PROJECT MANUAL for

MORGAN COUNTY HOG AND SHEEP BARN BRUSH, COLORADO

PROJECT #N-0124

OWNER:

MORGAN COUNTY, COLORADO

PROJECT ARCHITECT:

JOSEPH R. HEWGLEY & ASSOCIATES, INC.
702 South Bailey, North Platte, Nebraska 69101
(308) 534-4983

ELECTRICAL/PLUMBING ENGINEER:

Engineering Technologies Inc.
825 M Street, Suite 200
Lincoln, Nebraska 68508
(402) 476-1273

STRUCTURAL ENGINEER:

Performance Engineering
11811 Fort Street, Suite 104
Omaha, NE 68164
(402) 343-3960

CIVIL & SITE ENGINEERING:
TC Engineering
1 S Sycamore St
North Platte, Nebraska 69101
(308) 534-9245

I, Joseph R. Hewgley, Jr. am the Coordinating Professional on the Morgan County Hog and Sheep Barn, Brush, CO

SECTION 00 00 02

PROJECT DIRECTORY

Architect:
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702 South Bailey
North Platte, Nebraska 69101
(308) 534-4983
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ryan@jrharchitecture.com

Mechanical/ Electrical Eng:
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Civil & Site Eng:
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END OF SECTION 00 00 02

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SECTION 00 10 00

INSTRUCTIONS TO BIDDERS

1. EXAMINATION OF PREMISES

A. Before Submitting proposals, each bidder shall carefully examine all the contract documents, visit the site to obtain knowledge of existing conditions under which he will be obligated to operate or that will any way affect his work, familiarize himself with Federal, State, and Local any laws, ordinances, rules or regulations which may affect on any work in this contract.

B. The submission of a bid will serve a representation by the bidder that he has complied with paragraph A above

C. After execution of Agreement, no consideration will be given to any claim or misunderstanding of the contract documents, alleged unfamiliarity of site conditions, or any regulations affecting the work.

D. Bidders shall use the entire set of plans to bid from, carefully examine all sheets.

2. INTERPRETATION OF CONTRACT DOCUMENTS

A. If, during the bidding period, a bidder observes any error, discrepancy, ambiguity, or omission in, or requires clarification as to the meaning of the drawings and/or specifications, he shall immediately, in writing, request interpretations or corrections by the Architect, who, if appropriate, will issue a written clarification, by addendum to all known bidders. Questions received less the eight calendar days prior to the date for receipt of bids will not be answered.

B. Should there be any doubt as to the exact meaning of the documents which reasonably should have been apparent during the bidding period, and or, brought to the attention of the Architect prior to receipt of bids. No additional claim or payment shall be allowed thereafter for a claim of "misunderstanding" of the contract documents.

C. It is the intent of these specifications, for bidding purposes, that each prime Subcontractor i.e. Mechanical, Electrical, shall be responsible for the coordination of any demolition, including any replacement or repair required, with the General Contractor.

D. All patching and/or replacement of any portion of the building or site shall, however, be the ultimate responsibility of the General Contractor.

E. It shall be clearly understood that all walls, floors, or other portions of the building shall be "finished surfaces" i.e. painted, carpeted, etc., unless specifically noted otherwise. All patching or replacement of walls, floors, etc., or other portions of the building shall be figured as "finished surfaces" i.e. painted, carpeted, etc., to match the adjacent finish unless specifically noted otherwise. No allowance will be made after the opening of bids for work involving finish treatment of any walls, floors, or other portions of the building whether noted or not.

3. PROPOSALS

A. Proposals shall be made upon the Bid Forms provided by the Architect, with all blank spaces dully filled in; numbers stated in both figures and in writing, where so provided in the Bid Form; signatures shall be in long hand, executed by principals authorized or qualified to obligate the bidder to the extent of the Bid. Bidders legal name fully stated; if a corporate name or co-partnership, by a member of the firm. Completed form shall be without interlineations, alterations, or erasures.

B. Bidders shall be responsible to ascertain that all addenda, complete, have been received, and to indicate receipt of same in the space provided on the Bid Form.

C. Failure to submit proposals on or before the time stipulated may result in a disqualification of the bid.

4. FILING OF BID PROPOSALS

A. Owner requests a combined bid for all, General, Civil, Mechanical and Electrical Work. Each bid proposal shall be enclosed in a sealed opaque envelope and filed with the Architect prior to letting. Face of envelope shall bear the following information:

Project Number: N-0124
Project Name: MORGAN COUNTY HOG AND SHEEP BARN
BRUSH, COLORADO

Bidders Name and Address:_____

B. Proposals may be withdrawn at any time prior to the time scheduled for the receiving of bids. Bids not withdrawn prior to this time, may not be withdrawn for a period of thirty (30) days thereafter.

C. Any bidder may modify his bid by telegraphic communication provided such communication is received by the Owner prior to the published time for receipt of bids. Written confirmation of such modification must be received by the North Platte Supt. of Schools within two (2) working days from the receipt of bids.

5. OPENING OF BIDS

A. The receiving and opening of the proposals will be in an open bid letting at the time and place listed in the Notice to Bidders. The successful bid will be based upon cost and may also be affected by other pertinent data contained in the proposal.

B. The Owner reserves the right to reject any or all bids or to accept any bid considered advantageous to them. The Owner further reserves the right to delay the award of contract up to thirty (30) days after receipt of proposals, with no change in the Base Bid or other conditions or prices stated in the proposals.

C. The Bidder agrees that this Base Bid Proposal is contingent upon the Bidder being fully prepared to commence work within ten (10) working days of receipt of a written "Letter of Intent", or "Notice To Proceed".

6. ADDENDA

All addenda are to be incorporated in the Proposal and shall become a part of the Contract Documents.

7. BID BOND

All bids must be accompanied by a certified or cashier's check or bid bond made payable to the Owner in an amount equal to five percent (5%) of the total base bid.

8. PERFORMANCE AND PAYMENT BOND

The successful bidders shall be required to furnish a Performance Bond, AIA Document A 311, Labor and Material Payment Bond, AIA Document A 311, in an amount equal to one hundred percent (100%) of the contract. All Bonds shall be furnished within ten (10) calendar days of Notice of the Notice of Acceptance by the owner. Work will not commence until a copy of all bonds have been delivered to the Architect.

9. TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. Bidder shall state on his bid form the estimated time of completion for the construction of the Project.

B. The Contractor hereby agrees to commence work under this Contract within an agreed upon number of calendar days from the owners notice to proceed and endeavor to substantially complete said project within agreed upon consecutive calendar days thereafter.

C. No liquidated damages will be assessed on this project.

10. PROGRESS SCHEDULE

Work progress is considered critical. It is a condition precedent to submitting of a proposal for this work that Contractor agrees to maintain a work force adequate to comply with all work schedules and deadlines, including those contained in these documents.

11. SALES TAX

Contractor shall not figure sales tax in his bid. The successful bidder shall be designated as a purchasing agent on behalf of the Owner.

12. QUALIFICATIONS

A. Owner will not award Contract to any bidder who does not furnish, upon request, satisfactory evidence that he has the necessary ability and experience in work of this scope, financial resources, facilities and plant to enable him to successfully complete the project as shown and described in the Contract Documents.

B. Unless waived by the Architect, the bidder shall, within seven days of notification of selection of the award of a Contract for the Work, submit the following information to the Architect:
   1. A designation of the Work to be performed by the Bidder with his own forces.
   2. The proprietary names and the suppliers of principal items of systems of material and equipment proposed for the Work.

3. A list of names of the subcontractors or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

C. The Bidder will be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the proposed subcontractors to furnish and perform the Work described in the sections of the Specifications pertaining to such proposed subcontractors respective trades.

D. Prior to the award of the Contract the Architect will notify the Contractor in writing of any subcontractor either the Owner or Architect have a reasonable and substantial objection to and refuses to accept on the project. The Contractor can, at his option, either withdraw his bid or submit an acceptable substitute subcontractor, with any increase in his bid price as may be warranted by this change. The owner may, at his option, accept the increased bid price or disqualify the bidder. In either event the "Bid Security" will not be forfeited not withstanding anything to the contrary in paragraph "Bid Security" in this section.

E. Subcontractors, material suppliers, and other persons or firms proposed by the Contractor and accepted by the Owner may not be changed without written approval of both the Owner and Architect.

END OF SECTION 00 10 00

SECTION 00 11 16

INVITATION TO BID

Sealed bids will be received at **218 W. Kiowa Street, Fort Morgan, CO 80701 until 9:00am mountain time the 2nd day of January, 2025** for the **Morgan County Hog and Sheep Barn.** All bids, properly received, will be opened at that time in an open and public letting. The Owner will review all bids with the Architect with the intent of awarding a contract for all construction to the lowest responsible bidder. All Bids (including Unit Prices) must be submitted on the Bid Form provided in the documents.

One proposal for the general construction work, (including, but not limited to, all civil, structural, mechanical and electrical construction) will be accepted.

Digital Plans and specifications for the above construction **may be obtained after December 16th, 2024** from https://morgancounty.colorado.gov/bids-and-proposals. At the time of filing their bids, each bidder will be required to furnish a certified check, cashier's check or bid bond in an amount equal to five percent (5%) of their total bid.

Morgan County reserves the right to reject any or all bids, to waive all irregularities, and to accept any bid deemed to be in the best interest of the organization. Bids received after the closing time will be returned unopened.

By: Morgan County, Fort Morgan Colorado

SECTION 00 31 00

BID PROPOSAL

BID PROPOSAL FOR: MORGAN COUNTY HOG AND SHEEP BARN
BRUSH, COLORADO

ONE LUMP SUM PROPOSAL FOR ALL GENERAL AND OTHER MISCELLANEOUS WORK.

The undersigned, being familiar with the local conditions affecting the cost of the work and the Contract Documents, including Instructions to Bidders, General and Supplemental Conditions, Plans and Specifications hereby proposes to furnish all labor, materials and equipment required to complete the Contract in accordance with Plans, Specifications and Contract Documents for the sum of:

BASE BID:

_____

_____($_____)

To be completed within _____calendar days.

The undersigned acknowledges receipt of Addenda No(s). _____ prior to the time of submitting this proposal, and all items therein are included in this proposal.

MORGAN COUNTY RESERVES THE RIGHT TO REJECT ANY OR ALL BIDS OR TO ACCEPT ANY BID CONSIDERED THE MOST ADVANTAGEOUS TO THEM.

Corporation Seal

Respectfully Submitted by:

Firm Name:
_____

By:
_____

Address:
_____

Date:
_____

END OF SECTION 00 31 00

SECTION 00 43 23

ALTERNATE FORM

1.1 BID INFORMATION

A. Bidder: _____.

B. Project Name: **NEW HOG AND SHEEP BARN**

C. Project Location: BRUSH**, COLORADO**

D. Owner: **MORGAN COUNTY**

E. Architect: **JOSEPH R. HEWGLEY & ASSOCIATES, INC.**

F. Architect Project Number: **R-0124**

1.2 BID FORM SUPPLEMENT

A. This form is required to be attached to the Bid Form.

B. LIST OF ALTERNATES: ADD/DEDUCT AMOUNT

A-1: ELIMINATE LEAN-TOO STRCUTURE_____ $_____

1.1.3 SUBMISSION OF SUPPLEMENT

Respectfully submitted this ____ day of _____, 2016.

Submitted By: _____
(Name of bidding firm or corporation)

Authorized Signature: _____
(Handwritten signature)

Signed By: _____
(Type or print name)

Title: _____
(Owner/Partner/President/Vice President)

END OF SECTION 00 43 23

SECTION 00 44 00

SUBSTITUTION LISTING

TO: Morgan County hereinafter referred to as "Owner"

1. Pursuant to bidding requirements for the work titled:

New Hog & Sheep Barn for Morgan County Fairgrounds, Brush, Colorado

The Contract Sum proposed by the undersigned on the bid form is for the Work as shown on the Drawings, described in the Specifications, and otherwise defined in the Contract Documents. However, the undersigned proposes the following substitutions for the Owners consideration. If the Owner should accept any or all of the proposed substitutions, the Contract Sum may be reduced or increased by an appropriate amount.

2.

Specified Product or Material	Drawing # or Spec. Section	Proposed Substitution	Proposed Red. or add. Contract Sum
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

PROVIDE SIGNATURE IDENTICAL TO THAT SHOWN ON THE BID FORM

BIDDER:

_____

by_____

END OF SECTION 00 44 00

SECTION 00 80 00

SUPPLEMENTARY CONDITIONS

1. GENERAL NOTES:

The Special Conditions herein stated shall be included and shall become a part of these specifications.

These specifications are of the abbreviated type and may include incomplete sentences omissions of words or phrases such as "in conformity therewith", "as noted", "a", "an", "the" are international. Omitted words and phrases shall be supplied by inference in the same manner as they are when a "note" occurs on drawings. Words "shall be", "shall", or "similar to", or other appropriate words or phrases, shall be supplied by inference.

The American Institute of Architects Document A201, 2007 edition, “General Conditions of the Contract for Construction”. A copy of this document is on file for reference at the office of the Architect.

2. LAWS, REGULATIONS AND SPECIFICATIONS:

A. All laws, ordinances, regulations, orders, manuals, manufacturers specifications, or publications, whether or not specifically made a part of or incorporated by reference in the Contract Documents shall be the latest edition unless specifically noted otherwise.

B. All references to manufacturers directions, specifications or recommendations shall refer to the referenced manufacturers current published manuals or publication. These publications are hereby made a part of and incorporated by this reference into the Project Specifications.

C. No provision or term of any referenced manual, or publication shall change the duties or responsibilities of the Architect, his agents, consultants or their employees as established in the Owner-Architect Agreement.

D. If any materials or equipment is "Furnished by Others" for the Contractors installation, the Contractor shall use the manufacturers or suppliers detailed drawings to establish roughing-in dimensions and service locations. Except for aesthetic or structural considerations the manufacturers detailed drawings shall be used where any conflicts may occur.

3. EXECUTION, CORRELATION AND INTENT

A. Add the following to subparagraph 1.2.3 of the GENERAL CONDITIONS.

1.2.3.1. The Contract Documents are diagrammatic in nature, showing the design intent but not showing every detail for the completed construction. By execution of the Contract by the Contractor, he represents that the Contract Documents, in addition to the subsequent submittals provided by the Contractor and approved by the Architects, are adequate to complete the construction of the several kinds called for.

1.2.3.2. In addition to the Contract documents, other drawings may be necessary for the Contractor to carry the Work to a successful conclusion. Such things as additional details and shop drawings may be necessary and the Contractor shall be responsible for preparing all such drawings and submitting them for the

Architect's review as required to confirm the intent of the design. The Contractor's schedule shall allow time for submittals of interpretation/clarification and Drawings so as to cause no delay in the Work.

The Owner will not consider any additional cost or additional contract time for preparing these additional drawings, nor will any additional cost or additional contract time be considered for the Work shown in these additional drawings unless it is Work clearly outside the scope of the Contract Documents.

4. SUPERVISION AND CONSTRUCTION PROCEDURES

A. Add the following to paragraph 3.3.1 of the GENERAL CONDITIONS:

3.3.1.1. It is the Contractor's responsibility to complete the Work using the information given in the Contract Documents. The Contractor shall have sufficient engineering and technical resources available to prepare and necessary additional drawings based on the design and specifications contained in the Contract Documents.

3.3.1.2. The Contractor's responsibilities for coordination of the Work extends to coordination of the shop drawings and other drawings necessary, whether prepared by the Architect of the Contractor, to insure the proper execution and completion of the Work.

5. COST INFORMATION

A. Before a Contract is executed, the successful Bidder shall supply to the Architect the following:
1. A schedule of wage rates in effect at the time the Contract is to be dated.
2. Amounts of overhead and profit which he proposes to add in Change Orders involving additional Work.

6. FORM OF AGREEMENT

A. The form of agreement to be used for this Project is the American Institute of Architects Documents A101, 1987 edition, "Standard Form of Agreement Between Owner and Contractor." A copy of this document is on file for reference at the office on the Architect.

7. PHOTOGRAPHS

A. Contractor shall cause to be taken at his own expense on about the first of each calendar month during the progress of the construction, and finally at its conclusion, six (6) 3 inch x 5 inch archive quality photographs of the building from station points designated by the Architect. Two (2) color glossy prints shall be made from each negative, and shall be inserted in separate, 3 -hole heavy-duty vinyl (free of PVC) photo pages, and promptly delivered: one print to the Owner and one (1) to the Architect. Each negative and print to bear date of exposure and project identification on the face.

B. Each of the first prints submitted to the Owner and Architect shall be included in a black vinyl, three ring photo album. Each album shall be provided with 1 ½ inch rings to accommodate additional prints.

8. EXIT

A. When the business is in session the Contractor shall maintain free and usable, all exits from the building, or make alternate exiting provisions to the satisfaction of the Fire Marshal, throughout the duration of the construction operations.

9. OWNER-FURNISHED ITEMS (if any are noted)

A. Certain item will be furnished by the Owner and shall be installed by the Contraction. This includes all items which are generally categorized in the grouping hereinafter, but does not preclude the inclusion of other items as noted on the Drawings. The Owner will deliver these items to the Site, unload same and stack materials where directed by the Contractor and approved by the Architect. The Contractor will be responsible for unwrapping, uncrating, counting, verifying sizes and lengths and providing all labor, equipment and services necessary for the erection of all materials detailed or specified herein.

B. The Owner will provide the Contractor with adequate shop drawings to cover the complete installation of all Owner-furnished items, except when items are existing, relocated or reused.

C. This Contractor shall be required to perform all field cutting, fitting and adjustments as might be required to complete the Work. He shall carefully coordinate his Work with the Owner to preclude omission or double supply. The Contractor shall submit a delivery date request to the Architect for all Owner-supplied materials to insure the availability of these materials as they become needed.

10. SCHEDULING OF WORK

A. While school is in session all Work in existing buildings must be coordinated with and approved by the Owner. The school calendar is as follows:

11. COPIES OF CONTRACT DOCUMENTS

A. With reference to subparagraph 2.2.5 of the GENERAL CONDITIONS, the Contractor will be supplied with not more that 15 complete sets of Contract Documents. Additional complete sets or portions thereof may be issued upon request and on payment of reproduction costs.

12. SPECIAL CONDITIONS

A. Before submitting proposals for this work, each bidder shall be held to have examined the premises and satisfied himself as to the existing conditions under which he will be obliged to operate or that will in any way affect the work under this contract. No consideration will be given to the Contractor subsequent to the opening of bids for lack of information, or misinformation regarding this site.

B. Time for Completion - The Contractor shall commence work under this contract on a date to be specified in contract and shall fully complete all work there unto within the time limit set forth in Section 00100 Instructions to Bidders. Each Subcontractor shall coordinate his work with General Contractor so that all work shall be completed within time specified.

C. Progress Chart - Within two weeks after the award of contract, the Contractor shall submit, for approval of Architect, a "progress chart" of sufficient detail, as determined by the Architect, to clearly show the estimated progress for each component of the work, and the estimated progress for all work under this contract.

With each Application for Payment and for the purposes of comparison, the Contractor shall submit an identical chart showing the actual rate of progress to date, beside the estimated rate of progress, for each component of work and the work as a whole. Payment will not be made to the Contractor until such schedule has been received and reviewed by the Architect. If at any time the Contractors working force, in the opinion of the Architect, shall be inadequate for securing the necessary progress, the Contractor shall, if so directed increase the working force and/or equipment to such extent as to give reasonable assurance of compliance with the Schedule of Progress. Failure by the Architect to make such demand however shall not relieve Contractor of his obligation to secure a safe and quality rate of progress required by contract.

D. Temporary Services and Facilities - General Contractor shall furnish the following temporary services and shall maintain such services throughout construction.

Temporary Heat - Temporary heat, if required, is any and all heat necessary to provide working temperatures adequate to facilitate proper construction, and shall be provided by the General Contractor. Such temporary heat shall be provided by means such that neither the heat nor its effect will endanger health or property.

All heating required after enclosure of building, and before substantial completion, shall be classified as temporary heat. The building shall be considered as enclosed when it is roofed and has such protection at doorways, windows, and other openings as will provide a reasonable heat retention. The Contractor shall be responsible to furnish and maintain all temporary heat throughout the duration of the project. Unless specifically noted otherwise, a minimum temperature of 50 degrees and a maximum temperature of 75 degrees shall be maintained in the building during working hours, or at other times to facilitate temperatures adequate for various stages of work.

Temporary Light and Power - All temporary light and power shall be the responsibility of the Contractor.

Water - Water for all construction shall be provided by Contractor, and the contractor shall be responsible for any hoses required for the use of such water. The Contractor may request the use of water from the Fairgrounds but will still be responsible for the delivery of such water to the required construction areas.

Field offices and sheds shall be furnished by General Contractor and shall be weather tight with lighting, electrical outlets, and layout table suitable for the review of drawings by the Architect. Field offices shall be equipped with a phone and fax machine for us by the Contractor and Architect. Storage sheds for tools, materials and equipment shall be weather tight with adequate space for organized storage and access, and lighting for inspection of stored materials.

E. Manufacturers Directions - Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as per the manufacturers printed directions.

F. Maintenance Manual - At termination of work, Contractor shall submit to the Architect for review, three (3) properly bound and indexed maintenance manuals presenting full details for care and maintenance of visible surfaces and equipment.

G. Guaranty - Warranty - At termination of work, Contractor shall secure and submit to Architect for review, two (2) properly bound and indexed manuals with all guarantees and warranties for all equipment and materials having such guarantees or warrantees and shall be addressed to and in favor of Owner.

H. Payments to Contractor - Owner shall make payments on account of contract herewith. Ninety percent (90%) of the value, proportionate to the amount of contract of the labor and materials incorporated in the work, and materials suitably stored on the premises, less the aggregate sum of previous payments up to fifty percent (50%) of the completion of the project. Thereafter there shall be no additional retainage withheld.

I. Cooperation - All subcontractors shall coordinate their work with all adjacent work and with other trades so as to facilitate the general progress of the work.

Each trade shall afford all other trades every reasonable opportunity for the installation of their work and for the storage of their materials.

J. Reimbursement to Owner - Contractor and subcontractors shall reimburse Owner for expenses incurred by Architect at rates established in the Owner/Architect agreement for any of the following reasons:

1. At the specific request of Contractor or subcontract to Owner or Architect for the purpose of coordinating the work or resolving disputes.

2. Failure of Contractor or Subcontractor to carry out Architects previous instructions or directions and thereby causing additional expense to Architect.

3. Expense of reproduction of drawings or specifications specifically requested by Contractor or subcontractors over and above original sets issued to the General Contractor for distribution to his various subcontractors and/or suppliers.

