material thickness and finishes, including color charts.
   5. Dampers, including housings, linkages, and operators.
   6. Fan speed controllers.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 2 - PRODUCTS

2.1 CEILING-MOUNTED VENTILATORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   1. Broan-NuTone LLC.
   2. Broan-NuTone LLC; NuTone Inc.
   3. Carnes Company.
   4. Greenheck Fan Corporation.
   5. Loren Cook Company.
   6. PennBarry.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

C. Install units with clearances for service and maintenance.

D. Label unit according to schedule.

3.2 CONNECTIONS

A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Section 16060 "Grounding and Bonding."

D. Connect wiring according to Section 16120 "Conductors and Cables."

END OF SECTION 15838

SECTION 16060

GROUNDING AND BONDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes grounding and bonding systems and equipment.

1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

2.2 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   4. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

B. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
   3. Connections to Ground Rods at Test Wells: Bolted connectors.
   4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

3.3 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Grounding and Bonding for Piping:
   1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
   2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
   3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
   2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

B. Grounding system will be considered defective if it does not pass tests and inspections.

END OF SECTION 16060

SECTION 16073

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.

B. Related Sections include the following:

1. Section 16074 "Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Steel slotted support systems.

2. Nonmetallic slotted support systems.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze hangers. Include Product Data for components.

2. Steel slotted channel systems. Include Product Data for components.

3. Nonmetallic slotted channel systems. Include Product Data for components.

4. Equipment supports.

1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified together with concrete Specifications.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Section 07720 "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

4. Channel Dimensions: Selected for applicable load criteria.

B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface.

1. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.

2. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.

3. Rated Strength: Selected to suit applicable load criteria.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.

7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 05500 "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Raceway Support Methods: In addition to methods described in NECA 1, EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.

2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

4. To Existing Concrete: Expansion anchor fasteners.

5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.

6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.

7. To Light Steel: Sheet metal screws.

8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 05500 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 16073

SECTION 16075

ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Identification for conductors.
2. Underground-line warning tape.
3. Warning labels and signs.
4. Equipment identification labels.

1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.4 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

PART 2 - PRODUCTS

2.1 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive, Self-Laminating Polyester Labels: [**Preprinted**] [**Write-on**], 3-mil- thick flexible label with acrylic pressure-sensitive adhesive that provides a clear, weather- and chemical-resistant, self-laminating, protective shield over the legend. Labels sized to fit the conductor diameter such that the clear shield overlaps the entire printed legend.

C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

D. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve with diameter sized to suit diameter of conductor it identifies and to stay in place by gripping action.

E. Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tube with machine-printed identification label. Sized to suit diameter of and shrinks to fit firmly around conductor it identifies. Full shrink recovery at a maximum of 200 deg F. Comply with UL 224.

F. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

G. Write-On Tags: Polyester tag, [**0.010 inch**] [**0.015 inch**] <**Insert dimension**> thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
   2. Labels for Tags: Self-adhesive label, machine-printed with permanent, waterproof, black ink recommended by printer manufacturer, sized for attachment to tag.

2.2 UNDERGROUND-LINE WARNING TAPE

A. Tape:
   1. Recommended by manufacturer for the method of installation and suitable to identify and locate underground electrical utility lines.
   2. Printing on tape shall be permanent and shall not be damaged by burial operations.
   3. Tape material and ink shall be chemically inert, and not subject to degrading when exposed to acids, alkalis, and other destructive substances commonly found in soils.

B. Color and Printing:
   1. Comply with ANSI Z535.1 through ANSI Z535.5.
   2. Inscriptions for Red-Colored Tapes: ELECTRIC LINE

2.3 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

2.4 INSTRUCTION SIGNS

A. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

F. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at 6 to 8 inches below finished grade. Use multiple tapes where width of multiple lines installed in a common trenchexceeds 16 inches overall.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
   1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
      a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
      b. Colors for 208/120-V Circuits:
         1) Phase A: Black.
         2) Phase B: Red.
         3) Phase C: Blue.
      c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable.
   1. Limit use of underground-line warning tape to direct-buried cables.
   2. Install underground-line warning tape for both direct-buried cables and cables in raceway.

E. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
   1. Comply with 29 CFR 1910.145.
   2. Identify system voltage with black letters on an orange background.
   3. Apply to exterior of door, cover, or other access.
   4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
      a. Power transfer switches.
      b. Controls with external control power connections.

F. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

END OF SECTION 16075

SECTION 16120

CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THHN-2-THWN-2.

C. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for nonmetallic-sheathed cable, Type NM

2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-2-THWN-2, single conductors in raceway.

B. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2-THWN-2, single conductors in raceway

C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Nonmetallic-sheathed cable, Type NM.

D. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-2-THWN-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 16130 "Raceways and Boxes" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 16073 "Hangers and Supports for Electrical Systems."

3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material[and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors].
   1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 16075 "Electrical Identification."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

END OF SECTION 16120

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Metal conduits, tubing, and fittings.
   2. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

A. GRC: Galvanized rigid steel conduit.

B. IMC: Intermediate metal conduit.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. IMC: Comply with ANSI C80.6 and UL 1242.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
   1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
   2. Fittings for EMT:
      a. Material: die cast.
      b. Type: Setscrew or compression.

F. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

C. Continuous HDPE: Comply with UL 651B.

D. Coilable HDPE: Preassembled with conductors or cables, and complying with ASTM D 3485.

E. Fittings for RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

F. Solvent cements and adhesive primers shall have a VOC content of 510 and 550 g/L or less, respectively, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Solvent cements and adhesive primers shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

E. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, galvanized, cast iron with gasketed cover.

F. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

G. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
   1. Exposed Conduit: GRC or IMC.
   2. Concealed Conduit, Aboveground: GRC or IMC.

3. Underground Conduit: RNC, Type EPC-40-PVC, direct buried.
4. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply raceway products as specified below unless otherwise indicated:
1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC or IMC.
4. Damp or Wet Locations: GRC or IMC.
5. Boxes and Enclosures: NEMA 250, Type 1.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, cast-metal fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

C. Complete raceway installation before starting conductor installation.

D. Comply with requirements in Section 16073 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches of enclosures to which attached.

I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.

K. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

L. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

M. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.

N. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.

O. Comply with manufacturer's written instructions for solvent welding RNC and fittings.

P. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
   1. Use LFMC in damp or wet locations subject to severe physical damage.
   2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

Q. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

R. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

S. Locate boxes so that cover or plate will not span different building finishes.

T. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

U. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

V. Set metal floor boxes level and flush with finished floor surface.

W. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:
   1. Excavate trench bottom to provide firm and uniform support for conduit.
   2. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.
   3. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through floor unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
   4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.
      a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
      b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.
   5. Underground Warning Tape: Comply with requirements in Section 16075 "Electrical Identification."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.
   1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 16130

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Snap switches.

1.3 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

C. Samples: One for each type of device and wall plate specified, in each color specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
   1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
   2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 5351 (single), CR5362 (duplex).
      b. Hubbell; HBL5351 (single), HBL5352 (duplex).
      c. Leviton; 5891 (single), 5352 (duplex).
      d. Pass & Seymour; 5361 (single), 5362 (duplex).

2.4 GFCI RECEPTACLES

A. General Description:
   1. Straight blade, feed-through type.
   2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
   3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; VGF20.
      b. Hubbell; GFR5352L.
      c. Pass & Seymour; 2095.
      d. Leviton; 7590.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:
   1. Products: Subject to compliance with requirements, provide one of the following:
      1) Single Pole:
         a) Cooper; AH1221.
         b) Hubbell; HBL1221.
         c) Leviton; 1221-2.
         d) Pass & Seymour; CSB20AC1.

2.6 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.
   2. Material for Finished Spaces: 0.035-inch- thick, satin-finished, Type 302 stainless steel.
   3. Material for Unfinished Spaces: Galvanized steel.

2.7 FINISHES

A. Device Color:
   1. Wiring Devices Connected to Normal Power System: Gray unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:
   1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
   2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
   3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
   4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:
   1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
   2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
   3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
   4. Existing Conductors:
      a. Cut back and pigtail, or replace all damaged conductors.
      b. Straighten conductors that remain and remove corrosion and foreign matter.
      c. Pigtailing existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:
   1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
   2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

A. Comply with Section 16075 "Electrical Identification."

B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

A. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
3. Ground Impedance: Values of up to 2 ohms are acceptable.
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