K. Complaints Due to Adjustments and Repairs - Any complaints received due to adjustments, operational difficulties or repairs, within the construction time or guarantee time, shall be turned over to Contractor. The Contractor upon notice by letter, wire, or phone shall investigate complaint immediately and complete all necessary work within 72 hours of such notice. Failure to comply will necessitate Architect having work done and back-charged to Contractor. Contractor shall be back-charged at the rate of $75.00 per hour or 1.5 times the amount billed to the Architect by his consultants, which ever is greater, for Architects time in arranging for others to do work.

L. Arbitration Deleted - Delete reference to Arbitration in Articles 2.2.10, 2.2.11, and 7.10 in AIA Document A-210-General Conditions of the contract for construction. All disputes shall be settled by Architect, the parties to the contract, or the courts.

M. Indemnification - Delete in its entirety subparagraph 3.18.1 of the GENERAL CONDITIONS and substitute the following: The Contractor shall indemnify and hold harmless the Owner, Architect, Architects Consultants, their agents and employees of any of the above, from and against any claims, damages, losses, and or expenses, including but not limited to attorney's fees, arising out of or resulting from performance of the work, provided that such claim, damage, loss or expense is attributable to the bodily injury, sickness, disease or death, or to injury to or destruction of any tangible property, other than the work itself,

including loss of use resulting therefrom. Such indemnification shall only apply to such extent caused in whole or in part by negligent acts or omissions of the Contractor, subcontractors, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, except to the it is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in paragraph 3.18.

N. Progress Payments - On or before the twenty-fifth day of each month, Contractor shall submit to Architect an itemized application for payment supported to the extent required by Architect by receipts or other vouchers showing payments for materials and labor, payments to subcontractors and such evidence of Contractors right to payment as Architect may direct. If payments are made on valuation of work done, Contractor shall, before the first application, submit to Architect a schedule of values of the various parts of the work, including quantities, aggregating the total sum of the contract, and divided as to facilitate payments to subcontractors in accordance with Article 5.4, made out in such form as the Architect may direct, and if required, supported by such evidence as the Architect may deem necessary. This schedule, when approved by Architect, shall be used as a basis for all Certificates of Payment. In applying for payments, Contractor shall submit all statements based upon this schedule. If payments are made on account of materials not incorporated in the work but delivered and suitably stored at the site, or at some other location agreed upon in writing, such payments shall be conditioned upon submission by contractor of bills of sale or such other procedure as will establish Owners title to such materials or otherwise adequately protect Owners interest including any and all applicable insurance.

0. Final Payment – After all work is completed, approved by Architect, and accepted by Owner, final payment to Contractor shall be due in accordance with C.R.S. 38-28-107, as applicable, or, if not applicable, within thirty (30) days of approval and acceptable by the Architect and Owner.

P. Contractor's Liability Insurance - During the term of this contract, Contractor shall maintain such insurance as will protect him from claims set forth below which may arise out of or result from Contractor's operations under the contract whether such operations be by himself or by a Subcontractor, Sub-subcontractor or anyone directly or indirectly employed by the Contractor, Subcontractor, or Sub-subcontractor or by anyone individual whose acts may cause any one of them to be held liable.

1) For claims arising under any Workmen Compensation, Employer's Liability, or any similar employee benefit act.

2) For claims because of bodily injury, sickness, disease or death of any person or persons other than his employees, and for claims because of damage to or destruction of property of others resulting therefrom including loss of use thereof.

Such insurance shall be written for amounts not less than the following with respect to subparagraph (1) above:

Workmen's Compensation	Statutory
Employer's Liability	$100,000
Each Occurrence	

And with respects to subparagraph (2) above:

Bodily Injury and Property Damage with a Combined Single Limit of Liability	$1,000,000 Each Occurrence

Or

Bodily Injury

General and Automobile	$500,000 Each Person
General and Automobile	$1,000,000 Each Occurrence
Property Damage General and Automobile	$500,000
Each Person General and Automobile	$1,000,000
Each Aggregate	

The insurance referred to above shall be written under Comprehensive General and Comprehensive Automobile liability policy forms, including coverage for all owner-hired and non-owner automobiles. Contractor may at his option, provide the limits of liability as set out above by a combination of the above described forms and an Umbrella Excess Liability policy.

It is a condition of Contract that the policy or policies afford coverage for damage to property of others rising out of the perils of damage to underground facilities, and it is a further condition that the policy or policies afford the same limits of liability as set out above for liability assumed under contract, including CONTRACTUAL LIABILITY as set out in Paragraphs of the General Conditions, AIA Document No. A-201 "INDEMNIFICATION" as modified.

All responsibility for payment of any sums resulting from any deductible provision corridor or self-insured retention conditions of the policy or policies shall remain with Contractor.

It is a condition of the insurance by Owner shall not in any way relieve or decrease the liability of Contractor hereunder, and it is expressly understood that Owner/Architect does not in any way represent that the above specified insurance or limits of liability are sufficient or adequate to protect Contractors interests or liabilities.

Q. Builders Risk Insurance - Owner shall furnish standard form "All Risk Builders Risk Insurance" completed value insurance, Form 60-SBR as published by Inspection Bureau. This insurance shall include but not be limited to fire, lightning, extended coverage, and optional perils. Owner shall furnish Architect and Contractor with Certificate of Insurance.

R. Definition of Terms - The following terms as employed in these specifications are hereby defined:

Contractor:	Person or Persons, firm or corporation that enters into a contract with the Owner for the performance of Work.
Bidder:	Person or Persons, firm or corporation submitting a bid or proposal to Owner for consideration of a contract for performance of Work.
Owner:	Morgan County 218 West Kiowa Fort Morgan, Colorado 80701

Architect: Joseph R. Hewgley & Associates, Inc.
702 South Bailey
North Platte, Nebraska 69101

Work: Includes equipment, tools, materials and labor necessary to fulfill all obligations of the Contract Documents.

Notice to Proceed:

A written notice given by the Owner to the Contractor, with a copy to the Architect, fixing the date on which the Contract Time will commence to run and on which the Contractor shall start to perform his obligation under the Contract Documents.

13. REFERENCE STANDARDS

A. Industry Standards

1. Except where Contract Documents include more stringent requirements, applicable construction industry standards have same force and effect as if bound or copied directly into Contract Documents to extent referenced. Such standards are made a part of Contract Documents by reference.
2. Comply with standard in effect as of date of Contract Documents, unless specific date is specified.
3. Where compliance with two or more standards is specified and standards apparently establish different or conflicting requirements for minimum quantities or quality levels, refer to Architect for decision before proceeding. Quantity or quality level shown or specified shall be minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for context of requirements. Refer uncertainties to Architect for decision before proceeding.
4. Each entity engaged in construction on Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with Contract Documents. Where copies of standards are needed for performance of a required construction activity, Contractor shall obtain copies directly from publication source.
5. Trade association names and titles of general standards are frequently abbreviated. Following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean associated names. Names and addresses are subject to change and are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

AABC Associated Air Balance Council, 1518 K St NW, Suite 503, Washington, D.C. 20005 (202) 737-0202
AAMA American Architectural Manufacturers Assoc, 1540 K Street NW, Palatine, IL 60067 (708) 202-1350
AAN American Association of Nurserymen, 1250 Eye St NW, Suite 500, Washington, D.C. 20005 (202) 789-2900
AASHTO American Association of State Highway & Transportation Officials, 444 North Capitol St, Suite 249, Washington, D.C. 20001 (202) 624-5800

ACI American Concrete Institute, P.O. Box 19150, 22400 West 7 Mile Rd, Detroit, MI 48219 (313) 532-2600
AGA American Gas Assoc, 1515 Wilson Blvd, Arlington, VA 22209 (703) 841-8400
AIA American Institute of Architects, 1735 New York Ave NW, Washington, D.C. 20006 (202) 626-7300
AISC American Institute of Steel Construction, One East Wacker Drive, Suite 3100, Chicago, IL 60601-2001 (312) 670-2400
AISI American Iron & Steel Institute, 1101 17th St NW, Washington, D.C. 20036-4700 (202) 452-7100
AITC American Institute of Timber Construction, 7012 South Revere Parkway #140, Englewood, CO 80112 (303) 792-9559
AMCA Air Movement & Control Assoc, 30 West University Dr, Arlington Heights, IL 60004 (312) 394-0150
ANSI American National Standards Institute, 11 West 42nd St, New York, NY 10036 (212) 642-4900
APA American Plywood Assoc, P.O. Box 11700 (98411), 7011 South 19th St (98466), Tacoma, WA (206) 565-6600
ARI Air Conditioning & Refrigeration Institute, 4301 Fairfax Drive, Suite 425, Arlington, VA 22203 (703) 524-8800
ASHRAE American Society of Heating, Refrigerating, & Air-Conditioning Engineers, 1791 Tullie Circle NE, Atlanta, GA 30329 (404) 636-8400
ASME American Society of Mechanical Engineers, 345 East 47th St, New York, NY 10017 (212) 705-7722
ASTM American Society for Testing & Materials, 1916 Race St, Philadelphia, PA 19103 (215) 299-5400
AWI Architectural Woodwork Institute, 13924 Braddock Road, Suite 100, P O Box 1550, Centreville, VA 22020 (703) 222-1100
AWPA American Wood Preservers' Assoc, P.O. Box 286, Woodstock, MD 21163-0286 (410) 465-3169
AWS American Welding Society, 550 LeJeune Road NW, P.O. Box 351040, Miami, FL 33135 (305) 443-9353
AWWA American Water Works Assoc, 6666 West Quincy Ave, Denver, CO 80235 (303) 794-7711
BHMA Builders' Hardware Manufacturers Assoc, 355 Lexington Ave, 17th Floor, New York, NY 10017 (212) 661-4261
CFI International Certified Floorcovering Installers Association, 10336 NW Prairie View Rd, Kansas City, MO 64153 (816) 880-9999
CRI Carpet & Rug Institute, P O Box 2048, Dalton, GA 30722 (706) 278-3176
CRSI Concrete Reinforcing Steel Institute, 933 Plum Grove Rd, Schaumburg, IL 60173 (312) 517-1200
DHI Door & Hardware Institute, 14170 Newbrook Drive, Chantilly, VA 22021 (703) 222-2010
EIMA EIFS Industry Manufacturers Association, 2759 State Road 580, Suite 112, Clearwater, FL 34621 (813) 726-6477
FM Factory Mutual Research Organization, 1151 Boston-Providence Turnpike, Norwood, MA 02062 (617) 762-4300
GA Gypsum Association, 810 First Street NE, Suite 510, Washington, D.C. 20002 (202) 289-5440
ICBO International Conference of Building Officials, 5360 S. Workman Mill Rd, Whittier, CA (310)-699-0541
LPI Lightning Protection Institute, 3365 North Arlington Heights Road, Arlington Heights, IL 60004 (800) 488-6864

MFMA Maple Flooring Manufacturers' Assoc, 60 Revere Dr, Suite 500, Northbrook, IL 60062 (708) 480-9138
NAAMM National Association of Architectural Metal Manufacturers, 600 South Federal St, Suite 400, Chicago, IL 60605 (312) 922-6222
NEC National Electric Code (from NFPA)
NEMA National Electrical Manufacturer's Association, 2101 'L' St, NW, Washington, D.C. 20037 (202) 457-8400
NFPA National Fire Protection Assoc, One Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101 (800) 344-3555
NFRC National Fenestration Rating Council, 1300 Spring Street, Suite 120, Silver Spring, MD 20910 (301) 589-6372
NSF National Sanitation Foundation, 3475 Plymouth Rd, P.O. Box 1468, Ann Arbor, MI 48106 (313) 769-8010
NWWDA National Wood Window and Door Association, 1400 East Touhy Ave, #G54, Des Plaines, IL 60018 (312) 299-5200
PCA Portland Cement Assoc, 5420 Old Orchard Road, Skokie, IL 60077 (312) 966-6200
PCI Prestressed Concrete Institute, 175 West Jackson Blvd, Chicago, IL 60604 (312) 786-0300
PEI Porcelain Enamel Institute, 102 Woodmont Boulevard, Suite 360, Nashville, TN 38205 (615) 385-0758
SDI Steel Door Institute, 30200 Detroit Road, Cleveland, OH 44145 (216) 899-0010
SIGMA Sealed Insulating Glass Manufacturers Association, 401 North Michigan Avenue, Chicago, IL 60611 (312) 644-6610
SJI Steel Joist Institute, 1205 48th Avenue North, Suite A, Myrtle Beach, SC 29577 (803) 449-0487
SMACNA Sheet Metal and Air Conditioning Contractors National Association, 4201 Lafayette Center Drive, Chantilly, VA 22116 (703) 803-2980
SPIB Southern Pine Inspection Bureau, 4709 Scenic Highway, Pensacola, FL 32504 (904) 434-2611
TCA Tile Council of America, P.O. Box 326, Princeton, NJ 08542 (609) 921-7050
TPI Truss Plate Institute, 583 D'Onofrio Drive, Suite 200, Madison, WI 53719 (608) 833-5900
UL Underwriters Laboratories, 333 Pfingsten Rd, Northbrook, IL 60062 (708) 272-8800
WWPA Western Wood Products Assoc, Yeon Building 522 SW 5th Avenue, Portland, OR 97204-2122 (503) 224-3930

B. Federal Government Agencies - Names and titles of federal government standard or specification producing agencies are often abbreviated. Following acronyms or abbreviations referenced in Contract Documents represent names of standard or specification producing agencies of federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

CS Commercial Standard (U.S. Department of Commerce), Government Printing Office, Washington, D.C. 20402 (202) 377-2000
EPA Environmental Protection Agency, 401 'M' St SW, Washington, D.C. 20460 (202) 382-2090
FCC Federal Communications Commission, 1919 'M' St NW, Washington, D.C. 20554 (202) 632-7000
FS Federal Specification (from GSA), Specifications Unit (WFSIS), 7th & D St SW, Washington, D.C. 20406 (202) 708-9205

MIL Military Standardization Documents (U.S. Department of Defense), Naval Publications & Forms Center, 5801 Tabor Ave, Philadelphia, PA 19120
OSHA Occupational Safety & Health Administration (U.S. Department of Labor), 200 Constitution Ave NW, Washington, D.C. 20410 (202) 219-6091
PS Product Standard of NBS (U.S. Department of Commerce), Government Printing Office, Washington, D.C. 20402 (202) 783-3238

END OF SECTION 00 80 00

CONSTRUCTION CONTRACT

THIS CONSTRUCTION CONTRACT (the "Contract") is made and entered into this Choose an item. day of Choose an item., 20Choose an item., by and between Morgan County, Colorado, a Colorado county acting by and through its Board of County Commissioners with a principal place of business at 218 West Kiowa Avenue, Fort Morgan 80701 (the "County"), and Click here to enter text., an independent contractor with a principal place of business at Click here to enter text., Colorado Click here to enter text. ("Contractor") (each individually a "Party" and collectively the "Parties").

For the consideration hereinafter set forth, the receipt and sufficiency of which are hereby acknowledged, the Parties agree as follows:

1. Scope of Work. Contractor shall perform the following described work (the "Work"), in accordance with this Contract and the Contract Documents, attached hereto and incorporated herein by this reference:

Click here to enter text.

If there is any conflict between the Invitation to Bid and the Bid, the language of the Invitation to Bid shall control, unless expressly agreed to by the County in this Contract.

2. Bonds. Within ten days of the date of this Contract, Contractor shall provide the payment and performance bond and certificate of insurance required by the Contract Documents.

3. Commencement and Completion of Work. Contractor shall commence the Work within Click here to enter text. days of date of the Notice to Proceed. Substantial Completion of the Work shall be accomplished by the Choose an item. day of Choose an item., 20Choose an item., unless the period for completion is extended otherwise in accordance with the Contract Documents. Final Completion of the Work shall be accomplished within Click here to enter text. days of the date of Substantial Completion.

4. Compensation/Contract Price. The County agrees to pay Contractor, subject to all of the terms and conditions of the Contract Documents, for the Work, an amount not to exceed $Click here to enter text.. The County shall pay Contractor in the manner and at such times as set forth in the General Provisions such amounts as required by the Contract Documents.

5. Keep Jobs In Colorado Act. Pursuant to the Keep Jobs in Colorado Act, C.R.S. 8-17-101 *et seq.* (the "Act") and the rules adopted by the Division of Labor of the Colorado Department of Labor and Employment implementing the Act (the "Rules"), the Contractor shall employ Colorado labor to perform at least eighty percent (80%) of the work and shall obtain and maintain the records required by the Act and the Rules. For purposes of this Section "Colorado labor" means any person who is a resident of the state of Colorado at the time of this Project, without discrimination as to race, color, creed, sex, sexual orientation, marital status, national origin, ancestry, age, or religion except when sex or age is a bona fide qualification. A resident of the state is a person who can provide a valid Colorado driver's license, a valid Colorado state-issued photo

identification, or documentation that he or she has resided in Colorado for the last thirty (30) days. Contractor represents that it is familiar with the requirements of the Act and the Rules and will fully comply with same. This Section shall not apply to any project for which appropriation or expenditure of moneys may be reasonably expected not to exceed five hundred thousand dollars ($500,000) in the aggregate for any fiscal year.

6. Governing Law and Venue. This Contract shall be governed by the laws of the State of Colorado, and any legal action concerning the provisions hereof shall be brought in Morgan County, Colorado.

7. No Waiver. Delays in enforcement or the waiver of any one or more defaults or breaches of this Contract by the County shall not constitute a waiver of any of the other terms or obligation of this Contract.

8. Integration. This Contract and any attached exhibits constitute the entire Contract between Contractor and the County, superseding all prior oral or written communications.

9. Third Parties. There are no intended third-party beneficiaries to this Contract.

10. Notice. Any notice under this Contract shall be in writing, and shall be deemed sufficient when directly presented or sent pre-paid, first class United States Mail, addressed to:

The County: Project Manager
Morgan County
218 West Kiowa Avenue, P.O. Box 596
Fort Morgan, Colorado 80701

Contractor: Click here to enter text.
Click here to enter text.
Click here to enter text.
Click here to enter text.

11. Severability. If any provision of this Contract is found by a court of competent jurisdiction to be unlawful or unenforceable for any reason, the remaining provisions hereof shall remain in full force and effect.

12. Modification. This Contract may only be modified upon written agreement of the Parties.

13. Assignment. Neither this Contract nor any of the rights or obligations of the Parties hereto, shall be assigned by either party without the written consent of the other.

14. Governmental Immunity. The County and its officers, attorneys and employees are relying on, and do not waive or intend to waive by any provision of this Contract, the monetary limitations or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, C.R.S. § 24-10-101, *et seq.*, as amended, or otherwise available to the County and its officers or employees.

15. Rights and Remedies. The rights and remedies of the County under this Contract are in addition to any other rights and remedies provided by law. The expiration of this Contract shall in no way limit the County's legal or equitable remedies, or the period in which such remedies may be asserted, for work negligently or defectively performed.

16. Subject to Annual Appropriation. Consistent with Article X, § 20 of the Colorado Constitution, any financial obligation of the County not performed during the current fiscal year is subject to annual appropriation, shall extend only to monies currently appropriated, and shall not constitute a mandatory charge, requirement or liability beyond the current fiscal year.

IN WITNESS WHEREOF, this Construction Contract has been executed by the Parties as of the date first above written.

MORGAN COUNTY, COLORADO

_____
Chair Date

_____
Commissioner Date

_____
Commissioner Date

ATTEST:

_____
Clerk to the Board

CONTRACTOR

By: _____
Date

STATE OF COLORADO)
) ss.
COUNTY OF _____)

The foregoing instrument was subscribed, sworn to and acknowledged before me this ___ day of _____, 20____, by _____ as _____ of _____.

My commission expires: _____

(S E A L) Notary Public

Construction Contract (over 50K) Agreement # _____

CERTIFICATE OF INSURANCE

STATE OF _____)
) ss.
COUNTY OF _____)

I, _____, being first duly sworn, state and affirm, under penalty of law, that I am familiar with the insurance coverages maintained by the Insured, _____, and the coverage requirements set forth in the foregoing Certificate of Insurance, that I have completed or caused to be completed and subsequently reviewed the foregoing Certificate of Insurance and that the information contained therein is true and correct to the best of my knowledge. I further understand that Morgan County shall rely on the information provided.

This information is provided for Morgan County, Project: _____.

By: _____

Title: _____

Agency: _____

STATE OF COLORADO)
) ss.
COUNTY OF _____)

The foregoing instrument was subscribed, sworn to and acknowledged before me this ___ day of _____, 20_____, by _____, as _____ of _____.

My commission expires:

(S E A L)

_____
Notary Public

NOTICE OF AWARD

Date: _____

_____
Contractor Name

_____
Address

_____

_____

RE: _____

Dear _____:

Thank you for submitting a Bid for the _____.

Your firm submitted the most qualified and responsible Bid and you have been selected as the successful Contractor. Accordingly, this is your Notice of Award for the _____.

Enclosed please find an original and duplicate original Construction Contract. Please review and sign both, then, within ten days of receipt of this letter, return both to me along with your certification of insurance, payment and performance bond, each in the full amount of the Contract Price, and appropriate powers of attorney. When dating the above documents, please make sure that all dates, on all documents, are the same and that the insurance policy reflects the requirements of the Contract Documents. Please return all of the documents at the same time, in the same envelope.

Upon receipt of the signed Contracts, the County will execute both and return one fully executed original to you.

Should you have any questions, please call me at _____.

Sincerely,

_____

Project Manager Signature Date

NOTICE TO PROCEED

Date: _____

_____
Contractor Name

_____
Address

_____

_____

RE: _____

Dear _____:

This letter is your Notice to Proceed, effective as of the date cited below. This notice is in reference to the Construction Contract between you and Morgan County concerning the _____.

Please note that in accordance with the Construction Contract, Work must commence within ten days of the date of this Notice, and all Work must be substantially completed within _____ (_____) days of the date of this Notice, which shall be the ___ day of _____, 20___, and finally completed within _____ days of the date of this Notice, which shall be the ___ day of _____, 20_____.

If you have any questions, please call me at _____.

Sincerely,

_____

Project Manager-Signature Date

BID BOND

KNOW ALL MEN BY THESE PRESENTS

THAT _____, (hereinafter called "Principal") as PRINCIPAL, and _____, (hereinafter called the "Surety") as SURETY, are held and firmly bound unto Morgan County, Colorado, hereinafter called OWNER, as Obligee, in the penal sum of _____ Dollars ($_____), for the payment of which sum in lawful money of the United States, well and truly to be made, said PRINCIPAL and SURETY bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the PRINCIPAL has submitted a Bid to OWNER for certain Work or services generally described as follows: _____

_____

NOW, THEREFORE, (a) if said Bid shall be rejected, or (b) if said Bid shall be accepted and the PRINCIPAL is awarded the Contract and, within the time and manner specified in the Contract Documents, enters into a written Contract in the prescribed form and shall give such bond or bonds as may be specified in the Contract Documents to guarantee faithful performance of such Contract and to guarantee prompt payment of labor and materials furnished in the prosecution thereof, and shall provide to OWNER a Certificate of Insurance as required by the Contract Documents, and shall in all other respects perform the Contract created by the acceptance of said Bid, or (c) in the event of the failure of the PRINCIPAL to enter such Contract and to give such bond or bonds, and Certificate of Insurance, if the PRINCIPAL shall pay to OWNER the difference not to exceed the penalty hereof between the amount specified in said Bid and such larger amount for which the OWNER may in good faith contract with another party to perform the Work covered by said Bid, then this obligation shall be null and void, otherwise it shall be and remain in full force and effect.

The SURETY, for value received, hereby stipulates and agrees that the obligations of said SURETY hereunder shall be in no way impaired or affected by any alteration or irregularities in the bid or in the bidding procedure or by any extension of time within which OWNER may accept such Bid, and does hereby waive notice of same.

Dated this _____ day of _____, 20_____.

(SURETY)	(PRINCIPAL)
By: _____	By: _____
Title: _____	Title: _____

(ACKNOWLEDGMENTS AND POWER OF ATTORNEY TO BE ATTACHED)
CORPORATE SEAL MUST BE AFFIXED IF PRINCIPAL IS A CORPORATION.

PAYMENT AND PERFORMANCE BOND

Bond No._____

KNOW ALL MEN BY THESE PRESENTS: that

(Firm)_____

(Address)_____
(an Individual), (a Partnership), (a Corporation), hereinafter referred to as "the Principal", and

(Firm)_____

(Address)_____

hereinafter referred to as "the Surety", are held and firmly bound unto Morgan County, Colorado, a Colorado county, hereinafter referred to as "the Owner", in the penal sum of _____ Dollars in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION are such that whereas the Principal entered into a certain Contract with the Owner, dated the ____ day of _____,20_____, a copy of which is hereto attached and made a part hereof for the performance of the Work, _____.

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions and agreements of said Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without Notice to the Surety and during the life of the guaranty or warranty period, and shall satisfy all claims and demands incurred under such Contract, and shall fully indemnify and save harmless the Owner from all cost and damages which it may suffer by the Principal's failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, and make payment to all persons, firms, subcontractors and corporations furnishing materials for or performing labor in the prosecution of the work provided for in such Contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, repairs on machinery, equipment and tools, consumed, rented or used in connection with the construction of such work, and all insurance premiums on said work, and for all labor performed in such work, whether by subcontractor or otherwise, then this obligation shall be void; otherwise it shall remain in full force and effect.

PROVIDED, FURTHER, that the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this Bond; and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract or to the Work or to the Specifications.

PROVIDED, FURTHER, that no final settlement between the Owner and the Principal shall abridge the right of any beneficiary hereunder whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in five (5) counterparts, each one of which shall be deemed an original, this _____ day of _____, 20_____.

ATTEST:

By: _____

Title:_____

PRINCIPAL

By:_____

Title:_____

Address:_____

_____

(Corporate Seal)

SURETY

ATTEST:

By: _____

Attorney-in-Fact: _____

Surety:_____

By: _____

Title: _____

Address:_____

_____

(Surety Seal)

NOTE: Date of Bond must not be prior to date of Contract and Surety must be authorized to transact business in the State of Colorado and be acceptable to the County.

CERTIFICATE OF FINAL PAYMENT

With reference to Contract Number _____ dated _____, 20_____, between the undersigned Contractor and Morgan County (the "Owner"), for: _____ at _____, Morgan County, Colorado _____.

The undersigned hereby certifies that all costs, charges and expenses incurred by it on its behalf for work, labor, services, materials and equipment supplied to the foregoing premises, and/or used in connection with its Work under the Contract have been duly paid.

The undersigned further certifies that to its best knowledge and belief (based upon reasonable investigation) each of its subcontractors and material men have duly paid all costs, charges and expenses incurred by them or on their behalf for work, labor, services, materials and equipment supplied to the foregoing premises and/or used by them in connection with the Undersigned's Work under the Contract.

In consideration of _____ dollars ($_____) representing final payment under the Contract, the undersigned hereby releases and discharges the Owner and Owner's property from all claims, liens and obligations of every nature arising out of or in connection with the performance of the Work.

As additional consideration for the final payment, and to the fullest extent permitted by law, the undersigned agrees to indemnify and hold harmless Owner from and against all costs, losses, damages, claims, causes of action, judgments and expenses arising out of or in connection with claims against Owner which may be asserted by the undersigned or any suppliers, subcontractors of any tier or any of their representatives, officers, agents and employees for the costs, losses, damages, claims, causes of action, judgments and expenses and expenses that are attributable to the act, omission, error, professional error, mistake, negligence or other fault of the undersigned.

The foregoing shall not relieve the Undersigned of its obligations under the provisions of the Contract as amended, which by their nature survive completion of the Work including, without limitation, warranties, guarantees and indemnities.

Executed this _____ day of _____, 20____.

_____
Contractor Signature

CERTIFICATE OF FINAL ACCEPTANCE

Date: _____

TO: _____ Project No.: _____

Project Title: _____

This is to advise you that a final inspection of the referenced Work has been made and all work and material was found to be satisfactory. Therefore, the Work is considered to be complete in accordance with the approved plans, specifications and contract documents.

In accordance with the Contract, all Warranty periods shall begin as of the date of this letter.

MORGAN COUNTY

By: _____

Title: _____

GENERAL PROVISIONS

PART 1. DEFINITIONS

1.01 CONTRACT DOCUMENTS:

A. Bid Form (Including Bid Summary);
B. Bid Schedule;
C. Bidder's Qualification Statement;
D. Construction Contract;
E. Certificate of Insurance Verification;
F. Notice of Award;
G. Notice to Proceed;
H. Bid Bond;
I. Payment and Performance Bond;
J. Certificate of Final Payment;
K. Final Acceptance Form;
L. General Provisions;
M. Technical Specifications;
N. Construction Drawings;
O. Documentation submitted by Contractor prior to Notice of Award; and
P. Addenda ___ through ____.

1.02 CHANGE ORDER:

A written order issued by the County after execution of the Contract authorizing an addition, deletion or revision in the Work, or an adjustment in the Contract Price or the Contract Time.

1.03 COUNTY:

Morgan County, Colorado.

1.04 CONTRACT:

The entire written agreement covering the performance of the Work described in the Contract Documents including all supplemental agreements thereto and all general provisions pertaining to the Work and materials therefor.

1.05 CONTRACT PRICE:

The amount set forth in Paragraph 4 of the Construction Contract.

1.06 CONTRACT TIME:

The time for completion of the Work as set forth in Paragraph 3 of the Construction Contract.

1.07 DAY:

Calendar day, unless otherwise specified. When the last day for the occurrence of an event falls on a Sunday or legal holiday as recognized by the County, the time for performance shall be automatically extended to the next business day.

1.08 FINAL COMPLETION:

The date as certified by the Project Manager when all of the Work is completed and final payment may be made.

1.09 PROJECT MANAGER:

The County's duly authorized representative in connection with the Work.

1.10 SUBCONTRACTOR:

Any person, firm or corporation with a direct contract with Contractor who acts for or in behalf of Contractor in executing any part of the Contract, excluding one who merely furnishes material.

1.11 SUBSTANTIAL COMPLETION:

The date as certified by the Project Manager when the County occupies or takes possession of all or substantially all of the Work, or when the County may occupy or take possession of all or substantially all of the Work and put it to beneficial use for its intended purposes.

1.12 WORK:

All the work specified, indicated, shown or contemplated in the Contract Documents, including all alterations, amendments or extensions thereto made by supplemental agreements or written orders of the Project Manager.

PART 2. TIME

2.01 TIME OF THE ESSENCE:

All times stated in the Contract Documents are of the essence.

2.02 FINAL ACCEPTANCE:

Upon Final Completion, the Project Manager will issue final acceptance.

2.03 CHANGES IN THE WORK:

The County reserves the right to order changes in the Work, in the nature of additions, deletions or modifications, without invalidating the Contract, and to make corresponding adjustments in the Contract Price and the Contract Time. All changes shall be authorized by a written Change Order signed by the Project Manager. The Change Order shall include appropriate changes in the Contract Documents and the Contract Time. The Work shall be changed and the Contract Price and Contract Time modified only as set forth in the written Change Order. Any adjustment in the Contract Price resulting in a credit or a charge to the County shall be determined by mutual agreement of the parties before the work set forth in the Change Order is commenced. If a Change Order results in an increase in the Contract Price, approval of the Morgan County Board of County Commissioners shall be required, and if such approval is not obtained, the County shall have no payment obligation regardless of whether the Work pursuant to the Change Order has been performed.

2.04 DELAYS:

A. If Contractor is delayed in the progress of the Work by fire, unusual delay in transportation, unanticipated adverse weather conditions, or other unavoidable casualties beyond Contractor's control other than unanticipated adverse weather conditions, the Contract Time shall be extended for a reasonable period of time. "Weather" means precipitation, temperature, or wind, and an "adverse weather condition" means weather that on any calendar day varies from the average weather conditions for that day by more than 100% as measured by the National Oceanic and Atmospheric Administration. The term "unanticipated adverse weather conditions" means the number of days in excess of the anticipated adverse weather days per month as set forth below:

MONTHLY ANTICIPATED ADVERSE WEATHER DAYS

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
7	4	4	4	6	3	4	2	3	3	2	5

By reason of example only, if in March there are two days when the snowfall exceeds the average snowfall for that day by 100%, those two days will have experienced an adverse weather condition. However, there will have been no unanticipated adverse weather condition in March, because there are four anticipated adverse weather days in March, which should be accounted for in the schedule. If, however, there are five days in which the snowfall exceeds the average snowfall by 100%, an unanticipated adverse weather condition will have occurred, and Contractor shall be entitled to request an extension of time.

B. Any request for extension of the Contract Time shall be made in writing to the Project Manager not more than seven days after commencement of the delay; otherwise it shall be waived. Any such request shall contain an estimate of the probable effect of such delay on the progress of the Work.

C. Contractor shall not be entitled to any increase in the Contract Price, or to damages, or to additional compensation as a consequence of any such delays.

2.05 NO DAMAGES FOR DELAY:

In strict accordance with C.R.S. § 24-91-103.5, the County shall not amend the Contract Price to provide for additional compensation for any delays in performance which are not the result of acts or omissions of the County or persons acting on behalf of the County.

PART 3. CONTRACTOR'S RESPONSIBILITIES

3.01 COMPLETION/SUPERVISION OF WORK:

Contractor hereby warrants that it is qualified to assume the responsibilities and render the services described herein and has all requisite corporate authority and licenses in good standing. The services performed by Contractor shall be in accordance with generally accepted professional practices and the level of competency presently maintained by others in the same or similar type of work, and in compliance with applicable laws, ordinances, rules and regulations. Contractor shall be responsible for completion of all Work in a timely and workmanlike manner in accordance with the terms and specifications of the Contract Documents, including the techniques, sequences, procedures and means. Contractor shall be responsible for the coordination of all Work. Contractor shall supervise and direct the Work and give it all attention necessary for proper supervision and direction. Contractor shall maintain a supervisor on site at all times when Contractor or any subcontractor is performing Work.

3.02 DUTY TO INSPECT:

Contractor shall inspect all Contract Documents, tests and reports, including soil tests and engineering tests, if applicable, and shall conduct a site or field review prior to executing the Contract. Contractor assumes the risk of all conditions which are disclosed, or which are reasonably suggested by any such tests or reports, or which would be disclosed by a field or site review. Contractor shall have the affirmative duty to advise the County of any concerns which Contractor may have regarding construction conditions prior to executing the Contract.

3.03 FURNISHING OF LABOR AND MATERIALS:

A. Contractor shall provide and pay for all labor, materials and equipment, including: tools; construction equipment and machinery; utilities, including water; transportation; and all other facilities and services necessary for the proper completion of the Work.

B. In all purchases of supplies, materials and provisions to be incorporated or otherwise used by Contractor in the Work, Contractor shall use supplies, materials and provisions produced, manufactured or grown in Colorado if such supplies, materials and provisions are not of inferior quality to those offered by competitors outside of Colorado.

C. While engaged in the performance of the Work, Contractor shall maintain employment practices that do not violate the provisions of the Colorado Antidiscrimination Act of 1957, C.R.S. § 24-34-301, *et seq*., as amended.

3.04 EMPLOYEES AND SAFETY:

A. Contractor shall maintain at all times strict discipline of its employees, and Contractor shall not employ on the Work any person unfit or without sufficient knowledge, skill, and experience to perform properly the job for which the employee was hired.

B. Contractor shall be responsible to the County for the acts, negligence and omissions of all direct and indirect employees and subcontractors. The Contract Documents shall not be construed as creating any contractual relation between any subcontractor and the County.

C. Contractor shall provide for and oversee all safety orders and precautions necessary for the safe performance of the Work. Contractor shall take reasonable precautions for the safety of all employees and others whom the Work might affect, all work and materials incorporated into the Work, and all property and improvements on the work site and adjacent property.

3.05 CLEANUP:

A. Contractor shall keep the work site and adjoining ways free of waste material and rubbish caused by its employees or subcontractors. Contractor shall remove all such waste material and rubbish daily during construction, together with all tools, equipment, machinery and surplus materials. Contractor shall, upon termination of its Work, conduct general cleanup operations on the work site, including the cleaning of all surfaces, paved streets and walks, and steps. Contractor shall also conduct such general cleanup operations on adjacent properties which were disturbed by the Work.

B. If Contractor fails to perform the cleanup required by this Section, after written notice, the County may cause the cleanup to be performed at Contractor's expense. Upon receipt of a statement for such cleanup, Contractor shall pay to the County the costs incurred by the County for such cleanup, or the County shall have the right to withhold said amount from any final payment due to Contractor.

3.06 PAYMENT OF ROYALTIES AND LICENSE FEES:

Contractor agrees to pay all royalties and license fees necessary for the Work, and to defend against all actions for infringement of copyright or patent rights, and to save and hold the County harmless from such actions.

3.07 TAXES, LICENSES AND PERMITS:

Contractor shall pay all taxes imposed by law in connection with the Work and shall procure all permits and licenses necessary for the prosecution of the Work.

3.08 SAMPLES AND SHOP DRAWINGS:

Contractor shall furnish, upon the request of the Project Manager, samples and shop drawings to the Project Manager, who shall review them for conformance with the Contract Documents. All Work shall comply with approved samples and drawings.

3.09 COMPLIANCE WITH LAWS AND REGULATIONS:

Contractor shall comply with all federal, state and local laws, ordinances, rules, regulations and orders in any manner relating to the Work. If any provision of the Contract Documents is at variance therewith, Contractor shall notify the Project Manager promptly.

3.10 SUBCONTRACTORS:

A. Contractor shall furnish to the Project Manager at the time the Construction Contract is executed, a list of names of subcontractors to whom Contractor proposes to award the portions of the Work to be subcontracted by Contractor.

B. Contractor shall not employ a subcontractor to whose employment the County reasonably objects, nor shall Contractor be required to hire a subcontractor to whose employment Contractor reasonably objects.

C. All contracts between Contractor and subcontractor shall conform to the provisions of the Contract Documents, and shall incorporate the relevant provisions of the Contract Documents.

3.11 CORRECTIVE WORK:

When any Work does not conform to the Contract Documents, Contractor shall make the necessary corrections so that the Work will so conform. Such corrections shall be accomplished within the time period approved by the Project Manager. Failure to complete such required corrections within the time period required shall constitute a breach of the Contract. The County's review, approval or acceptance of, or payment for any work shall not be construed as a waiver of any rights under this Contract or any cause of action arising out of the performance of this Contract.

3.12 OTHER CONTRACTS:

The County reserves the right to let other contracts in connection with the Work. Contractor shall cooperate with all other contractors so that their work is not impeded by the Work, and Contractor shall give other contractors access to the work site necessary to perform their contracts.

3.13 COMMUNICATION:

Contractor shall direct all communications to the County regarding the Work to the attention of the Project Manager.

PART 4. TERMINATION

4.01 LABOR DISPUTES:

Notwithstanding any other provision contained in this Contract, in the event of any picket or other form of labor dispute at the construction site, Contractor shall continue to perform the Work without interruption or delay. If Contractor ceases performance of the Work because of such picket or other

form of labor dispute, the County may terminate the services of Contractor after giving forty-eight (48) hours' written notice of its intent to do so.

4.02 DEFAULT:

The County may terminate this Contract upon seven days' written notice to Contractor if Contractor defaults in the timely performance of any provision of the Contract Documents, or otherwise fails to perform the Work, or any part thereof, in accordance with the Contract Documents. Termination of the Contract by the County shall not be the County's exclusive remedy, and the County may pursue such other remedies and actions lawfully available to the County including, but not limited to, an action at law for damages against Contractor or any bonding agency issuing a bond hereunder, or an action in equity for injunctive relief.

PART 5. WARRANTIES:

5.01 WARRANTY OF FITNESS OF EQUIPMENT AND MATERIALS:

Contractor represents and warrants to the County that all equipment and materials used in the Work, and made a part of the Work, or placed permanently in the Work, shall be new unless otherwise specified in the Contract Documents. All equipment and materials used shall be of good quality, free of defects and in conformity with the Contract Documents. All equipment and materials not in conformity with the Contract Documents shall be considered defective.

5.02 GENERAL WARRANTY:

Contractor shall warrant and guarantee all material furnished and work performed by Contractor for a period of two years from the date of final acceptance of the Work by the Project Manager. Under this warranty, Contractor agrees to repair or replace, at its own expense and under the direction of the Project Manager, any portion of the Work which fails or is defective, unsound, unsatisfactory because of materials or workmanship, or which is not in conformity with the provisions of the Contract. Should Contractor fail to perform any such work within the warranty period after a request by the County, the County may withdraw from the Payment and Performance Bond any and all amounts necessary to complete the required work. The expiration of the warranty period shall in no way limit the County's legal or equitable remedies, or the period in which such remedies may be asserted, for work negligently or defectively performed.

PART 6. BONDS, INSURANCE AND INDEMNIFICATION

6.01 INDEMNIFICATION:

A. Contractor agrees to indemnify and hold harmless the County and its officers, insurers, volunteers, representatives, agents, employees, heirs and assigns from and against all claims, liability, damages, losses, expenses and demands, including attorney fees, on account of injury, loss, or damage, including, without limitation, claims arising from bodily injury, personal injury, sickness, disease, death, property loss or damage, or any other loss of any kind whatsoever, which arise out of or are in any manner connected with this Contract or the Contract Documents, to the extent that such injury, loss or damage is attributable to the act, omission, error, professional error, mistake, negligence or other fault of Contractor, any subcontractor of Contractor, or any officer, employee, representative, or agent of Contractor or of any subcontractor of Contractor, or which arise out of any worker's compensation claim of any employee of Contractor or of any employee of any subcontractor of Contractor.

B. Contractor, to the fullest extent permitted by law, shall defend, investigate, handle, respond and provide defense for and defend against any such liability, claims, damages, losses, expenses or demands at the sole expense of Contractor, or at the option of the County, Contractor agrees to pay the County or reimburse the County for defense costs incurred by the County in connection with any such liability, claims, damages, losses, expenses or demands. Contractor, to the fullest extent permitted by law, shall defend and bear all other costs and expenses related thereto, including court costs and attorney fees, whether or not such liability, claims or demands alleged are groundless, false or fraudulent.

C. This indemnification provision is intended to comply with C.R.S. § 13-21-111.5(6), as amended, and shall be read as broadly as permitted to satisfy that intent.

6.02 NOTICE OF CLAIM:

If Contractor receives any claim arising from the performance of the Work, Contractor shall notify the County in writing of the nature of the claim within 24 hours of receipt of the claim by Contractor. In this notice, Contractor shall provide evidence that Contractor has notified Contractor's insurer of the claim. Contractor shall keep the County apprised of the disposition of the claim, and Contractor shall take all necessary action to resolve the claim and make restitution, if required, as quickly as possible.

6.03 INSURANCE:

A. Contractor agrees to procure and maintain, at its own cost, a policy or policies of insurance sufficient to insure against all liability, claims, demands, and other obligations assumed by Contractor pursuant to this Contract. At a minimum, Contractor shall procure and maintain, and shall cause any subcontractor to procure and maintain, the insurance coverages listed below, with forms and insurers acceptable to the County.

1. Worker's Compensation insurance to cover obligations imposed by applicable law for any employee engaged in the performance of work under this Agreement, and Employer's Liability insurance with minimum limits of five hundred thousand dollars ($500,000) each accident, one million dollars ($1,000,000) disease – policy limit, and one million dollars ($1,000,000) disease – each employee. Evidence of qualified self-insured status may be substituted for the requirements of this Section.

2. Commercial General Liability insurance with minimum combined single limits of one million dollars ($1,000,000) each occurrence and one million dollars ($1,000,000) general aggregate. The policy shall be applicable to all premises and operations, and shall include coverage for bodily injury, broad form property damage, personal injury (including coverage for contractual and employee acts), blanket contractual, products, and completed operations. The policy shall contain a severability of interests' provision, and shall include the County and the County's officers, employees, and contractors as additional insureds. No additional insured endorsement shall contain any exclusion for bodily injury or property damage arising from completed operations.

B. Such insurance shall be in addition to any other insurance requirements imposed by law. The coverages afforded under the policies shall not be canceled, terminated or materially changed without at least thirty (30) days prior written notice to the County. In the case of any claims-made policy, the necessary retroactive dates and extended reporting

periods shall be procured to maintain such continuous coverage. Any insurance carried by the County, its officers, its employees, or its contractors shall be excess and not contributory insurance to that provided by Contractor. Contractor shall be solely responsible for any deductible losses under any policy.

C. Contractor shall provide to the County a certificate of insurance as evidence that the required policies are in full force and effect. The certificate shall identify this Contract.

6.04 PERFORMANCE AND PAYMENT BOND:

Contractor shall furnish a Payment and Performance Bond in the full amount of the Contract Price, as security for the faithful performance and payment of all Contractors' obligations under the Contract Documents, including the warranty. This bond shall remain in effect at least until two years after the date of Final Completion.

PART 7. PAYMENT

7.01 PROGRESS PAYMENTS:

A. The County shall make periodic progress payments to Contractor within thirty (30) days following the Project Manager's approval of the Work completed. A progress payment shall be made only after Contractor has submitted an application for a progress payment on a form approved by the Project Manager, and if requested by the Project Manager, Contractor shall submit copies of invoices from subcontractors or supplies and partial waivers executed by each.