B. Wiring device will be considered defective if it does not pass tests and inspections.

END OF SECTION 16140

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Indoor occupancy sensors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show installation details for occupancy and light-level sensors.
   1. Interconnection diagrams showing field-installed wiring.
   2. Include diagrams for power, signal, and control wiring.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Cooper Industries, Inc.
   2. Hubbell Building Automation, Inc.
   3. Leviton Manufacturing Co., Inc.
   4. Sensor Switch, Inc.
   5. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
   1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
   3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
   4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
   5. Mounting:
      a. Sensor: Suitable for mounting in any position on a standard outlet box.

b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.
8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

2.2 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Manufacturing Co., Inc.
4. Sensor Switch, Inc.
5. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor:
1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: PIR.
3. Switch Type: SP.
4. Voltage: Match the circuit voltage.
5. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
6. Concealed "off" time-delay selector at 30 seconds, and 5, 10, and 20 minutes.

2.3 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 16120 "Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 16120 "Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 16120 "Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

3.2 CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

A. Wiring Method: Comply with Section 16120 "Conductors and Cables." Minimum conduit size is 1/2 inch.

B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring according to Section 16075 "Electrical Identification."
   1. Identify controlled circuits in lighting contactors.
   2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
   2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Lighting control devices will be considered defective if they do not pass tests and inspections.

END OF SECTION 16145

SECTION 16442

PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Distribution panelboards.
2. Lighting and appliance branch-circuit panelboards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of panelboard, switching and overcurrent protective device, , accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA PB 1.

D. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

    a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
    b. Outdoor Locations: NEMA 250, Type 3R.

2. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box.
3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
4. Finishes:

    a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    b. Back Boxes: Same finish as panels and trim.

5. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.

B. Phase, Neutral, and Ground Buses:

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

C. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus-Configured Terminators: Mechanical type.

D. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.

E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1, power and feeder distribution type.

B. Doors: Secured with vault-type latch with tumbler lock; keyed alike.

1. For doors more than 36 inches high, provide two latches, keyed alike.

C. Mains: Circuit breaker.

2.3 Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers; LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: lugs only.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1.

B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.

C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.

B. Mount panelboard cabinet plumb and rigid without distortion of box.

C. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

D. Install filler plates in unused spaces.

E. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.

F. Comply with NECA 1.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 16075 "Electrical Identification."

B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 16075 "Electrical Identification."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 16075 "Electrical Identification."

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

C. Panelboards will be considered defective if they do not pass tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.

1. Measure as directed during period of normal system loading.

2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION 16442

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Lighting fixtures, lamps, and ballasts.
   2. Lighting fixture supports.

1.3 DEFINITIONS

A. BF: Ballast factor.

B. CCT: Correlated color temperature.

C. CRI: Color-rendering index.

D. LER: Luminaire efficacy rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of lighting fixture including dimensions.
   2. Ballast, including BF.
   3. Energy-efficiency data.
   4. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
   5. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.
   6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.
      a. Testing Agency Certified Data: For indicated fixtures, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining fixtures shall be certified by manufacturer.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   2. Wiring Diagrams: For power, signal, and control wiring.

C. Installation instructions.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
   1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.6 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910, complying with the IESNA Lighting Measurements Testing & Calculation Guides.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NFPA 70.

1.7 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide one of the products indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Diffusers and Globes:
   1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   2. Glass: Annealed crystal glass unless otherwise indicated.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp and ballast characteristics:
      a. "USE ONLY" and include specific lamp type.
      b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
      c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
      d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
      e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
      f. CCT and CRI for all luminaires.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:
   1. Comply with UL 935 and with ANSI C82.11.
   2. Designed for type and quantity of lamps served.
   3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
   4. Sound Rating: Class A.
   5. Total Harmonic Distortion Rating: Less than 10 percent.
   6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   7. Operating Frequency: 42 kHz or higher.
   8. Lamp Current Crest Factor: 1.7 or less.
   9. BF: 0.88 or higher.
   10. Power Factor: 0.95 or higher.
   11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electronic Programmed-Start Ballasts for T8 Lamps: Comply with ANSI C82.11 and the following:

1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
2. Automatic lamp starting after lamp replacement.

D. Single Ballasts for Multiple Lighting Fixtures: Factory wired with ballast arrangements and bundled extension wiring to suit final installation conditions without modification or rewiring in the field.

2.4 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.
1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.5 FLUORESCENT LAMPS

A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 80 (minimum), color temperature 4100 K, and average rated life 25,000 hours unless otherwise indicated.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 16073 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:
1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Connect wiring according to Section 16120 "Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 16075 "Electrical Identification."

END OF SECTION 16511