B. Progress payments shall be in an amount equal to 90% of the Work actually completed until 50% of the total Work, as determined by the Project Manager, is completed. Such determination shall include materials and equipment not incorporated in the Work but delivered to the work site and suitably stored. After 50% of the total Work is completed, no additional retainage shall be held.

C. If Contractor fails to complete any required Work within the time period agreed between Contractor and the Project Manager, or within any time period set forth in the Contract Documents, as modified or extended, the County is expressly authorized to withhold any progress payment for such Work until such Work is completed.

7.02 FINAL PAYMENT:

Upon final acceptance of the Work, the County shall make final payment to Contractor pursuant to C.R.S. § 38-26-107.

7.03 LIQUIDATED DAMAGES:

A. Because time is of the essence and delayed performance constitutes a compensable inconvenience to the County and its residents, the liquidated damages established in this Section shall be enforced. Such damages are not a penalty. For each day Final Completion is delayed after the Final Completion date stated in the Construction Contract, as modified through approved change orders, Contractor shall be assessed the following amounts:

Contract Price	**Amount per day**
\$0-\$50,000	\$350
\$50,000-\$100,000	\$380
\$100,000-\$250,000	\$440

$250,000-$500,000	$520
$500,000-$1,000,000	$640
$1,000,000-$2,000,000	$820
$2,000,000-$4,000,000	$1,080
$4,000,000-$8,000,000	$1,450
$8,000,000-$12,000,000	$1,820
$12,000,000 or greater	$2,250

B. Allowing Contractor to continue and finish the Work or any part thereof after the Final Completion date shall not operate as a waiver on the part of the County of any of its rights under the Contract Documents. Any liquidated damages assessed shall not relieve Contractor from liability for any damages or costs of other contractors caused by a failure of Contractor to complete the Work in the Contract Time. Liquidated damages may be deducted from any payment due Contractor or the retainage. If the liquidated damages exceed the amount owed to Contractor, Contractor shall reimburse the County.

7.04 ORAL AGREEMENTS PROHIBITED:

This Contract is expressly subject to the provisions of C.R.S. § 29-1-110(1), and Contractor acknowledges that neither the County nor any employee or agent thereof is authorized to expend or contract for the expenditure of any monies in excess of those appropriated by the Morgan County Board of County Commissioners. The County acknowledges that sufficient funds have been appropriated to pay the Contract Price, but Contractor shall not rely upon the appropriation of any funds in addition to those already appropriated unless and until the same are lawfully appropriated by the Morgan County Board of County Commissioners.

7.05 ITEMS NOT INCLUDED IN BID:

No additional compensation shall be paid for any costs or services listed in the Contract Documents but not specifically listed in the Bid as a Bid item.

7.06 CHANGES IN QUANTITY:

A. Except as provided in Section 7.07, the unit Bid price shown in the Bid Schedule shall be used to determine the payment owed Contractor for any changes in quantity.

B. The actual quantity placed, as determined by the Project Manager, shall be used to calculate the payment due to Contractor.

C. Prior to any Work being performed in excess of any of the Bid Schedule quantities, Contractor shall notify the County, in writing, of every quantity that will exceed 105% of the quantity listed on the Bid Schedule.

D. Except as provided in Section 7.08, Contractor shall not be entitled to compensation for any increased expense, loss of expected reimbursement or loss of anticipated profits, directly or indirectly caused by any changes in quantity.

7.07 BID PRICE ADJUSTMENTS:

A. When a major item is increased to more than 125% or decreased below 75% of the original quantity stated on the Bid Schedule, the unit Bid price shall be modified by written change order. Payment for major items shall be calculated by multiplying the actual quantity placed by the modified Bid price.

B. For purposes of this Section, a major item is any item having a Bid value, determined by multiplying the Bid quantity by the unit Bid price that exceeds 10% of the original Contract Price.

7.08 ELIMINATED ITEMS:

Should any items contained in the Bid Schedule be found unnecessary for completion of the Work, the items shall be eliminated. The Contract Price shall be modified through written change order, and the amount of the change order shall be the eliminated quantity multiplied by the unit Bid price stated in the Bid Schedule, minus any reasonable costs incurred by Contractor for the eliminated items. Reasonable costs shall be determined by the Project Manager based on information provided by Contractor, and may include mobilization of eliminated materials and equipment mobilization costs, if the sole purpose of the equipment was to place the eliminated material. In no case shall the costs exceed the amount of the eliminated items.

7.09 MATERIALS STORED BUT NOT INCORPORATED:

Payments may be made to Contractor for materials stored on the work site but not incorporated into the Work as evidenced by invoices or a cost analysis of material produced, if the material has been fabricated or processed and is ready for installation into the Work and conforms to the Contract Documents. Payments shall not exceed 85% of the price shown in the Bid Schedule or 100% of the certified invoice cost of the stockpiled material, whichever is less. Payment for stockpiled materials shall not relieve Contractor of responsibility for loss or damage to the material. Payment for living plant materials or perishable materials shall not be made until the living or perishable material is made an integral part of the finished Work.

7.10 COST RECORDS:

Contractor shall make cost records available to the County if the County deems it necessary to determine the validity and amount of any item claimed.

PART 8. MISCELLANEOUS

8.01 PUBLICATIONS:

Any and all publications relating to the Work and authored by Contractor or any of its subcontractors shall be submitted to the County for its prior written approval of the content of the publication. If the County disapproves of the content of the publication, the author shall withdraw it from publication. The term "publication" as used herein shall include articles or letters to be published in any newspaper, magazine, trade journal or other periodical.

8.02 CONFIDENTIALITY:

Any and all reports, information, date, statistics, forms, designs, plans, procedures, systems, studies and any other communication form of knowledge given to or prepared or assembled by Contractor under this Contract shall, to the extent authorized and permitted by law, be kept as confidential and not be made available by Contractor to any individual, company or organization without the prior written consent of the County. Notwithstanding the foregoing, Contractor shall not be restricted from releasing information in response to a subpoena, court order, or legal process, but Contractor shall notify the County in writing before responding.

8.03 INDEPENDENT CONTRACTOR:

Contractor, for all purposes arising out of this Contract, is an independent contractor and not an employee of the County. It is expressly understood and agreed that Contractor shall not be entitled

to any benefits to which the County's employees are entitled, such as overtime, retirement benefits, worker's compensation, injury leave or other leave benefits.

8.04 CONFLICTS:

Should any conflict arise in the Contract Documents, the order of precedence is as follows:

1. Construction Contract.
2. General Provisions.
3. Supplemental Specifications.
4. Detailed Plans (Calculated dimensions will govern over scaled dimensions).

SECTION 01 10 00

SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work by Owner.
5. Work under separate contracts.
6. Future work.
7. Purchase contracts.
8. Owner-furnished products.
9. Contractor-furnished, Owner-installed products.
10. Access to site.
11. Coordination with occupants.
12. Work restrictions.
13. Specification and drawing conventions.
14. Miscellaneous provisions.

B. Related Requirements:

1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: MORGAN COUNTY HOG AND SHEEP BARN
PROJECT NO. N-0124

1. Project Location: BRUSH, COLORADO

B. Owner: MORGAN COUNTY

C. Architect:

JOSEPH R. HEWGLEY & ASSOCIATES INC., 702 SO. BAILEY, NORTH PLATTE, NE. 69101.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Engineering Technologies Inc., 825 M Street, Suite 200, Lincoln, Nebraska 68508.

2. Performance Engineering, 11811 Fort Street, Suite 104, Omaha, NE 68164

3. TC Engineering, 1 S Sycamore St, North Platte, Nebraska 69101

E. Project Web Site: A project Web site administered by Contractor will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination." for requirements for administering and using the Project Web site.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Morgan County Hog and Sheep Barn, Brush CO.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.5 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.6 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

1.7 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project (as applicable)

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet (12.2 m) beyond building perimeter; 10 feet (3 m) beyond surface walkways, patios,

surface parking, and utilities less than 12 inches (300 mm) in diameter; 15 feet (4.5 m) beyond primary roadway curbs and main utility branch trenches; and 25 feet (7.6 m) beyond constructed areas with permeable surfaces (such as pervious paving areas, storm water detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.

2. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

    a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
    b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.8 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work to normal business working hours Monday through Friday, unless otherwise indicated and approved by Owner.

1. Weekend Hours: As approved by Owner and Architect
2. Early Morning Hours: As approved by Owner and Architect and according to regulations by authorities having jurisdiction for restrictions on noisy work.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions in area.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Architect and Owner not less than two days in advance of proposed disruptive operations.

E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet (8 m) of entrances, operable windows, or outdoor-air intakes.

F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

G. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

H. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Alternate Form (attached to the Stipulated Sum Bid Form) for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

1.5 SCHEDULE OF ALTERNATES

A1: State the amount to be Deducted from the Base Bid should the Owner elect to remove the lean-too structure & footings on the West side of the building. Contractor shall still include all paving & upper wall panels in this area.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

END OF SECTION 01 23 00

SECTION 01 25 13

PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Contractor's selection of products

B. Requests for substitution of products

1.02 RELATED REQUIREMENTS

A. Section 00 21 13 - Instructions to Bidders

B. Section 00 70 00 - General Conditions

C. Section 00 80 00 - Supplementary Conditions

D. Section 01 33 00 - Submittals

E. Section 01 33 23 - Shop Drawings, Product data, and Samples

F. Section 01 77 00 - Closeout Procedures

G. Section 01 78 23 - Operation and Maintenance Data

H. Section 01 78 39 - Project Record Documents

1.03 SELECTION OF PRODUCTS

A. Contractor(s) bid shall be based on the products, materials, or systems specified in the project manual (or as indicated on the drawings) to establish the standard of quality required and a uniform basis for evaluating the bids.

B. For products specified by naming only one manufacturer, that manufacturer is to be included in the base bid.

C. For products specified by naming more than one manufacturer, any of the listed manufacturers of that section may be used in the base bid.

D. When product or manufacture's names are not specifically specified, provide products, materials, or systems in strict accordance with performance requirements and install such products in strict accordance with the material manufacturer's recommendations.

E. "Acceptable Substitution"

1. For any listing of products and manufacturers found in the specification, it is understood that the phrase "Acceptable Substitution" will apply to that listing except as otherwise noted.
2. Requests for approval of substitute products will not be considered prior to the Bid Opening Date or as options submitted with Bids. Bids must be submitted in accordance with the product option criteria stated herein, and bids must be based on the name brand products, model numbers, or styles where specifications are based on proprietary brand names.
3. Where the phrase "Acceptable Substitution" occurs in the project manual, do not assume that the products, materials or system submitted for substitutions will be

accepted (even if accepted for use on previous projects) until the item has been specifically so accepted for this work by the Architect.

4. Acceptance or rejections of a request for an “Acceptable Substitution” will be based on the Architect’s opinion, as concurred by the Owner, to the adaptability, durability, quality, aesthetics, and contract amount change, compare to the specified or noted items.
5. The decision of the Architect shall be final.

1.04 REQUESTS FOR SUBSTITUTIONS

A. Substitutions in the case of product unavailability after contract award, will be considered under the following criteria:

1. Cannot be delivered during the progress of the work.
   a. Submit a letter to this effect written by the manufacturer.
2. Will no longer be available during the progress of the work.
   a. Submit a letter to this effect written by the manufacturer
3. The quality of the material, as specified, no longer meets the specification
   a. The Architect shall specify a substitute.

B. Substitutions will be considered after bidding if the proposed substitution will provide a substantial savings to the Owner. The material cost differential will be reflected in a change order to the contractor.

C. The request for a subsequent substitution constitutes a representation that the Contractor has investigated the proposed product and has determined that it is equal to or superior in all respects to the specified product. In addition, the Contractor;
   1. Will provide same warranty for substitution as for specified product.
   2. Will coordinate installation of Acceptable Substitution, making such changes as may be required for Work to be complete in all respects.
   3. Will certify that cost data presented is complete and includes all related costs under this Contract.
   4. Waives claims for additional costs related to substitution which may later become apparent.
   5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with obtaining approval from regulating authorities.
   6. Will reimburse Owner and Architect/Engineer for review or redesign services after originally specified product has been reviewed by Architect.

D. Acceptance or rejection of a request for an “Acceptable Substitution” will be based on the Architect’s opinion, as concurred by the Owner, to adaptability, durability, quality, aesthetics, and Contract Amount change, compare to the specified or noted items.

E. For acceptable products, submit shop drawings, product data and samples under provisions of Sections 01 33 00 and 01 33 23.

F. Substitutions will not be considered when they are indicated or implied on shop drawings or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 01 25 13

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:

1. Section 012100 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
3. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
4. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.

1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

    a. Application for Payment forms with continuation sheets.
    b. Submittal schedule.
    c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

3. Subschedules for Phased Work: (AS APPLICABLE) Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
4. Subschedules for Separate Elements of Work: (AS APPLICABLE) Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:

    a. Project name and location.
    b. Name of Architect.
    c. Architect's project number.
    d. Contractor's name and address.
    e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by

measured quantity. Use information indicated in the Contract Documents to determine quantities.

9. Purchase Contracts: Provide a separate line item in the schedule of values for each purchase contract. Show line-item value of purchase contract. Indicate owner payments or deposits, if any, and balance to be paid by Contractor.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

   1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.

2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:

    a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
    b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
    c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Schedule of unit prices.
7. Submittal schedule (preliminary if not final).
8. List of Contractor's staff assignments.
9. List of Contractor's principal consultants.
10. Copies of building permits.
11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
12. Initial progress report.
13. Report of preconstruction conference.
14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.
16. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00

SECTION 01 32 00

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

B. Related Requirements:
1. Section 013300 "Submittals" for submitting schedules and reports.
2. Section 014000 "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file, where indicated.
2. PDF electronic file.
3. Two paper copies.

B. Startup construction schedule.

1. Approval of cost-loaded, startup construction schedule will not constitute approval of schedule of values for cost-loaded activities.

C. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

F. Construction Schedule Updating Reports: Submit with Applications for Payment.

G. Daily Construction Reports: Submit at weekly intervals.

H. Material Location Reports: Submit at weekly intervals.

I. Site Condition Reports: Submit at time of discovery of differing conditions.

J. Special Reports: Submit at time of unusual event.

K. Qualification Data: For scheduling consultant.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the preliminary construction schedule and Contractor's construction schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.6 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.

2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittals" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.

4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.
2. Work under More Than One Contract: Include a separate activity for each contract.
3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
6. Work Restrictions: Show the effect of the following items on the schedule:

    a. Coordination with existing construction.
    b. Limitations of continued occupancies.
    c. Uninterruptible services.
    d. Partial occupancy before Substantial Completion.
    e. Use of premises restrictions.

f. Provisions for future construction.
g. Seasonal variations.
h. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

a. Subcontract awards.
b. Submittals.
c. Purchases.
d. Mockups.
e. Fabrication.
f. Sample testing.
g. Deliveries.
h. Installation.
i. Tests and inspections.
j. Adjusting.
k. Curing.
l. Building flush-out.
m. Startup and placement into final use and operation.

8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:

a. Structural completion.
b. Temporary enclosure and space conditioning.
c. Permanent space enclosure.
d. Completion of mechanical installation.
e. Completion of electrical installation.
f. Substantial Completion.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion, and the following interim milestones

1. Temporary enclosure and space conditioning.

E. Cost Correlation: Superimpose a cost correlation timeline, indicating planned and actual costs. On the line, show planned and actual dollar volume of the Work performed as of planned and actual dates used for preparation of payment requests.

1. See Section 012900 "Payment Procedures" for cost reporting and payment procedures.

F. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and Contract Time.

G. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means

by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

H. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Use Microsoft Project, Primavera, for Windows 7 operating system.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a cost- and resource-loaded, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Mobilization and demobilization.
c. Purchase of materials.
d. Delivery.
e. Fabrication.
f. Utility interruptions.
g. Installation.
h. Work by Owner that may affect or be affected by Contractor's activities.
i. Testing and commissioning.
j. Punch list and final completion.
k. Activities occurring following final completion.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

5. Cost- and Resource-Loading of CPM Schedule: Assign cost to construction activities on the CPM schedule. Do not assign costs to submittal activities. Obtain Architect's approval prior to assigning costs to fabrication and delivery activities. Assign costs under main subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project record documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.

   a. Each activity cost shall reflect an appropriate value subject to approval by Architect.
   b. Total cost assigned to activities shall equal the total Contract Sum.

E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

H. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

    a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

B. Material Location Reports: At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.

1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their

assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00

SECTION 01 33 00

SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the following Submittals:

1. Submittal schedule.
2. Expanded Construction Progress Schedules
3. Construction Progress Schedule
4. Schedule of Values
5. Shop Drawings Submittal Schedule
6. Manufacturer’s Instructions
7. Hazardous Materials
8. Spare Parts
9. Other submittals required at Pre-Construction Conference
10. Mock Up Schedule

B. In accordance with the General Conditions of the Contract.

C. Submittals constitute an implied statement by the Sub- and General Contractors that submitted items:

1. Have been reviewed and approved by the Sub- and General Contractor.
2. Have been verified and coordinated with specifications, measurements, conditions, and relevant criteria of the Contract Documents.
3. Can be fabricated and delivered to the project site within the proposed Project Schedule.

D. No Finish selection will be made until all appearance-related submittals have been received.

E. Under no circumstances shall unreviewed or unapproved submittals be used in conjunction with the work.

F. Review by the Architect and Boone County Ag Society shall not relieve the Contractor from full compliance with the Construction Documents

G. Related Sections:

1. Division 01 Section “Shop Drawings, Product Data, and Samples”
2. Division 01 Section "Product Substitution Procedures."
3. Division 01 Section "Applications for Payment."
4. Division 01 Section "Submittal Matrix."
5. Division 01 Section "Coordination" for submitting schedules and reports, including Contractor's construction schedule.
6. Division 01 Section "Product Substitution Procedures."
7. Division 01 Section "Closeout Procedures."
8. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
9. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
10. Division 01 Section "Demonstration and Training" for submitting video recordings of

demonstration of equipment and training of Owner's personnel.

H. Paper Use Reduction:

1. It is the intention of the Owner and the entire Project Team to reduce the amount of paper products used. With that in mind, all product catalogs, literature, cut sheets, etc. shall be submitted electronically (only as pdf). Furthermore, all documents 11” x 17” or less shall be submitted electronically.
2. Large format drawings (such as steel shop drawings) shall be submitted on hard copies. (no less than 3 copies)
3. Physical samples must be submitted for selection of colors and textures.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of CAD Drawings of certain Contract Drawings will be provided by Architect for Contractor's use in preparing bids and submittals, as follows:

1. Grading plan will be made available during bidding.
2. Reflected Ceiling Plans will be made available after Notice to Proceed.
3. Other drawings may be issued at the Architect’s digression.
4. All contractors requesting files must first complete and sign an Electronic Media Release form which will be provided by the Architect.
5. BIM files will not be released to bidders / contractors.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension

of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 business days for initial review of each submittal. Allow additional time if
   coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 business days for review of each resubmittal.

D. Identification and Information: Place a permanent label or title block on each hard-copy submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Number and title of appropriate Specification Section
    d. Name of Architect.
    e. Name of Contractor and person reviewing submittal for Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Name of subcontractor.
    h. Name of supplier.
    i. Name of manufacturer.
    j. Submittal number or other unique identifier, including revision identifier.
        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

E. Identification and Information: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., SVVSSD-ES#26 - 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., SVVSSD-ES#26 - 061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Include the following information on an inserted cover sheet:

    a. Project name.
    b. Date.
    c. Number and title of appropriate Specification Section

d. Name and address of Architect.
e. Name of Contractor and person reviewing submittal for Contractor.
f. Name of firm or entity that prepared submittal.
g. Name of subcontractor.
h. Name of supplier.
i. Name of manufacturer.
j. Drawing number and detail references, as appropriate.
k. Location(s) where product is to be installed, as appropriate.
l. Related physical samples submitted directly.
m. Other necessary identification.

F. Options: Identify options requiring selection by the Architect.

G. Deviations: Identify deviations from the Contract Documents on submittals.

H. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

I. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

J. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

L. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

M. Maintain one copy of Architect-reviewed submittals throughout the project in the on-site Construction Office.

1.5 PROCEDURES

A. Within 30 days following Notice to Proceed, provide a complete schedule of submittals, anticipated submittal dates, and prioritization of urgency.

B. After Contractor has reviewed each submittal and indicated his action thereon (except for samples and selection submittals), deliver submittals to the Architect at address listed in the Project Manual, unless otherwise instructed. If it is apparent to the Architect that the Contractor has not thoroughly reviewed a submittal, the Architect will terminate his review

and so notify the Contractor who will be required to perform the required review and resubmit the submittal in total. Any mailing/delivery costs for such procedure shall be borne by the Contractor.

C. Transmit each item with a separate Submittal Routing Form.

D. Identify project, project number, contractor, subcontractor, major supplier, pertinent drawings sheet(s) and detail number, specification section number, and individual product or other descriptive date as appropriate. Identify deviations from Contract Documents. If deviations are not indicated, submittal will be reviewed as contract compliant.

E. Coordinate submittals of related items.

F. Hard-copy submittals: The number of submittals for each item may vary. Contractor to submit, at a minimum, 2 Architect, 1 Owner, 1 Commissioner.

1.6 EXPANDED SUBCONTRACTORS AND MATERIAL SUPPLIERS LISTING

A. Submit in duplicate "Expanded Subcontractor Listing" to the Owner and Architect at Preconstruction Conference.

1.7 CONSTRUCTION PROGRESS SCHEDULE

A. Submit proposed Construction Progress Schedule in duplicate to the Owner and Architect at the Pre-Construction Conference.

1.8 SCHEDULE OF VALUES

A. Submit proposed schedule of values in duplicate to the Owner and Architect at the Pre-Construction Conference.

1.9 MANUFACTURER’S INSTRUCTIONS

A. When required in individual specification section, submit manufacturer’s printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for product data.

B. When required in individual specification sections, any software and/or hardware unique to components, equipment or systems applied under this contract require to setup, operate, maintain, calibrate, trouble shoot or repair such components and equipment or systems shall be provided by the contractor/manufacturer/vendor.

1.10 HAZARDOUS MATERIALS

A. All Contractors and Subcontractors bringing hazardous materials to an Owner’s facility must submit a Material Safety Data Sheet (MSDS) along with the Submittal Routing Form. Submit a MSDS for each hazardous material prior to use. Include information pertaining to the hazardous material with the MSDS.

1.11 SPARE PARTS AND MAINTENANCE MATERIALS

A. Submit an expanded list of products requiring spare parts.This detailed list is to include manufacturer’s product description and quantity description and quantity of spare parts

by individual product, maintenance tools and maintenance material to be provided to the owner. This detailed list is required thirty (30) days prior to substantial completion.

1.12 SUPERINTENDENT RESUME

A. Submit proposed Superintendent's Resume in duplicate to the Owner and Architect at the Pre-Construction Conference.

1.13 MOCKUP SCHEDULE

A. Concrete Masonry and Brick Veneer Walls including colored mortar:

1. Mockup Panel: Prior to installation of masonry work, fabricate one building sample wall panel (see A5/A203) using materials and systems as specified in individual specification sections. Locate where acceptable to Architect. Obtain Architect's and Owner's acceptance of visual qualities of the mock-up before start of work related to mock-up. Rebuild and revise mock-up as required until acceptable to Architect and Owner. Retain mock-up during construction as a standard for judging completed work.

    a. Size: As indicated on exterior elevation sheet, of proposed color range, texture, bond, mortar (including colored mortar sample) and workmanship. Panel will include exposed concrete stem-wall with Architectural Finish, wood plate, studs and sheathing, spray foam insulation, weeps, vents, masonry-ties, masonry veneer, aluminum window (frame only), window sill, window stool, all flashings, minimally-expanding spray foam insulation, sealants, vertical control joints, and precast coping. Coordinate with appropriate subcontractors.
    b. At window: Construct only ½ to 1/3 of window and wall finishes as indicated, for ease of visual verification.
    c. Location: Adjacent to construction for ease of verification.
    d. Do not begin work associated with mockup panel until Architect has accepted sample panel/panels.
    e. Panel shall be used as standard for quality of appearance, materials and construction when compared to completed work of the same.
    f. Do not destroy or move panel until directed by Architect.

2. Interior Masonry
    a. One for each type of masonry.
    b. Mockup may become part of Work if acceptable to Architect.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Submit electronic submittals via email as PDF electronic files.

    a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit three paper copies of each submittal, unless otherwise indicated. Architect will return two copies.

3. Informational Submittals: Submit two paper copies of each submittal, unless otherwise

indicated. Architect will not return copies.

4. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

    a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
    b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

6. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Submit product schedule in the following format:
    a. PDF electronic file.
    b. Three paper copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

D. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

E. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

F. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.

1. Submit subcontract list in the following format:

    a. PDF electronic file.
    b. Number of Copies: Three paper copies of subcontractor list, unless otherwise indicated. Architect will return two copies.

G. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms.

Include names of firms and personnel certified.

J. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

K. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

L. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

M. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

N. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

O. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

P. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

Q. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

R. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

S. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

T. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

U. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 33 00

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Shop Drawings
B. Product Data
C. Samples
D. Contractor Review
E. Submittal Requirements
F. Re-Submittals
G. Architect Review
H. Distribution

1.02 RELATED REQUIREMENTS

A. Section 01 29 10 - Application for Payment
B. Section 01 33 00 - Submittals
C. Section 01 60 00 - Product Requirements
D. Section 01 63 00 - Product Substitution Procedures
E. Section 01 77 00 - Closeout Procedures
F. Divisions 2 through 33

1.03 SHOP DRAWINGS

A. Present in a clear and thorough manner. Title each drawing with Project name and number; identify each element of drawings by reference to sheet number and detail, schedule, or room number of Contract Documents.

B. Identify field dimensions; show relation to adjacent or critical features or work or products.

C. Minimum Sheet Size: Multiples of 8.5 x 11 inches.

D. Maximum sheet size: 30 x 42 inches

E. Scale required: unless otherwise specifically directed by the Architect, make all shop drawings accurate to a scale sufficiently large to show all pertinent features of the item and its methods of connection to the Work.

1.04 PRODUCT DATA

A. Submit only pages which are pertinent: mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

B. Modify manufacture’s standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the Work. Delete information not applicable.

1.05 SAMPLES

A. Submit to the Architect the full range of manufacturer's standard finishes except when more restrictive requirements are specified, indicating colors, textures, and patterns, for Architect selection. All color charts are to be originals (no photo reproduction copies).

B. Submit samples to illustrate functional characteristics of products, including parts and attachments.

C. Approved samples which may be used in the Work are indicated in the specification section. Label each sample with identification required for transmittal letter.

D. Provide field samples of finishes and assemblies at the site, at location acceptable to the Architect, as required by individual specification sections. Install each sample or assembly complete and finished. Acceptable finishes in place may be retained in completed Work.

E. Architect reviewed samples will set the standard by which all Work performed thereafter will be judged.

F. Label each sample with identification required for transmittal letter.

1.06 CONTRACTOR REVIEW

A. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.

B. Coordinate submittals with requirements of Work and of Contract Documents.

C. Sign or initial each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of Contract Documents using submittal stamp illustrated under 1.7C of this Section.

D. Do not fabricate products or begin Work which requires submittals until submittal is returned with Architect's stamp of review.

1.07 SUBMITTAL REQUIREMENTS

A. Paper Use Reduction:

1. It is the intention of the Owner and the entire Project Team to reduce the amount of paper products used. With that in mind, all product catalogs, literature, cut sheets, etc. shall be submitted electronically (pdf). Furthermore, all documents 11" x 17" or less shall be submitted electronically.
2. Large format drawings (such as steel shop drawings) shall be submitted on hard copies.
3. Physical samples must be submitted for selection of colors and textures.

E. Transmit submittals in accordance with Shop Drawings Submittal Schedule – Section 01 33 23 form follows this section, in such sequence to avoid delay in the Work. The Contractor is solely responsible for coordinating the delivery of submittals, including any necessary corrections and re-submittals, to assure that Architect's review can be obtained without delaying the Work. All submittals are to be delivered to the Architect within 45 calendar days after the Pre-construction Conference.

1. At the Pre-Construction Conference, submit two (2) copies of Attachment B to the Architect and Owner.
2. Attachment B shall be prepared in detail, using one line for each item, sorted by section.
3. The Architect shall have approval of the proposed Shop Drawings Submittal Schedule.

F. Contractor shall have prepared and will use the submittal stamp (or one similar/approved by Architect) as illustrated. Provide 4 x 5 inch blank space on each submittal for the submittal stamp.

> By making this submittal No._____, Contractor Name does hereby approve said submittal and does certify that it has determined and verified all materials, field measurements and field construction criteria related thereto, or will do so, and has checked and coordinated the information contained within this submittal with the requirements of the Work and of the contract documents. The Contractor further certifies that, to the best of its knowledge, the material described within this submittal does not contain any asbestos containing materials.
>
> _____ _____
> Signed for the Contractor Date

Number submittals sequentially and by Section Number. Re-submittals shall be identified by means of an alphabetical suffix (beginning with A) after original submittal number.

G. Coordinate submittals into logical grouping to facilitate interrelation of the several items:

1. Finishes which involve Architect selection of colors, textures, or patterns.
2. Associated items which require correlation for efficient function or for installation.
3. Provide:
   a. All submittals required by a particular section at one time.
   b. Shop drawings, schedules, product data, coordination drawings, samples, color charts and other information required (whether listed or not) for Architects complete evaluation.
4. Incomplete information or partial submittal shall be cause for rejection.

H. For 'hard-copy' submittals, submit one copy of shop drawings when reviewed by Architect only, and two copies when reviewed by Architect's Consultant. Provide additional copies when additionally reviewed by Commissioning Agent and/or Owner.

I. Submit a minimum of one (2) copies of samples (unless otherwise specified in specific Section).

J. Contractor will be responsible for making copies of approved submittals; for Owner, Architect, subcontractors as required.

K. Contract Documents shall not be used or reproduced as submittals or any part thereof.

L. Submit number of samples specified in individual specification sections.

M. Submit in accordance with provisions of Section 01 33 00.

N. All submittals shall be made through the Contractor or they will be rejected.

O. No portion of the Work which requires a shop drawing or sample submissions shall be commenced until the submission has been reviewed and returned by the Architect.

1.08 RE-SUBMITTALS

A. Make re-submittals under procedures specified for initial submittals; identify changes made since previous submittal.

B. The Owner will not authorize a reduction in retainage unless all shop drawing submittals have been received and reviewed by the Architect with no required re-submittals.

1.09 ARCHITECT REVIEW

A. The Architect will review shop drawings, product data, and samples and return submittals to the Contractor.

B. Contractor is to schedule his submittals so that the Architect has twelve (12) working days after receipt at Architects office to review each submittal, however, should more time be required for evaluation, coordination, and/or review, the Contractor will be so notified.

C. Extension of review time shall not constitute a basis to automatically extend the Contract Time.

D. The Contractor shall make any corrections required by the Architect and shall resubmit the required number of corrected copies of shop drawings or new samples. The Contractor shall direct specific attention in writing or on resubmitted shop drawings to revisions other than the correction required by the Architect on previous submissions.

1.10 DISTRIBUTION

A. Duplicate and distribute reproductions of shop drawings, copies of product data, and samples, which bear Architect stamp of review, to job site file, record documents file, subcontractors, suppliers, and other entities requiring information.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 01 33 23

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Commissioning Agent, or authorities having jurisdiction are not limited by provisions of this Section.
4. Specific test and inspection requirements are not specified in this Section.

C. Related Requirements:

1. Section 012100 "Allowances" for testing and inspecting allowances.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Mockups: Full-size physical assemblies that are constructed on-site. Refer to Section 01 33 00 for mockup requirements.

D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups, provide plans, sections, and elevations, indicating materials and size of mockup construction.

1. Indicate manufacturer and model number of individual components.
2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within 10 days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's construction schedule.

B. Quality-Control Personnel Qualifications: Engage qualified full-time personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the "Statement of Special Inspections."
3. Owner-performed tests and inspections indicated in the Contract Documents**,** including tests and inspections indicated to be performed by the Commissioning Authority.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and re-inspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.9 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, and mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Commissioning Authority, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work: Refer to Section 01 33 00.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect**,** Commissioning Agent and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect, Commissioning Agent, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify

agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents as a component of Contractor's quality-control plan. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.

1. Distribution: Distribute schedule to Owner, Architect, Commissioning Agent, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:

B. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect, Commissioning Agent and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Agent with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and re-inspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's**,** Commissioning Agent, reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "No Exceptions Taken": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association (The) www.aluminum.org	(703) 358-2960
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
ACI	American Concrete Institute www.concrete.org	(248) 848-3700
AHRI	Air-Conditioning, Heating, and Refrigeration Institute, The www.ahrinet.org	(703) 524-8800
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
ANSI	American National Standards Institute	(202) 293-8020
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989

ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ASCE/SEI	*(*See ASCE)	
ASHRAE	www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9500
ATIS	Alliance for Telecommunications Industry Solutions	
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood Protection Association (Formerly: American Wood Preservers' Association) www.awpa.com	(205) 733-4077
AWI	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
BIA	Brick Industry Association (The) www.bia.org	
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CLFMI	Chain Link Fence Manufacturer Institute www.chainlinkinfo.org	(301) 596-2583
CRI	Carpet and Rug Institute www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200 (800) 328-6306
CSI	Electrical Components Association www.csinet.org	(800) 689-2900
DHI	Door and Hardware Institute www.dhi.org	(703) 295-6000

EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
GA	Gypsum Association www.gypsum.org	(301) 277-8686
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GS	Green Seal www.greenseal.org	(202) 872-6400
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
IGMA	Insulating Glass Manufacturers Alliance www.igmaonline.org	(613) 233-1510
LMA	Laminating Materials Association (Now part of CPA)	
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937 (604) 298-7578
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393

NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070 (888) 846-7622
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(301) 587-1400
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
PCI	Precast/Prestressed Concrete Institute www.pci.org	(312) 786-0300
RCSC	Research Council on Structural Connections www.boltcouncil.org	(706) 882-3833
RFCI	Resilient Floor Covering Institute www.rfci.com www.scte.org	(706) 882-3833
SDI	Steel Deck Institute www.sdi.org	(847)458-4647
SDI	Steel Door Institute www.steeldoor.org (See ASCE)	(440) 899-0010
SEI/ASCE	Security Industry Association www.siaonline.org	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
TCNA	Tile Council of North America, Inc. www.tileusa.com	(864) 646-8453
TMS	The Masonry Society www.masonrysociety.org	(303) 939-9700
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 649-5555

UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
USGBC	U.S. Green Building Council www.usgbc.org	(800) 795-1747
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (312) 321-6802
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

DIN	Deutsches Institut fur Normung e.V. www.din.de	49 30 2601-0
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICC	International Code Council www.iccsafe.org	(888) 422-7233

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167

FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from U.S. Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
FED-STD	Federal Standard (See FS)	
UFAS	Uniform Federal Accessibility Standards Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080

PART 2- PRODUCTS (Not Used)

PART 3- EXECUTION (Not Used)

END OF SECTION 01 42 00

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012100 "Allowances" for products selected under an allowance.
2. Section 012300 "Alternates" for products selected under an alternate.
3. Section 012500 "Substitution Procedures" for requests for substitutions.
4. Section 014200 "References" for applicable industry standards for products specified.

1.3 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
    b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:

    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience **will** be considered.
    b. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

    a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience **will** be considered **unless otherwise indicated**.
    b. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 **COMPARABLE PRODUCTS** (Refer to Section 01 25 31 Request for Substitutions)

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00

SECTION 01 73 00

EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 013300 "Submittal Procedures" for submitting surveys.
3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least **10** days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
3. Products: List products to be used for patching and firms or entities that will perform patching work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.

    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

C. Certified Surveys: Submit two copies signed by professional engineer.

D. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.

3. List below is an example only. Revise to suit Project. With advice of counsel, delete below if Architect's review is not required. If list is deleted, delete option in "Operational Elements" Subparagraph above.

    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Fire-detection and -alarm systems.
    i. Conveying systems.
    j. Electrical wiring systems.

k. Operating systems of special construction.

4. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

5. List below is an example only. Revise to suit Project. With advice of counsel, delete below if Architect's review is not required. If list is deleted, delete option in "Other Construction Elements" Subparagraph above.

   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Sprayed fire-resistive material.
   e. Equipment supports.
   f. Piping, ductwork, vessels, and equipment.
   g. Noise- and vibration-control elements and systems.

6. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Engage a professional engineer to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that

adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.

G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 **OWNER-INSTALLED PRODUCTS** (if applicable)

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00

SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Administrative provisions for Substantial Completion and for final acceptance.

1.02 RELATED REQUIREMENTS

A. Document 00700 - General Conditions: Fiscal provisions and additional administrative requirements.
B. Section 01 11 00 - Summary of Work
C. Section 01 45 00 - Quality Control
D. Section 01 66 13 - Non-Utilization of Asbestos Material
E. Section 01 71 23 - Field Engineering / Survey
F. Section 01 74 23 - Final Cleaning
G. Section 01 78 23 - Operation and Maintenance Data
H. Section 01 78 39 - Project Record Documents
I. Section 01 78 43 - Spare Parts and Maintenance Materials
J. Section 01 91 13 - General Commissioning Requirements
K. All other Sections and submittals/requirements therein.

1.03 SUBSTANTIAL COMPLETION

A. Courtesy Inspection: When Contractor considers Work or designated portion of Work is nearly or substantially complete, he shall submit written notice and request a courtesy inspection by the Architect. If the courtesy inspection indicates Contractor is ready for Substantial Completion Inspection, it will be scheduled at this time. Contractor to provide 10 days notice.

B. Contractor is to conduct Punch List inspection prior to Substantial Inspection. Contractor is to submit the punch list with the request for Substantial Completion Inspection. Punch List by Contractor should show all items found, noting which remain deficient, indicating the minimal items that might remain.

C. Contractor is to have completed functional performance testing with the commissioning authority outlined in 23 08 00, 26 09 23, & 26 09 33. Deficiencies and issues that are identified through the commissioning process are to be substantially resolved prior to substantial completion. The commissioning authority and the owner and design team will make the judgment on whether or not this has occurred at the time of submission for substantial completion

D. Substantial Completion Inspection: Upon written notice, and submission of Contractor's deficiency list, the Architect will inspect the project with the Contractor. Additional deficiencies will be noted and a comprehensive list of items to be completed or corrected shall be prepared by the Architect.

1. During the inspection, should the list become too extensive in the judgment of the Architect to constitute Substantial Completion, the inspection may be terminated and the Contractor notified in writing. Reinspection will not take place until the majority of deficiencies are corrected. Contractor would have to formally request the reinspection.

2. Reinspection Fee: Should the Contractor fail to complete and correct punch list items such that numerous additional inspections are required by the Architect, the Contractor will be billed at $95 per hour, including travel time and mileage for the Architect's and/or his consultants time or additional services. The Architect shall inform the Contractor prior to coordinating inspections that will be charged in this manner. If the Contractor has any questions with regard to any items on the punch list, he shall request clarification before final inspection. The Architect is to conduct a Substantial Completion Inspection and a Final Inspection for each area as agreed upon during the Project.
3. Should the Architect find the Work is Substantially Complete after reviewing the list, a Certificate of Substantial Completion shall be prepared in accordance with provisions of the General Conditions of the Contract Documents (Refer to section 9.8 of the AIA A201). The list of deficiencies shall be attached to the Certificate of Substantial Completion. List shall include all inspections i.e. mechanical, electrical, landscaping, and structural depending on portion of work being inspected for Substantial Completion.

E. Should the Architect's inspection find Work that is not substantially complete, he will promptly notify Contractor in writing, listing observed deficiencies.

F. Contractor shall remedy deficiencies and send a second written notice of Substantial Completion.

1.04 FINAL COMPLETION

A. When Contractor considers Work is complete, submit written certification:

1. Contract Documents have been reviewed.
2. Work has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents, and deficiencies listed with Certificate of Substantial Completion have been corrected in full.
4. Equipment and systems have been tested, adjusted and balanced and are fully operational.
5. Operation of systems has been demonstrated to Owner's personnel.
6. Operation of HVAC and lighting control systems have been demonstrated to Commissioning Authority through functional performance testing per 23 08 00, 26 09 23, & 26 09 33. Associated deficiencies and open issues are to be closed out and completed prior to receiving final completion.
7. Work is complete and ready for final inspection.
8. Contractor to allow 10 days notice for coordination of Final Inspection.

B. Should the Architect find Work incomplete, he will promptly notify Contractor in writing listing observed deficiencies.

C. Contractor shall remedy deficiencies and send a second certification of final completion.

D. When the Architect finds work is complete, closeout submittals will be considered.

1.05 REINSPECTION FEES

A. Should status of completion of Work require reinspection by the Architect due to failure of Work to comply with Contractor's claims on initial inspection, Owner will deduct the amount of Architect's compensation for reinspection services from final payment to Contractor.

1.06 CLOSEOUT SUBMITTALS

A. Evidence of compliance with requirements of governing authorities, governing entities, and governing utility companies:

1. Certificate of Occupancy (permit sign off)
2. Certificate of Inspection required for fire alarm, sprinkler, sound, mechanical and electrical systems (others as applicable).
3. Letter of Acceptance from governing entity for all offsite improvements.
4. Letters of Acceptance from sanitation district, water district, electric company, gas company and telephone company.
5. Completion of Final Inspection Punchlist items.

B. Project record documents: under provisions of Section 01 78 90.

C. Operation and Maintenance Data: under provisions of Section 01 78 30.

D. Warranties and Bonds

E. Spare Parts and Maintenance Materials: under provisions of Section 01 78 43.

F. Keys and keying schedule: under provisions of Division 8.

G. Evidence of Payment and Release of Liens: in accordance with Conditions of the Contract.

H. Consent of Surety to Final Payment.

I. Certificates of Insurance for Products and Completed Operations: in accordance with Supplementary Conditions.

J. Contractor’s one year guarantee of materials and workmanship

K. All guarantees, warranties and submittals, as specified

L. Receipts for extra materials delivered to the Owner

M. Miscellaneous keys, switches, etc.

N. Final Application for Payment

O. HVAC Test and Balance Report

P. Spare Parts

Q. Construction Photographs

R. Survey per Section 01 71 23.

S. Non-utilization of asbestos material –Section 01 66 13.

1.07 STATEMENT OF ADJUSTMENT OF ACCOUNTS

A. Submit final statement reflecting adjustments to Contract Sum indication.
1. Original Contract Sum
2. Previous change orders
3. Changes under unit prices
4. Deductions for uncorrected work

5. Deduction for liquidated damages
6. Deductions for reinspection fees
7. Other adjustments to Contract Sum
8. Total Contract Sum as adjusted
9. Previous payments
10. Sum remaining due

B. The Architect will issue a final Change Order reflecting approved adjustments to Contract Sum not previously made by change orders.

1.08 APPLICATION FOR FINAL PAYMENT

A. Submit application for final payment in accordance with provisions of the Contract Documents.

B. Final Payment will be made the Contractor after all listed deficiencies have been corrected, all closeout submittals have been received/approved, and any applicable notice pursuant to C.R.S. 38-26-107 has been made.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION 01 77 00

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for coordinating operation and maintenance manuals covering the Work of multiple contracts.
2. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.

    a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    b. Enable inserted reviewer comments on draft submittals.

2. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect, will return two copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least [30] days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's and Commissioning Agent's Authority's comments. Submit copies of each corrected manual within [15] days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Architect.
7. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
8. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.

4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."

G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

SECTION 01 79 00

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.

f. Date of video recording.

2. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
3. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
4. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals or in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Operations manuals.
    c. Maintenance manuals.
    d. Project record documents.
    e. Identification systems.
    f. Warranties and bonds.
    g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.

j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

a. Produce segments to present a single significant piece of equipment per segment.
b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

F. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 79 00

SECTION 03 10 00

CONCRETE FORMWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide formwork in accordance with provisions of this Section for cast-in-place concrete shown on the Drawings or required by other Sections of the Specifications.

B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
2. Section 02220: Excavating for footings.
3. Section 03200: Concrete reinforcement.
4. Section 03300: Cast-in-place concrete.

1.2 QUALITY ASSURANCE

A. 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.

B. Design of formwork is the Contractor's responsibility.

C. Standards: In addition to complying with pertinent regulations of governmental agencies having jurisdiction, comply with pertinent provisions of ACI 347.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owners Notice to Proceed, submit manufacturers data and installation instructions for proprietary materials including form coatings, ties, and accessories, and manufactured for systems if used.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Except for metal forms, use new materials. Materials may be re-used during progress of the Work, provided they are completely cleaned and reconditioned, recoated for each use, and capable of producing formwork of the required quality.

B. For footings and foundations, use Douglas Fir boards or planks secured to wood or steel stakes, substantially constructed to shapes indicated and to support the required loads.

C. For studs, wales, and supports, use Standard grade or better Douglas Fir, dimensions as

required to support the loads but not less than 2" x 4".

D. Column forms, if required:
   1. For square or rectangular columns, use 2" thick Douglas Fir planks or joists, surfaced one and two edges, or use metal forms.
   2. Construct column forms with tight joints and securely clamped together with steel clamps.

2.2 FORM TIES

A. Hold inner and outer forms for vertical concrete together with combination steel ties and spreaders approved by the Architect.
   1. Space ties symmetrically in tiers and rows, each tier plumb from top to bottom and each row level.
   2. At horizontal pour lines, locate ties not more than 6" below the pour lines. Tighten after concrete has set and before the next pour is made.
   3. For exposed concrete surfaces, provide form ties of removable type with she-bolts equipped with permanent plugs and a system approved by the Architect for fixing the plugs in place.
   4. Use a working strength of not less than 3000 pounds and a type that will, upon removal, leave no metal closer than 1 1/2 inches to the exposed surface.

2.3 DESIGN OF FORMWORK

A. General:
   1. Design, erect, support, brace, and maintain formwork so 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 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 the formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, foundation pressures, stresses, lateral stability, and other factors pertinent to safety of the structure during construction.
   5. Provide shores 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 materials by structural members spaced sufficiently close enough to prevent excessive deflection.
   8. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within the allowable tolerances.
   9. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints, and provide backup material at joints as required to prevent leakage and prevent fins.
   10. Provide camber in formwork as required for anticipated deflections due to weight and pressures of fresh concrete and construction loads.

2.4 EARTH FORMS

A. Side forms for footings may be omitted, and concrete may be placed directly against excavation, only when requested by the Contractor and approved by the Arch.

B. When omission of forms is accepted, provide additional concrete 1" on each side of the minimum design profiles and dimensions shown on the Drawings.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 FORM CONSTRUCTION

A. General:
   1. Construct forms complying with ACI 347 to the exact sizes, shapes, and dimensions shown, and as required to obtain accurate alignment, location, grades, and level and plumb work in the finished structure.
   2. Provide for openings, offsets, keyways, recesses, moldings, reglets, champfers, blocking, screeds, bulk-heads, anchorages, inserts, and other features as required.

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. Kerf wood inserts for forming keyways, reglets, recesses, and the like, to prevent swelling and assure ease of removal.
   4. Provide top forms for inclined surfaces where so directed by the Architect.

C. Forms for exposed concrete:
   1. Drill forms to suit ties being used, and to prevent leakage of cement paste around tie holes. Do not splinter forms by driving ties through improperly prepared holes.
   2. Provide sharp, clean corners at intersecting planes, without visible edges or offsets. Back the joints with extra studs or girts to maintain true, square intersections.
   3. Use extra studs, wales, and bracing to prevent objectionable bowing of forms between studs, and to avoid bowed appearance in concrete. Do not use narrow strips of form material which will produce bow.

D. Corner treatment:
   1. Unless shown otherwise, form champfers with 3/4"x3/4" strips, accurately formed and surfaced to produce uniformly straight lines and tight edges.
   2. Extend terminal edges to required limit, and miter the champfer strips at changes in direction.

E. Locate control joints as indicated on the Drawings and, where required but not shown on the Drawings, as approved by the Architect.

F. Provisions for other trades:
   1. Provide openings in concrete formwork to accommodate work of other trades.
   2. Verify size and location of openings, recesses, and chases with the trade requiring such items.

3. Accurately place and securely support items to be built into the concrete.

3.3 FORM COATINGS

A. Coat form contact surfaces with form coating compound before reinforcement is placed.

3.4 REMOVAL OF FORMS.

1. Do not allow excess form coating material to accumulate in the forms or to come in contact with
surfaces which will bond to fresh concrete.
2. Apply the form coating material in strict accordance with its manufacturer's recommendations.
3. Use "Nox-Crete form Coating" manufactured by the Nox-Crete Company, Omaha, Nebraska, or "Debond Form Coating" manufactured by Land M Construction Chemicals, Inc., Omaha, Nebraska. The coating shall be a chemical type nonstaining release agent which will not affect the bonding of plaster, paint, waterproofing, or other materials to the concrete.

A. General:
1. Do not disturb or remove forms until the concrete has hardened sufficiently to permit form removal with complete safety.
2. Do not remove shoring until the member has acquired sufficient strength to support its own weight, the load upon it, and the added load of construction.
3. Do not strip floor slabs in less than two days.
4. Do not strip vertical concrete in less than seven days.

B. Finished surfaces:
1. Exercise care in removing forms finished concrete surfaces so that surfaces are not marred or gouged, and that corners are true, sharp, and unbroken.
2. Release sleeve nuts or clamps, and pull the form ties neatly.
3. Do not permit steel spreaders, form ties, or other metal to project from, or be visible on, any concrete surface except where so shown on the Drawings.
4. Solidly pack form tie holes, rod holes, and similar holes in the concrete. For packing, use the cement grout specified on Section 03300 of these Specifications, flushing the holes with water before packing, screeding off flush, and grinding to match adjacent surfaces.

END OF SECTION 03 10 00

SECTION 03 20 00

CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide concrete reinforcement where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.
   2. Section 03100: Concrete formwork.
   3. Section 03300: Cast-in-place concrete.

1.2 QUALITY ASSURANCE

A. 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.

B. Comply with pertinent provisions of the following, except as may be modified herein.
   1. ACI 315 and 318;
   2. CRSI "Manual of Standard Practice."

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section;
   2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
   3. Shop Drawings showing details of bars, anchors, and other items, if any, provided under this Section.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

B. Delivery and storage:
   1. Use necessary precautions to maintain identification after bundles are broken.
   2. Store in a manner to prevent excessive rusting and fouling with dirt, greases, and other bond-breaking coatings.

PART 2 - PRODUCTS

2.1 REINFORCEMENT MATERIALS AND ACCESSORIES

A. Bars:
   1. Provide deformed billet steel bars complying with ASTM A615, using grades shown on the Drawings.
   2. Where grades are not shown on the Drawings, use grade 60.

B. Steel wire:
   1. Comply with ASTM A82.
   2. For tie wire, comply with Fed Spec QQ-W-461, annealed steel, black, 16 gage minimum.

C. Welded wire fabric:
   1. Provide welded steel, complying with ASTM A185.

D. Welding electrodes:
   1. Comply with AWS A5.1, low hydrogen, E70 series.

E. Welded reinforcing bars:
   1. Welding of reinforcing bars will not be allowed except where specifically shown on the Drawings.
   2. For reinforcing bars which are to be welded, conform with "structural welding code-reinforcing steel", AWS D1.4. Use bars conforming to ASTM A706.

F. 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 shown on the Drawings.
   2. Do not use wood, brick, or other non-complying material.
   3. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
   4. 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.

2.2 FABRICATION

A. General:
   1. Fabricate reinforcing bars to conform to the required shapes and dimensions, with fabrication tolerances complying with the CRSI Manual.
   2. In case of fabricating errors, do not straighten or rebend reinforcement in a manner that will weaken or injure the material.
   3. Reinforcement with any of the following defects will not be acceptable.
      a. Bar lengths, depths, and/or bends exceeding the specified fabrication tolerances;
      b. Bends of kinks not shown on the Drawings;
      c. Bars with reduced cross-section due to excessive rusting or other cause.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Comply with the specified standards for detail and method of placing

reinforcement and supports, except as may be modified herein.

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, and concrete placing operations.
4. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
5. Place reinforcement to obtain minimum coverages for concrete protection.
6. Arrange, space, and securely tie bars and bar supports together with the specified tie wire.
7. Set wire ties so twisted ends are directed away from exposed concrete surfaces.

B. Install welded wire fabric in as long lengths as practicable, lapping adjoining pieces at least one full mesh.

C. Provide sufficient numbers of supports, and of strength to carry the reinforcement.

D. Do not place reinforcing bars more than 2" beyond last leg of any continuous bar support.

E. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

3.3 SPLICES

A. Lap splices:
1. Tie securely with the specified wire to prevent displacement of splices during placement of concrete.

B. Splice devices:
1. Obtain the Architect's approval prior to using splice devices.
2. Install in accordance with manufacturer's written instructions.
3. Do not splice bars except at locations shown on the Drawings, except as otherwise specifically approved by the Architect.
4. Splice in a manner developing at least 125% of the yielding strength of the bar.

C. Welding:
1. Perform in accordance with AWS D1.4-79.

END OF SECTION 03 20 00

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide cast-in-place concrete where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:
   1. Documents affecting work of this Section included but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. 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.

B. Quality control:
   1. Do not commence placement of concrete until mix designs have been reviewed and approved by the Architect and all governmental agencies having jurisdiction.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
   1. Materials list of items proposed to be provided under this Section.
   2. Manufacturer's specifications and other data needed to prove compliance with the specified items.

1.4 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 - MATERIALS

2.1 CEMENT

A. Provide a standard brand of portland cement complying with ASTM C 150, type I, low Alkali. Do not change the brand of cement during progress of the work except as approved in writing by the Architect.

2.2 AGGREGATES

A. General:
   1. Provide hardrock aggregate complying with ASTM C33, with additional attributes as specified herein.
   2. For making grading tests of fine and course Platte River aggregates, use square mesh wire cloth complying with ASTM E11.

B. Fine Aggregate:

1. Provide washed natural sand having strong, hard durable particles, and containing not more than 2% by weight of deleterious matter such as clay lumps, mica, shale, or schist.
2. Grade from coarse to fine within the following limits:

Sieve Size:	Percentage by weight passing Sieve Minimum:	Maximum:
3/8"	100	---
No. 4	95	100
No. 8	65	95
No. 16	45	75
No. 30	30	50
No. 50	10	22
No. 100	2	8

C. Coarse aggregate:

1. Provide coarse aggregate consisting of clean, hard, fine grained, sound crushed rock or washed gravel, or a combination of both, containing not more than 5% by weight of flat, chip-like, thin, elongated, friable, or laminated pieces, nor more than 2% by weight of shale or cherty material.
   a. Any piece having a length in excess of five times the average thickness shall be considered flat or elongated.
2. Use coarse aggregate of the largest practicable size for each condition of placement, subject to the following maximum size limitations:
   a. Do not exceed 3/4 of the clear distance between reinforcing bars, 1/5 of the narrowest dimension between sides of forms, or 1/3 the depth of any slab section.
3. Grade combined aggregates within the following limits.

Sieve size or size in inches:	Percentage by weight passing sieve: 1-1/2" aggregate: Min:	Max:	1" aggregate: Min:	Max:	3/4" aggregate: Min:	Max:
1-1/2"	95	---	---	---	---	---
1"	75	90	90	100	---	---
3/4"	55	77	70	90	90	100
3/8"	40	55	45	65	60	80
No. 4	30	40	31	47	40	60
No. 8	22	35	23	40	30	45
No. 16	16	30	17	35	20	35
No. 30	10	20	10	23	13	23
No. 50	2	8	2	10	5	15
No. 100	0	3	0	3	0	5

D. Lightweight aggregate, coarse and fine: Provide rounded, sealed, expanded shale or clay conforming to ASTM C330.

2.3 WATER

A. Use only water which is clean and free from deleterious amounts of acid, alkali, salt, and organic materials.

2.4 ADMIXTURES

A. Use only a standard brand of admixture for concrete, approved by the Architect, meeting or exceeding the following requirements.
   1. Reduce the required mixing water at least 75% without entraining air in excess of 2% by volume.
      a. If the admixture used entrains more than 2% air, the water reduction shall be at least 10%, but in no case shall the volume of air entrained exceed 5%.
   2. A separate approved air-entraining agent may be used in addition to the water-reducing admixture, provided the combination of the two admixtures meets the requirements listed above.
   3. Calcium chloride shall not be used.
   4. Use only automatic dispensers approved by the testing agency for adding admixture.
   5. If an air-entraining agent is used, run air content determinations periodically during the pour to make certain the volume or air entrained is less than 5%.

2.5 OTHER MATERIALS

A. Expansion joint filler;
   1. Provide preformed strips, non-extruding and resilient bituminous type, of thickness indicated, complying with ASTM D1751.
   2. If sealants specified in Section 07920 are used in the joints built under this Section, provide a filler complying with ASTM D1752.

B. Curing materials:
   1. Liquid curing compounds:
      a. Provide a standard brand, clear or black as directed by the Architect for the particular application, and complying with ASTM C309.
      b. When black compound is used, provide compatibility with the adhesive used for laying floor covering in such areas.

C. Floor hardener:
   1. Provide mineral or metallic hardener, natural gray in color, where no floor indicated on drawings.
   2. Acceptable products:
      a. "Lapidolith" by Sonneborn Building Products;
      b. "Hydroment" by the Upco Company;
      c. "Colorcron" or "Masterplate" by Master Builders;
      d. "Chem Hard" by L & M Construction-Chemicals
      e. "Filpor" by West Chemical Products

D. Vapor barrier membrane:
   1. Provide polyethylene sheet of the thickness shown on the Drawings, complying with ASTM D2103.
   2. If vapor barrier is shown on the Drawings, but thickness is not indicated, provide 6 mil thickness.

E. Dovetail Slots:
   1. Use slots manufactured by Burke, Progress Unlimited or Heckman Building Products, Inc. Slots shall be formed of galvanized sheet steel not less than 24 gauge.

2.6 CONCRETE MIXES

A. Provide a mix design prepared by the approved testing agency, based on strengths of the approved materials, and meeting the requirements stated on the Drawings.
   1. Secure the Architect's approval of each mix design, including new mix designs required to be prepared should there occur a change in materials being used.
   2. All laboratory and field tests used shall have been conducted within 12 months prior to the date of submittal to the Architect.

B. Concrete Classes:

	Maximum Size of Aggregates (inches)	Minimum/ Maximum Slump (inches)	Minimum 28-day Strength (psi)	Minimum Cement per Cu.Yd. (sacks)	Maximum Water Gal./Sac
A.=	1"	2/4	3,500	6.00	5.5
B.=	1"	2/4	4,000	7.00	5.2

A.= Footings, Piers, Walls and Interior Slab-on-Grade
B.= Concrete Exposed to Weather
(A & B both use Platte River Aggregates)

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 CONCRETE MIXING

A. Concrete for minor work, when approved by the Architect, may be mixed at the site in a power mixer when the mixer has a capacity not less than one full sack batch.

B. Unless otherwise approved by the Architect, use ready mixed concrete complying with ASTM C94, except as may be modified by the following.
   1. For materials for ready mixed concrete, and for methods of measuring materials, comply with applicable provisions of this Section.
   2. Equip the loading plant to handle not less than four sizes of aggregate in such a manner as to prevent intermixing of aggregates until loaded into the weighing hopper.
   3. Equip truck mixers with a mixing water tank fitted with a water gage.
   4. Mixing:
      a. Mix each batch of concrete not less than 15 minutes, five minutes of which shall be at the site.
      b. Rotate the drum at the rate specified by the manufacturer of the mixer as "mixing speed."
      c. Whenever there is a delay in unloading, rotate the drum slowly at intervals to prevent incipient set of concrete.
      d. Concrete will be rejected if not placed in final position within 1-1/2 hours after water is first added to the batch.
   5. Addition of water:
      a. Indiscriminate addition of water to increase slump shall not be permitted.
      b. Any addition of water above that permitted by the limitation on water-

cement ratio must be accompanied by a quantity of cement sufficient to maintain the proper water-cement ratio, and then only when acceptable to the Architect.

6. Concrete at time of placing shall be in such condition that it can be placed properly.
7. Discharge all wash water from the mixing drum before the truck reloads at the batching plant.
8. Drivers are required to deliver signed dispatch tickets showing where the load was dispatched, when it left the mixing plant and the exact time (to the nearest minute) the batch was mixed. Failure to show the tickets properly filled out, will be considered as a basis for rejecting the entire batch. Dispatch tickets shall record any and all additives incorporated in the batch, including any water added after the batch was mixed.

C. Concrete consistency:
1. Use the amount of water established by the approved mix design.
   a. Do not exceed the maximum quantity specified for the grade of concrete.
   b. Use the minimum amount of water necessary to produce concrete of the workability required by the Architect.
   c. Do not supplement the predetermined amount of water with additional water for any reason.
2. Measure concrete consistency by ASTM C143 method.
   a. As part of the routine testing and inspecting, test twice each day or partial day's run of the mixer.
   b. Maintain a complete and accurate record of tests.
3. Provide maximum slumps of concrete as:
   a. Footings, and slabs on soil: 4"
   b. Other concrete: 4"

D. Cement grout and dry-pack grout:
1. Mix at the site, in composition of one volume of portland cement to 2-1/2 volumes of fine aggregate.
2. Mix the materials dry; then add sufficient water to make the mixture flow under its own weight.
3. When grout is used as dry-pack concrete, add sufficient water to make a stiff mixture, which can be molded into a sphere.

E. Miscellaneous provisions:
1. Provide strengths of concrete as specified.
2. Provide concrete dense and free from honeycomb and other defects.
3. Place and finish members to conform to the shapes and dimensions indicated, with all surfaces true to line, plumb, and level.

3.3 INSERTS, ANCHORS, AND EMBEDDED ITEMS

A. Powder driven concrete fasteners:
1. In addition to their use where the pins are loaded in shear, powder driven concrete fasteners may be used in tension for support of light loads such as acoustical ceilings, duct work, conduits, pipes, and similar items when such loads are limited to less than 75lbs.
2. Testing:
   a. Secure prequalification of operator, tool, and fastener by an approved testing agency, who shall observe testing of the first ten fastener installations.

b. Apply a test "pull-out" load of not less than twice the design load or 150 lbs, whichever is the greater, to the pin in such a manner as not to resist the spalling tendency of the concrete surrounding the pin.
c. Thereafter, secure random tests by the approved testing agency of approximately one in ten pins; except that when the design load exceeds 75lbs, test one-half of the pins.
d. Should failure occur on any pin tested, test all installations under observation of the approved testing agency, and replace all unqualifying pins at no additional cost to the Owner.
e. Where "Red Head" or similar types of concrete anchor bolts are used for significant gravity loads or seismic anchorage, test in the presence of the approved testing agency:
(1) Proof test 50% of the bolts (alternate bolts in any group arrangement) to twice that allowable load;
(2) If there are any failures, also test the immediately adjacent bolt.

3. Where hanger rods, bolts, wire, or similar items are used to suspend construction items, place in the concrete as required and/or indicated.
4. Where suspended ceilings with metal carrying systems are called for on the Drawings:
a. Provide hanger wires in the slab, as shown on the Drawings or otherwise required, of sufficient length to extend 12" below the line of the finish ceiling;
b. Place the hanger wires in line to receive runner channels, beginning 6" from the walls parallel to the runners.

B. Reglets and rebates:
1. Form reglets and rebates as required to receive frames, flashing, and other equipment.
2. Verify the dimensions and positions of required reglets and rebates with trades whose work is related to or contingent upon such dimensions and positions.
3. If concrete slabs on earth join a wall or other perpendicular concrete surface, form a reglet in the wall to receive and carry the horizontal concrete work.
a. Provide reglet full thickness of the slab and 3/4" deep, unless otherwise shown on the Drawings.
b. Exterior walks need not be provided for in this way except where so detailed on the Drawings.

C. Embedded piping and rough hardware:
1. Coordinate the various trades who are required to fasten work to the structure, or are required to insert therein any sleeve, box, bolt, anchor, insert, or other rough hardware.
2. Provide every facility for setting all required accurately in the forms.
3. Be responsible for changes positions of such items after they have been set.
4. Provide in the forms for all sleeves, boxes, bolts, anchors, inserts, strap anchors for frames, and other rough hardware required for the Work, and which are shown or required to be embedded in the concrete.
5. Conduits and sleeves:
a. Locate so as not to reduce the strength of construction. Do not place pipes, except conduits, in a slab of less than 3-1/2" thickness.
b. In supported concrete slabs, do not bury conduit having an outside diameter greater than 33% of the thickness of the slab. Increase slab thickness locally to meet this requirement.
c. Do not place conduit between the bottom of reinforcing steel and the bottom of supported slab.

d. In placing conduits at slabs on earth, placed below the reinforcement, and encase in concrete by increasing thickness of the slab locally to at least 3" of concrete around the conduit on all sides.

D. Where openings in floors and walls are required by the various trades, but are not detailed on the Drawings, reinforce as directed by the Architect.

3.4 CONVEYING AND PLACING CONCRETE

A. Before placing concrete, thoroughly clean forms, wash out with water, and make tight.

B. Time of placing:
1. Do not place concrete until reinforcement, conduits, outlet boxes, anchors, sleeves, hangers, bolts, and other embedded materials are securely and properly fastened in their correct positions.
2. Secure the Architect's approval of reinforcement before commencing placement of concrete.

C. Preparation:
1. Before new concrete is deposited upon or against concrete that has taken its initial set or has hardened, remove all incrustations from forms and reinforcement.
2. Remove all laitance, oil, and loose particles from concrete and concrete surfaces, and thoroughly clean the forms with water under stiff pressure.
3. Remove laitance after concrete has hardened partially (not less than two hours nor more than four hours after placing) by brushing with stiff bristles, or by directing a stream of water from a 1/4" nozzle, or by other method approved by the Architect, to expose the clean top surface of the coarse aggregate.
4. Where cleaning is not satisfactory to the Architect, sandblast the surface and then wash again.

D. Method of placing:
1. Place concrete only under the degree of inspection described elsewhere in these Specifications, and as required by governmental agencies having jurisdiction.
2. Do not place concrete outside of regular working hours unless required inspection authorities have been notified properly and are present.
3. Spouts, pipes, troughs, belts, chain buckets, and other equipment may be used in conveying concrete, but the manner and method used shall be only as approved by the Architect.
4. Do not permit concrete to free drop more than 6'-0"
5. Deposit concrete direct into conveyances, and direct from conveyances to final points of repose, except where troughs, buckets, or the like are used, in which case dump concrete into hoppers and then into the conveyances.
6. Where tremies are used, or where the free drop is 5'-0" or more, and through reinforcement, use a dumping box or board, moving the concrete therefrom by shovels or hoes.
7. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one position to another, and place as rapidly as practicable after mixing.
8. Do not use in this Work any concrete not placed within 30 minutes after leaving the mixer.

E. Tamping and conveying:
1. Thoroughly work concrete around reinforcement and embedded fixtures, and into corners of forms, during placing operations.

2. Completely compact with tamping poles and by tapping forms until the concrete is thoroughly compact and without voids. Determine the number of tampers needed by the amount and method of placing concrete.
3. Exercise care to tamp concrete vigorously and thoroughly to obtain maximum density.
4. Use manual tampers as well as mechanical vibrators.
    a. Exercise care to direct the quick handling of vibrators from one position to another.
    b. Do not over-vibrate concrete.
    c. Do not move concrete by use of vibrator.

F. Stoppages:
1. Stop concrete placing at natural breaks of direction or where approved by the Architect.
2. Maintain flow surfaces of freshly placed concrete as level whenever a pour is stopped, providing tight dams to accomplish this.
3. Make construction joints only where unavoidable, and then only at points determined by the Architect.
4. Make horizontal construction joints only where shown on the Drawings or specifically approved by the Architect.
5. Provide keys and dowels at construction joints where indicated on the Drawings, and where concrete placement is interrupted.

3.5 STEPS, SLABS, WALKS, AND PAVING ON EARTH

A. Preparation for slabs on earth:
1. Prepare the subgrade as specified in other Sections.
2. Dampen the subgrade for exterior slabs and paving prior to placing concrete, but do not dampen subgrade at interior floor slabs.
3. Provide the specified vapor barrier membrane, with the bedding and covering shown on the Drawings, beneath floor slabs on grade.
    a. Place the membrane in as large of sheets as practical lapping 12" in the top lap placed in direction concrete will be spread.
    b. Carefully cut, fit, and seal the membrane to all pipes and conduits projecting through the membrane, using small sheets, where necessary, and pressure-sensitive tape.
    c. Make necessary repairs to the membrane, and secure to the Architect's approval before placing concrete.
    d. Do not permit membrane to be punctured except at screed stakes and utility risers.

B. Placing and finishing:
1. Tamp the freshly placed concrete, except slabs to receive separate topping finish or mortar setting bed, using a heavy tamper, until at least 3/8" of mortar is brought to the surface.
2. Use tampers having a face consisting essentially of a grid of parallel metal bars.
3. Tamp with a light tamper, and screed with a heavy straightedge, until depressions and irregularities are worked out and the surface is true to finish grades and elevations.
4. Remove excess water and debris worked to the surface in compacting and screeding.
5. At slabs to receive separate topping finish of mortar setting beds, do not continue tamping to raise the mortar described in subparagraph 3.5-B-1 above.
6. Remove laitance as described in subparagraph 3.4-C-3 above.

7. When concrete has hardened sufficiently, float to a compact and smooth surface.
8. Provide the finish surfaces shown on the Drawings or otherwise directed by the Architect, in accordance with pertinent provisions of Section 03345 of these Specifications.
9. All sidewalk along the sides of the building should have a slope of 1/4" per foot away from the building

C. Cure and protect concrete in accordance with pertinent provisions of Section 03345 of these
Specifications.

3.6 SODA AND ACID WASH

A. At concrete surfaces to receive, plaster, paint, or other finish, and which have been formed by oil-coated forms, scrub with a solution of 1-1/2 lbs caustic soda to one gal of water.

B. On surfaces where smooth wood or waste molds have been used, scrub with a solution of 20% muriatic acid or hydrochloric acid.

C. After the surfaces have been scrubbed, wash with clean water as soon as possible.

3.7 DEFECTIVE CONCRETE

A. The following concrete will be deemed to be defective, and shall be removed promptly from the job site.
1. Concrete which is not formed as indicated, is not true to intended alignment, is not plumb or level where so intended, is not true to intended grades and levels;
2. Has voids or honeycomb that have been cut, filled or resurfaced, without Architects approval.
3. Has sawdust, shavings, wood, or embedded debris;
4. Or does not conform fully to provisions of the Contract Documents.

B. Repairs and replacements:
1. Defective concrete may be cut out and repaired with gunite, or other approved methods, when and as directed by the Architect.
2. Where defective concrete is found after removal of the forms, cut out the defective concrete, if necessary, and make the surfaces match adjacent surfaces.
3. Work uneven surfaces and angles of concrete to a surface matching adjacent concrete surfaces.

3.8 GROUTING AND CEMENT POINTING

A. After steel columns have been installed and leveled, dry-pack the space between the bottom of the plate and concrete, using cement grout driven in to completely fill the space and forming solid bearing for the column base plate.

3.9 MISCELLANEOUS CONCRETE ITEMS

A. Walls and curbs:
1. Construct header walls and curbs as shown on the Drawings.
2. Trowel exposed concrete surfaces smooth.

B. Leave openings in floor slabs and future foundations for machines and equipment, where so indicated on the Drawings, and in dimensions and arrangements required for the approved machines and equipment.

END OF SECTION 03 30 00

SECTION 03 34 50

CONCRETE FINISHING

PART I - GENERAL

1.01 DESCRIPTION

A. Work included: Provide finishes on cast-in-place concrete as called for on the Drawings, specified
herein, and needed for a complete and proper installation.

B. Related work:
1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division I of these Specifications.
2. Section 03300: Cast-in-place concrete.

1.02 QUALITY ASSURANCE

A. 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.

B. Except as may be modified herein or otherwise directed by the Architect, comply with ACI 301, "Specifications for Structural Concrete for Buildings."

1.03 SUBMITTALS

A. Comply with pertinent provisions of Section 01340.

B. Product data: Within 35 calendar days after the Contractor has received the Owner's Notice to Proceed, submit:
1. Materials list of items proposed to be provided under this Section;
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
3. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.04 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:
1. Carefully study the Drawings and Specifications to determine the location, extent, and type of finish required.
2. Provide the following materials, or equals approved in advance by the Architect.

B. Concrete materials: Comply with pertinent provisions of Section 03300, except as may be modified herein.

C. Liquid bonding agent: "Weld-Crete," manufactured by the Larsen Products Corporation.

D. Curing and protection paper:
1. Approved products:
a. "Sisalkraft, Orange Label";
b. Equal products complying with ASTM C171.
2. Where concrete will be exposed and will be subjected to abrasion, such as floor slabs, use non-staining paper such as "Sisalkraft, Seekure 896," or equal paper faced with polyethylene film.

E. Liquid curing agents:
1. Where application of specified finish materials will be inhibited by use of curing agents, cure the surface by water only; do not use chemical cure.
2. For curing other areas, use "Hunt TLF" manufactured by Hunt Process Company, Inc.

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. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.02 FINISHING OF FORMED SURFACES

A. General:
1. After removal of forms, give the concrete surfaces one or more of the finishes specified
below where so indicated on the Drawings.
2. Revise the finishes as needed to secure the approval of the Architect.

B. As-cast finish:
1. Rough form finish:
a. Leave surfaces with the texture imparted by forms, except patch tie holes and defects.
b. Remove fins exceeding 1/4" in height.
2. Smooth form finish:
a. Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces, with number of seams kept to a practical minimum and in a uniform and orderly pattern.
b. Patch tie holes and defects.
c. Remove fins completely.

C. Rubbed finishes:
1. Provide rubbed finish on all exposed concrete steps and piers which are formed with a "smooth form finish" base as described above.
2. Smooth rubbed finish.
a. Produce on newly hardened concrete no later than the day following

form removal.
b. Wet the surfaces, and rub with Carborundum brick or other abrasive until uniform color and texture are produced.
c. Do not use a cement grout other than the cement paste drawn from the concrete itself by the rubbing process.

3. Grout cleaned finish:
a. Do not start cleaning operations until all contiguous surfaces to be cleaned are completed and accessible.
b. Do not permit cleaning as the work progresses.
c. Mix one part portland cement and 1-1/2 parts fine sand with sufficient water to produce a grout having the consistency of thick paint.
d. Substitute white portland cement for part of the gray portland cement as required to produce a color matching the color of surrounding concrete, as determined by a trial patch.
e. Wet the surface of the concrete sufficiently to prevent absorption of water from the grout, and apply the grout uniformly with brushes or spray gun.
f. Immediately after applying the grout, scrub the surface vigorously with a cork float or stone to coat the surface and fill all air bubbles and holes.
g. While the grout is still plastic, remove all excess grout by murking the surface with a rubber float, sack, or other means.
h. After the surface whites from drying (about 30 minutes at normal temperatures), rub vigorously with clean burlap.
i. Keep the surface damp for at least 36 hours after final rubbing.

D. Unspecified finish: If the finish of formed surfaces is not specifically called out elsewhere in the Contract Documents, provide the following finishes as applicable.
1. Rough form finish:
a. For all concrete surfaces not exposed to public view.
2. Smooth form finish:
a. For all concrete surfaces exposed to public view.

3.03 FINISHING SLABS

A. Definition of finishing tolerances:
1. "Class A": True plane within 1/8" in ten feet as determined by a ten foot straightedge placed anywhere on the slab in any direction.

B. Floated finish:
1. After the concrete has been placed, consolidated, struck off, and leveled, do not work the concrete further until ready for floating.
2. Begin floating when the water sheen has disappeared and when the surface has stiffened sufficiently to permit the operation.
3. During or after the first floating, check the planeness of the surface with a ten foot straightedge applied at not less than two different angles.
4. Cut down high spots and fill low spots, and produce a surface with a Class A tolerance throughout.
5. Refloat the slab immediately to a uniform sandy texture.

C. Troweled finish:
1. Provide a floated finish as described above, followed by a power troweling, and then a hand troweling as required, at all interior concrete slabs.
a. Produce an initial surface which is relatively free from defects, but which still may show some trowel marks.
b. Provide hand troweling when a ringing sound is produced as the trowel is

moved over the surface.

c. Thoroughly consolidate the surface by hand troweling.

2. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of Class A tolerance.

a. On surfaces intended to support floor coverings, use grinding or other means as necessary and remove all defects of such magnitude as would show through the floor covering.

D. Broom finish: (Exterior Conc. Walks and Ramps.)

1. Provide a floated finish as described above.
2. While the surface is still plastic, provide a texture finish by drawing a fiber bristle broom
uniformly over the surface.
3. Unless otherwise directed by the Architect, provide the texturing in short direction only.
4. Provide "light," texturing as directed by the Architect or otherwise called for on the Drawings.

E. Unspecified finish: If the finish of slab surfaces is not specifically called for elsewhere in the Contract Documents, provide the following finishes as directed by the Architect or applicable:

1. Scratched finish:
   a. For surfaces scheduled to receive bond-applied cementitious applications.
2. Burlap finish:
   a. For surfaces intended for vehicular traffic.
3. Troweled finish:
   a. For floors intended as walking surfaces;
   b. Floors scheduled to receive floor coverings or waterproof membrane;
4. room finish:
   a. Exterior pedestrian ramps.
5. on-slip finish:
   a. platforms, steps, and landings;
   b. Exterior pedestrian ramps.

3.04 CURING AND PROTECTION

A. Beginning immediately after placement, protect concrete from premature drying, excessively hot and cold temperatures, and mechanical injury.

B. Preservation of moisture:

1. Unless otherwise directed by the Architect, apply one of the following procedures to concrete not in contact with forms, immediately after completion of placement and finishing.
   a. Ponding or continuous sprinkling;
   b. Application of absorptive mats or fabric kept continuously wet;
   c. Application of sand kept continuously wet;
   d. Continuous application of steam (not exceeding 150 degrees F) or mist spray;
   e. Application of waterproof sheet materials specified in Part 2 of this Section;
   f. Application of other moisture-retaining covering as approved by the Architect;
   g. Application of the curing agent specified in Part 2 of this Section or

elsewhere in the Contract Documents.

2. Where forms are exposed to the sun, minimize moisture loss by keeping the forms wet until they can be removed safely.
3. Cure concrete by preserving moisture as specified above for at least seven days.

C. Temperature, wind, and humidity:
   1. Cold weather:
      a. When the mean daily temperature outdoors is less than 40 degrees F, maintain the temperature of the concrete between 50 degrees F and 70 degrees F for the required curing period.
      b. When necessary, provide proper and adequate heating system capable of maintaining the required heat without injury due to concentration of heat.
      c. Do not use combustion heaters during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.
   2. Hot weather: When necessary, provide wind breaks, fog spraying, shading, sprinkling, ponding, or wet covering with a light colored material, applying as quickly as concrete hardening and finishing operations will allow.
   3. Rate of temperature change: Keep the temperature of the air immediately adjacent to the concrete during and immediately following the curing period as uniform as possible and not exceeding a change of 5 degrees F in any one hour period, or 50 degrees F in any 24 hour period.

D. Protection from mechanical injury:
   1. During the curing period, protect the concrete from damaging mechanical disturbances such as heavy shock, load stresses, and excessive vibration.
   2. Protect finished concrete surfaces from damage from construction equipment, materials, and methods, by application of curing procedures, and by rain and running water.
   3. Do not load self-supporting structures in such away as to overstress the concrete.

END OF SECTION 03 34 50

SECTION 07 21 00

BUILDING INSULATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work included: Provide building insulation where shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Related work:

1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.2 QUALITY ASSURANCE

A. 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.

B. Upon completion of this portion of the Work, complete and post a certificate of insulation compliance in accordance with pertinent requirements of governmental agencies having jurisdiction.

1.3 PRODUCT HANDLING

A. Comply with pertinent provisions of Section 01640.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide the following building insulation where shown on the Drawings or otherwise needed to achieve the degree of insulation required under pertinent regulations of governmental agencies having jurisdiction.

1. 3 ½” thick vinyl faced glass fiber batts with an insulation value of R-11 to be used over roof purlins & wall girts. Appropriate tape shall be used in conjunction with this system at all locations.

2.2 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, selected by Contractor subject to Architect's approval

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

B. Remove, or protect against, projections in construction framing which may damage or prevent proper insulation.

3.2 INSTALLATION

A. Install the work of this Section in strict accordance with the original design, requirements of governmental agencies having jurisdiction, and the manufacturer's recommended installation procedures as approved by the Architect, anchoring all components firmly into position.

END OF SECTION

SECTION 07 90 05

JOINT SEALERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sealants and joint backing including, but not limited to:
   1. Masonry control joints.
   2. Sealing at open penetrations.
   3. Bedding for thresholds and stud tracks in exterior walls.
   4. Construction and expansion joints.
   5. Sidewalk/Foundation wall joints, curb/sidewalk joints and open joints between sidewalk sections.
   6. Precast concrete joints.
   7. Sealing of sawcut joints in special finish concrete slabs (See Section 03300).
B. Acoustical sealant.
C. Pre-compressed foam sealers.

1.02 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping: Firestopping sealants.
B. Section 08 80 00 - Glazing: Glazing sealants and accessories.

1.03 REFERENCE STANDARDS

A. ASTM C 834 - Standard Specification for Latex Sealants; 2005.
B. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications; 2008.
C. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2005.
D. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2009.
E. ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell); 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with other sections referencing this section.

1.05 SUBMITTALS

A. See Section 01 33 00 - Submittals, for submittal procedures.
B. Product Data: Provide data indicating sealant chemical characteristics.
C. Samples: Submit two samples, 1/2 inch x 6 inches in size illustrating sealant colors for selection.
E. Manufacturer's Installation Instructions: Indicate special procedures.
F. Submit schedule or matrix listing locations of use and dissimilar materials sealed for each product.

1.06 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.
B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
C. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.
D. Sealant not fully adhered to joint surfaces and not neat and workmanlike in appearance will be

rejected. Rejected work shall be removed and joints thoroughly cleaned prior to installing new sealant.

1.07 MOCK-UP

A. Provide mock-up of sealant joints in conjunction with window under provisions of Section 01 45 00.
B. Per Section 01 45 00, an entire mockup wall assembly including masonry, window, flashings, copings, metal wall panels, insulation, glazing, sealants, etc. will be required for review by Architect before proceeding with Work.
C. Construct mock-up with specified sealant types and with other components noted.
D. Locate where directed.
E. Install 5 lineal feet of each type of exposed to view sealant for acceptance of color and workmanship by Architect. Installation may become part of final work if accepted. Performing work without Architect's acceptance will be subject to rejection and removal by this contractor.

1.08 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.09 WARRANTY

A. See Section 01 77 00 - Closeout Procedures, for additional warranty requirements.
B. Correct defective work within a three year period after Date of Substantial Completion.
C. Warranty: Include written coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silicone Sealants:
    1. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com.
    2. Pecora Corporation: www.pecora.com.
B. Polyurethane Sealants:
    1. Pecora Corporation: www.pecora.com.
    2. BASF Construction Chemicals-Building Systems: www.chemrex.com.
C. Acrylic Emulsion Latex Sealants:
    1. Pecora Corporation
    2. BASF Construction Chemicals-Building Systems
D. Preformed Compressible Foam Sealers:
    1. Dow "Ethafoam".
    2. Sonneborn "Sonofoam".
    3. Denver Foam.
E. Exterior Paving Sealants
    1. Sika Flex 2CSL

2.02 SEALANTS

A. Sealants and Primers - General: Provide products having volatile organic compound (VOC) content as specified in Section 01 81 13.
B. Silicone Sealant: ASTM C 920, Grade NS, Class 25, Uses NT, A, G, M, O; single component, solvent curing, non-sagging, non-staining, fungus resistant, non-bleeding.
    1. Color: Standard colors matching finished surfaces.
    2. Movement Capability: Plus and minus 50 percent.

3. Service Temperature Range: -65 to 180 degrees F.
4. Shore A Hardness Range: 15 to 35.
5. Use for:
    a. Control, expansion and soft joints in masonry, exterior and interior.
    b. Joints between concrete and other materials.
    c. Joints between exterior metal frames and other materials.
    d. Joints between bottom of stud tracks in exterior walls and adjacent materials.
    e. Other exterior non-traffic joints for which no other sealant is indicated.

C. General Purpose Traffic Bearing Self-Leveling Exterior Sealant: Polyurethane; ASTM C 920, Type P, Grade NS, Class 25, Uses T, M, and A; single component, non-staining, non-bleeding.
1. Color: Standard colors matching finished surfaces.
2. Use for:
    a. Pedestrian and vehicular traffic bearing joints, exterior and interior.
    b. Joints between foundation walls and adjacent sidewalks.
    c. Joints between curbs and sidewalks and open joints between sidewalk sections.
    d. Other exterior traffic bearing joints for which no other sealant is indicated.

D. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, non-sagging, non-bleeding paintable.
1. Color: Standard colors matching finished surfaces.
2. Applications: Use for:
    a. Interior wall and ceiling control joints (except masonry control and expansion joints).
    b. Joints between door and window frames and wall surfaces.
    c. Other interior joints for which no other type of sealant is indicated.

E. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
1. Color: Match adjacent finished surfaces.

F. Acoustical Sealant: Butyl or acrylic sealant; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning. Comply with ASTM C834 per ASTM E90.
1. Applications: Use for concealed locations only:
    a. Sealant bead between top stud runner and structure and between bottom stud track and floor.

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.
B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.
B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.
D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C 1193. Installation not tooled correctly or overrun on other materials is cause for rejection.
C. Install sealant between all dissimilar materials, whether or not shown on Drawings.
D. Install sealant at all conduit, pipe and duct penetrations in walls, floors and ceilings to comply with requirements of Building Code and Health Department. Coordinate work with Section 07 8400, Firestopping.
E. Perform acoustical sealant application work in accordance with ASTM C 919.
F. Apply sealant prior to masonry having sealer applied.
G. Apply sealant to gypsum board only after gypsum board has been primed.
H. Install bottoms of stud tracks at exterior walls in bed of sealant.
I. Install sealant in joints between sidewalks and foundation walls, joints between curbs and sidewalks and open joints between sidewalk sections.
J. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
K. Install bond breaker where joint backing is not used.
L. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
M. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
N. Tool joints concave.
O. Pre-compressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
P. Compression Gaskets: Avoid joints except at ends, corners, and intersections; seal all joints with adhesive; install with face 1/8 to 1/4 inch below adjoining surface.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

END OF SECTION 07 90 05

SECTION 09 90 00

PAINTS AND COATINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.
B. Field application of paints, stains, varnishes, and other coatings.
C. Surfaces to be finished are indicated in this section and on the Drawings.

1.02 RELATED SECTIONS

A. Section 32 17 23.13 - Painted Pavement Markings: Pavement markings.
B. Section 05 50 00 - Metal Fabrications: Shop-primed items.
C. Section 05 51 00 - Metal Stairs: Shop-primed items.

1.03 REFERENCES

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
B. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; current edition, www.paintinfo.com.
C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Master Painters and Decorators Association; 2004.

1.04 SUBMITTALS

A. See Section 01 33 00 - Submittals, for submittal procedures.
B. Product Data: Provide complete list of all products to be used, with the following information for each:
    1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
    2. Cross-reference to specified paint system(s) product is to be used in; include description of each system (copy of relevant MPI Manual page is acceptable).
    3. Manufacturer's installation instructions.
C. Certification by manufacturer that products comply with Contract Documents and are compatible with applicable substrates and with each other.
D. Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
E. Samples: Submit two paper "drop" samples, 8-1/2 by 11 inches in size, illustrating range of colors, stains and textures available for each finishing product specified. Refer to Sections 06 20 00, 06 41 00 and 08 21 00 for wood species to submit. Remake samples until acceptable to Architect.
    1. Submit samples in semi-gloss sheen only, unless scheduled otherwise.
    2. Allow 30 days for approval process, after receipt of complete samples by Architect.
    3. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry, have been approved.
F. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
G. Color Schedule: Architect will provide color documentation to the Contractor listing paint colors selected. If materials of other manufacturers are accepted by Architect, colors must match those of paint colors selected.
H. Accent colors or deep tone colors (contrasting bright colors) shall be applied where indicated on forthcoming Color Documentation, approximately 20 different colors, not including base wall

color. These accents constitute up to 20 percent of all areas to be painted. Where bright colors are selected, apply extra coats of paint where required to obtain a completely opaque surface. Additional labor or materials to achieve this level of finish will not be accepted as "extra cost".

I. At Final Completion, submit list, by room number, of paint color and manufacturer for inclusion in Operations and Maintenance Manuals.

1.05 QUALITY ASSURANCE

A. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years of experience.
B. Material Safety Data Sheets: At project site maintain file of MSDS sheets for each product used; become familiar with and follow manufacturer's stated application and safety requirements.
C. Workmanship shall be first class throughout or work will be subject to rejection and refinishing at no additional cost to Owner.

1.06 MOCK-UP

A. See Section 01 45 00 - Quality Requirements, for general requirements for mock-up.
B. Samples shall serve as a standard for similar work throughout the project. Paint mason's block sample wall at time of its construction to establish acceptance quality of filling and finish coats.
C. Provide door and frame assembly illustrating coating color, texture, and finish.
D. Mock-up may remain as part of the Work.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
C. If woodwork, metal or any other surface to be finished cannot be put in proper condition for finishing by customary cleaning, sanding and puttying operations, notify General Contractor and Architect in writing or assume responsibility for any unsatisfactory resulting finish.
D. Do not apply paint, stains or finishes in areas where dust is being generated or where rubbish has accumulated or is being removed.
E. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
F. Minimum Application Temperatures for Latex Paints: 50 degrees F for exterior and interior; unless required otherwise by manufacturer's instructions.

G. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
H. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.09 EXTRA MATERIALS

A. See Section 01 60 00 - Product Requirements, for additional provisions.
B. Supply 2 gallons, full and unopened, of each color; store where directed.
C. Label each container with color number of formula in addition to the manufacturer's label.
D. Epoxy and high performance coatings are not included.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
B. Provide all paint and coating products from the same manufacturer.
C. Paints, Transparent Finishes and Stains: Manufacturers are limited to the following:
    1. Sherwin Williams: www.sherwin-williams.com. “Harmony”
    2. KWAL - "EnvirKote" Zero VOC

2.02 MATERIALS - GENERAL

A. Volatile Organic Compound (VOC) Content:
    1. Provide coatings that comply with the most stringent requirements specified in the following:
        a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
        b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
            1) Opaque, Flat: 50 g/L, maximum.
            2) Opaque, Nonflat: 150 g/L, maximum.
            3) Opaque, High Gloss: 250 g/L, maximum.
            4) Varnishes: 350 g/L, maximum.
    2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
B. Chemical Content: The following compounds are prohibited:
    1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
    2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate., dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, asbestos, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.

C. Paints and Coatings: Provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI Categories, except as otherwise indicated.
    1. Provide ready mixed paints and coatings, except field-catalyzed coatings.
    2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
E. Patching Material: Latex filler.
F. Fastener Head Cover Material: Latex filler.
G. All adhesives, sealants, paints and coatings used on the interior of the building (defined as

inside the weatherproofing system and applied on-site) shall comply with the requirements in Section 01 81 13 - Sustainable Design Requirements.

2.03 PAINT SYSTEMS

A. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
B. Where a specified paint system does not have a Premium Grade, provide Custom Grade system.
C. Extend colors to surface edges; colors may change at any edge as directed by Architect.

PART 3 - INSTALLATION

3.01 SCOPE -- SURFACES TO BE FINISHED

A. Paint all exposed surfaces except where indicated not to be painted or to remain natural; the term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.
B. Paint the surfaces described in PART 2, indicated on the Drawings, and as follows:
    1. If a surface, material, or item is not specifically mentioned, paint in the same manner as similar surfaces, materials, or items, regardless of whether colors are indicated or not.
    2. Paint surfaces behind movable equipment and furnishings the same as similar exposed surfaces.
    3. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of the permanent item.
    4. Paint back sides of access panels and removable and hinged covers to match exposed surfaces.
    5. Finish top, bottom, and side edges of exterior doors the same as exposed faces.
    6. Paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment occurring in finished areas to match background surfaces, unless otherwise indicated.
    7. Paint equipment, piping, conduit, and exposed duct work in utility areas in colors according to the color coding scheme indicated.
        a. Refer to Division 22 and Division 26 for schedule of color coding of equipment, duct work, piping, and conduit.
    8. Paint all mechanical and electrical equipment, except that which is factory finished or aluminum, exposed to weather or to view on the roof and outdoors.
    9. Paint shop-primed mechanical and electrical items occurring in finished areas.
    10. Remove louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately. These items shall be spray painted in colors as directed by Architect (generally to match adjacent finished materials), and returned for installation. Touch up screws and scuffed spots, or repaint to achieve uniform finish.
    11. Paint interior surfaces of air ducts and convector and baseboard heating cabinets with flat, nonspecular black paint where visible through registers, grilles, or louvers.
    12. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
    13. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
C. Do Not Paint or Finish the Following Items:
    1. Items fully factory-finished unless specifically noted; factory-primed items are not considered factory-finished.
2. Items indicated to receive other finish.
3. Items indicated to remain naturally finished.

4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
5. Anodized aluminum.
6. Polished and brushed stainless steel items.
7. Brick, precast concrete, integrally colored plaster.
8. Concrete masonry in utility, mechanical, and electrical spaces unless noted to be painted.
9. Polished and brushed stainless steel, anodized aluminum, bronze, terne, and lead.
10. Acoustical materials.
11. Concealed piping, ductwork, and conduit.

3.02 EXAMINATION

A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.
B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
C. Test shop-applied primer for compatibility with subsequent cover materials; report incompatible primer conditions and submit recommended changes for Architect's approval.
D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
    1. Plaster and Gypsum Board: 12 percent.
    2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
    3. Interior Wood: 12 percent, measured in accordance with ASTM D 4442.
    4. Exterior Wood: 12 percent, measured in accordance with ASTM D 4442.
    5. Concrete Floors: 8 percent.
E. Measure the ph factor of concrete, masonry, and mortar before starting any finishing process, using the method specified in MPI Architectural Painting Manual.
    1. Report results in writing to Architect before starting work.
    2. If results of test indicate need for remedial action, provide written description of remedial action. If a different primer or paint systems is required, state the total cost of the change. Do not proceed with remedial action or change without receiving written authorization from Architect.

3.03 PREPARATION

A. Prepare surfaces as specified in MPI Architectural Painting Specification Manual and as follows for the applicable surface and coating; if multiple preparation treatments are specified, use as many as necessary for best results; where the Manual references external standards for preparation (e.g. SSPC standards), prepare as specified in those standards; comply with coating manufacturer's specific preparation methods or treatments, if any.
B. Coordinate painting work with cleaning and preparation work so that dust and other contaminants do not fall on newly painted, wet surfaces.
C. Surface Appurtenances: Prior to preparing surfaces or finishing, remove electrical plates, hardware, light fixtures, light fixture trim, escutcheons, machined surfaces, fittings, and similar items already installed that are not to be painted.
    1. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before preparation and finishing.
    2. After completing painting in each space or area, reinstall items removed using workers skilled in the trades involved.
D. Surfaces: Correct defects and clean surfaces which affect work of this section.
E. Marks: Seal with shellac those which may bleed through surface finishes.
F. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
H. Insulated Coverings to be Painted: Remove dirt, grease, and oil from canvas and cotton.
I. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with

solvent. Apply coat of etching primer.

1. Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical or chemical methods as recommended as best practice by primer manufacturer.

J. Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

1. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

K. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.

L. Interior Wood Items to Receive Transparent Finish: Sand wood to obtain a uniform appearance before immediately starting work. Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

M. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

N. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.04 APPLICATION

A. Apply products in accordance with manufacturer's instructions and as specified or recommended by MPI Manual, using the preparation, products, sheens, textures, and colors as indicated.

1. Provide completed work matching approved samples for color, texture, and coverage.
2. Remove, refinish, or repaint work not complying with requirements.

B. Do not apply finishes over dirt, rust, scale, grease, moisture, scuffed surfaces, or other conditions detrimental to formation of a durable coating film; do not apply finishes to surfaces that are not dry.

C. Use applicators and methods best suited for substrate and type of material being applied and according to manufacturer's instructions.

1. Brush Application: Use brushes best suited for the type of material applied; use brush of appropriate size for the surface or item being painted; produce results free of visible brush marks.
2. Roller Application: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Application: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
4. Where application method is listed in the MPI Manual for the paint system that application method is required; otherwise any application method recommended by manufacturer for material used and objects to be painted is acceptable.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate; provide total dry film thickness of entire system as recommended by manufacturer.

1. Number of coats and film thickness required are the same regardless of application method.
2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance.
3. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.

E. Apply finish to completely cover surfaces with uniform appearance without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, flashing or other surface imperfections.
    1. Before applying finish coats, apply a prime coat of material recommended by manufacturer, unless the surface has been prime coated by others; where evidence of suction spots or unsealed areas in first coat appear, recoat primed and sealed surfaces to ensure finish coat with no burn through or other defects due to insufficient sealing.
    2. Apply first coat to surface that has been cleaned, pretreated, or otherwise prepared as soon as practical after preparation and before subsequent surface deterioration.
    3. Do not apply succeeding coats until the previous coat has cured as recommended by manufacturer.
    4. 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 will not cause the undercoat to lift or lose adhesion.
    5. If manufacturer's instructions recommend sanding to produce a smooth, even surface, sand between coats.
    6. Before applying next coat vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
F. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

3.05 WORKMANSHIP

A. Ensure complete coverage of block filler such that pores and pinholes are filled. At Toilet Rooms and Food Preparation areas apply filler coats until completely smooth and acceptable to Health Department having jurisdiction.
B. Paint entire wall where patching is to be painted and nearest horizontal break line, or ceiling, if none is existing.

3.06 CLEANING AND PROTECTION

A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.
B. At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from site.
C. Protect other work, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting as approved by Architect.
D. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Clean off paint, varnish and stains from floors, glass, walls, ceilings, doors, cabinets and hardware. Do not scratch or damage adjacent finished surfaces. Glass shall be cleaned only in a manner that does not cause scratches. Comply with procedures specified in MPI Manual.

3.07 EXTERIOR SURFACES SCHEDULE:

A. Ferrous Metals, including areas on roof not visible from ground. First coat not required on items with prime coat applied by manufacturer. Two finish coats over primer.
    1. Primer: Synthetic rust-inhibiting primer, total dry film thickness of not less than 1.4 mils.
        a. First and Second Coats: Acrylic gloss alkyd enamel, total dry film thickness of not less than 3.7 mils.
B. Zinc Coated Metals (Galvanized) including areas on roof not visible from ground. Gloss Enamel: Two finish coats over primer.
    1. Treatment as described in Part 3, Preparation, for galvanized metal.
    2. Primer: Galvanized metal primer, total dry film thickness not less than 2.5 mils.
    3. First and Second Coats: Acrylic gloss enamel, total dry film thickness not less than 2.6

mils.

C. Gypsum Board, Cement Plaster Soffits:
    1. Primer: Latex based, total dry film thickness of not less than 1.5 mils.
    2. First and Second Coats: Satin, exterior acrylic latex, total dry film thickness of not less than 2.4 mils.
D. Exterior Structural Steel (Not Galvanized):
    1. Shop Primed by 05120 Contractor, not less than 3.0 mils:
    2. Final Coat, not less than 2.0 mils:
E. Glue Lam Beams:
    1. Messmer's "UV Plus"; www.messmers.com. 1 gallon per 150 square feet - apply until completely saturated.

3.08 INTERIOR SURFACES:

A. Concrete Block - Semi Gloss Latex Enamel Finish: Two finish coats over an undercoat and a filled surface.
    1. Block Filler: High performance latex-based block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness not less than 5.0 mils. Apply in two coats to permit identification and correction of CMU surface irregularities, pinholes not filled and the like after the first coat.
    2. First and Second Coats: Interior, satin latex enamel, total dry film thickness of not less than 2.8 mils.
B. Concrete Block - Epoxy Emulsion Coating: Where indicated on Finish Schedule and/or on Drawings, provide one coat block filler and two finish coats epoxy emulsion.
    1. Block Filler: Total dry film thickness not less than 5.0 mils.
    2. First and Second Coats: Epoxy Emulsion, semi-gloss finish.
    3. All walls above 7 feet 2 inches high “rail”:
        a. Block Filler: High performance latex-based block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness not less than 5.0 mils. Apply in two coats to permit identification and correction of CMU surface irregularities, pinholes not filled and the like after the first coat.
        b. First and Second Coats: Interior flat latex enamel, Pure Brilliant White, 92% Directional Reflectance per ASTM E97, total dry film thickness not less than 3.2 mils.
C. Gypsum Board: Spot prime taped and spackled areas with primer before texturing.
    1. Primer: White, interior, latex-based primer, total dry film thickness not less than 1.2 mils.
    2. First and Second Coats: Interior semi-gloss latex enamel, total dry film thickness not less than 2.8 mils.
D. Gypsum Board - Epoxy Emulsion Coating: Where indicated on Finish Schedule and /or on Drawings, provide one coat primer as recommended by coating manufacturer and two finish coats epoxy emulsion.
    1. Bond Coat: Primer White, Interior Latex Based Primer.
    2. First and Second Coats: Epoxy Emulsion, semi-gloss finish.
    3. All walls above 7 feet 2 inches high “rail”:
        a. Primer: White, interior, latex-based primer, total dry film thickness not less than 1.2 mils.
        b. First and Second Coats: Interior flat latex enamel, Pure Brilliant White, 92% Directional Reflectance per ASTM E97, total dry film thickness not less than 3.2 mils.
E. Zinc Coated Metal (Galvanized): Acrylic Semi-Gloss Finish: Two finish coats over a primer.
    1. Primer: Galvanized metal primer, total dry film thickness of not less than 1.2 mils.
    2. Finish Coats: Exterior, semi-gloss, acrylic enamel, total dry film thickness of not less than 1.2 mils each.
F. Ferrous Metal: Full Gloss Enamel Finish: Two coats over a primer.
    1. Primer: Synthetic, quick-drying, rust-inhibiting primer, total dry film thickness of not less

than 1.5 mils.
2. Finish Coat: Exterior, gloss, acrylic enamel, total dry film thickness of not less than 1.2 mils.

G. Interior Wood (Transparent Finish):
1. Oil Based Stain to achieve color:
2. Sealer:
3. Two Finish Coats:
4. Sand between each coat.

H. Exposed Metal Decking and Framing (Dry Fall):
1. First and Second Coats: Flat, alkyd enamel, total dry film thickness of not less than 2.8 mils.

I. Surfaces to Receive Wallcovering:
1. Primer: Alkyd, total dry film thickness of not less than 1.4 mils.

J. Colors: Architect will provide color documentation to the contractor listing paint colors selected, including accent or deep tone colors. Allow approximately 10 colors, not including base wall color. Accents may constitute up to 20% of all areas painted. Where bright colors are selected, apply extra coats of paint where required to obtain a completely opaque surface. Additional labor or materials to achieve this level of finish will not be accepted as "extra Cost".

END OF SECTION 09 90 00

SECTION 13 34 19

METAL BUILDING 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. Section Includes:

1. Structural-steel framing.
2. Metal roof panels.
3. Metal wall panels.
4. Accessories.

1.3 DEFINITIONS

A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

1. Structural-steel-framing system.
2. Metal roof panels.
3. Metal wall panels.
4. Flashing and trim.
5. Accessories.

B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other work.

1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.

a. Show provisions for attaching equipment and pipe racks.

3. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.

   a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
   b. Show wall-mounted items including doors, windows, louvers, and lighting fixtures.

4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches

   a. Flashing and trim.
   b. Gutters.
   c. Downspouts.

C. Samples for Initial Selection: For units with factory-applied color finish.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Metal Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.
2. Flashing and Trim: Nominal 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: Nominal 12 inch long Samples for each type of accessory.

E. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified manufacturer.

B. Welding certificates.

C. Metal Building System Certificates: For each type of metal building system, from manufacturer.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

   a. Name and location of Project.
   b. Order number.
   c. Name of manufacturer.
   d. Name of Contractor.
   e. Building dimensions including width, length, height, and roof slope.
   f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
   g. Governing building code and year of edition.

h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.

D. Manufacturer Certificates: For each product, from manufacturer.

E. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Land Surveyor Qualifications: A professional land surveyor who practices in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.

C. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

E. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.

F. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

G. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to metal building systems including, but not limited to, the following:

a. Condition of foundations and other preparatory work performed by other trades.
b. Structural load limitations.

c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
d. Required tests, inspections, and certifications.
e. Unfavorable weather and forecasted weather conditions.

2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:

a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
b. Structural limitations of purlins and rafters during and after roofing.
c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
d. Temporary protection requirements for metal roof panel assembly during and after installation.
e. Roof observation and repair after metal roof panel installation.

3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:

a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
b. Structural limitations of girts and columns during and after wall panel installation.
c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
d. Temporary protection requirements for metal wall panel assembly during and after installation.
e. Wall observation and repair after metal wall panel installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements:

1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt

installation to ensure that actual anchorage dimensions correspond to established dimensions.

2. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.10 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

B. Coordinate installation of roof curbs, equipment supports and roof penetrations, which are specified in Division 07 Section "Roof Accessories."

C. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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. B&C Steel Buildings, Inc.
2. Behlen Mfg. Co.
3. Chief Buildings; Division of Chief Industries, Inc.

2.2 METAL BUILDING SYSTEMS

A. Description: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of

withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

1. Provide metal building system of size and with bay spacings, roof slopes, and spans indicated.

B. Primary-Frame Type:

1. Rigid Clear Span: Solid-member, structural-framing system with & without interior columns.
2. Lean to: Solid, structural-framing system without interior columns, designed to be partially supported by another structure.

C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns

D. Secondary-Frame Type: Manufacturer's standard purlins and joists and flush-framed girts.

E. Eave Height: Manufacturer's standard height, as indicated by nominal height on Drawings.

F. Bay Spacing: As determined by manufacturer & shown on drawings.

G. Roof Slope: 1 inch per 12 inches.

H. Roof System: Manufacturer's standard vertical-rib, standing-seam metal roof panels with field-installed insulation.

I. Exterior Wall System: Manufacturer's standard tapered-rib, exposed-fastener metal wall panels with field-installed insulation.

2.3 METAL BUILDING SYSTEM PERFORMANCE

A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings.
2. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:

    a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
    b. Girts: Horizontal deflection of 1/240 of the span.
    c. Metal Roof Panels: Vertical deflection of 1/240 of the span.
    d. Metal Wall Panels: Horizontal deflection of 1/240 of the span.
    e. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.

3. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:

a. Lateral Drift: Maximum of 1/300 of the building height.

4. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.

C. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

D. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at negative test-pressure difference of **1.57 lbf/sq. ft.**

E. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than 0.06 cfm/sq. ft. of wall area when tested according to ASTM E 283 at static-air-pressure difference of **1.57 lbf/sq. ft.**

F. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 2.86 lbf/sq. ft.

G. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a wind-load design pressure of not less than 2.86 lbf/sq. ft.

H. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 30 Class 60 Class 90.

I. Energy Performance: Provide roof panels that are listed on the DOE's ENERGY STAR Roof Products Qualified Product List for low-slope roof products.

2.4 STRUCTURAL-STEEL FRAMING

A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.

2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
3. Frame Configuration: Single gable Lean to, with high side connected to and supported by another structure.
4. Exterior Column Type: Straight/Tapered as shown on plans.
5. Rafter Type: Tapered.

B. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other

miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, pre-painted with coil coating, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2 ½ inch wide flanges.

    a. Depth: As needed to comply with system performance requirements.

2. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2 ½ inch wide flanges.

    a. Depth: As required to comply with system performance requirements.

3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
4. Flange Bracing: Minimum 2 by 2 by 1/8 inch structural-steel angles or 1 inch diameter, cold-formed structural tubing to stiffen primary-frame flanges.
5. Sag Bracing: Minimum 1 by 1 by 1/8 inch structural-steel angles.
6. Base or Sill Angles: Minimum 3 by 2 inch Standard primed steel sheet.
7. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
8. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from structural-steel sheet.
9. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

C. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.

    1. Type: Straight-beam, eave type.

D. Bracing: Provide adjustable wind bracing as follows:

    1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50; minimum ½ inch diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
    2. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
    3. Bracing: Provide wind bracing using any method specified above, at manufacturer's option.

E. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide zinc-plated [**or**] hot-dip galvanized bolts for structural-framing components that are galvanized.

F. Materials:

1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70.
7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80; with G60 coating designation; mill phosphatized.
8. Metallic-Coated Steel Sheet Pre painted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and pre painted by the coil-coating process to comply with ASTM A 755/A 755M.

    a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80; with G90 coating designation.
    b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade 50 or 80; with Class AZ50 coating.

9. Joist Girders: Manufactured according to "Standard Specifications for Joist Girders," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated and required for primary framing.
10. Steel Joists: Manufactured according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated and required for secondary framing.
11. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.

    a. Finish: Plain.

12. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

    a. Finish: Plain.

13. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers, plain.
14. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex-head steel structural bolts with spline ends.

    a. Finish: Plain.

15. Unheaded Anchor Rods: ASTM F 1554, Grade 36.

    a. Configuration: Straight.

b. Nuts: ASTM A 563 heavy-hex carbon steel.
c. Plate Washers: ASTM A 36/A 36M carbon steel.
d. Washers: ASTM F 436 hardened carbon steel.
e. Finish: Plain.

16. Headed Anchor Rods: ASTM F 1554, Grade 36.

a. Configuration: Straight.
b. Nuts: ASTM A 563 heavy-hex carbon steel.
c. Plate Washers: ASTM A 36/A 36M carbon steel.
d. Washers: ASTM F 436 hardened carbon steel.
e. Finish: Plain.

17. Threaded Rods: ASTM A 193/A 193M.

a. Nuts: ASTM A 563 heavy-hex carbon steel.
b. Washers: ASTM F 436 hardened carbon steel.
c. Finish: Plain.

G. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.

1. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.

a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

2. Prime galvanized members with specified primer after phosphoric acid pretreatment.
3. Primer: SSPC-Paint 15, Type I, red oxide.

2.5 METAL ROOF PANELS

A. Standard tapered-rib, exposed-fastener metal Roof Panels: 36 inch wide net coverage, with 1-3/16 inch high major ribs at 12 inches on center with 2 minor ribs spaced between the major ribs.

1. Material: Zinc-coated (galvanized) steel sheet, 26 ga nominal thickness.

a. Exterior Finish: Fluoropolymer.
b. Color: As selected by Architect from manufacturer's full range.

2. Clips: Manufacturer's standard, floating type to accommodate thermal movement; fabricated from **zinc-coated (galvanized) steel**.
3. Joint Type: Tapered-rib.
4. Panel Coverage: 36 inches.
5. Panel Height: 1-3/16 inches.
6. Uplift Rating: UL 120.

B. Materials:

1. Metallic-Coated Steel Sheet: Restricted-flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.

b. Surface: Smooth, flat finish.

C. Finishes:

1. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.6 METAL WALL PANELS

A. Standard tapered-rib, Exposed-Fastener Metal Wall Panels: Formed with recessed, trapezoidal major valleys and intermediate stiffening valleys symmetrically spaced between major valleys; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners inside laps.

1. Material: Zinc-coated (galvanized) steel sheet, 26 ga nominal thickness.

a. Exterior Finish: Siliconized Polyester.
b. Color: As selected by Architect from manufacturer's full range.

2. Major-Rib Spacing: 12 inches o.c.
3. Panel Coverage: 36 inches.
4. Panel Height: 1.5 inches.

B. Materials:

1. Metallic-Coated Steel Sheet: Restricted-flatness steel sheet, metallic coated by the hot-dip process and pre-painted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
b. Surface: Smooth, flat finish.

C. Finishes:

1. Exposed Coil-Coated Finish:

a. Siliconized Polyester

2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.7 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch thick, flexible closure strips; cut or pre-molded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1 inch standoff; fabricated from extruded polystyrene.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1 inch thick, flexible closure strips; cut or pre-molded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

D. Flashing and Trim: Formed from 26 ga. nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating; finished to match adjacent metal panels.

1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
2. Opening Trim: Formed from 26 ga. nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

E. Gutters: Formed from 26 ga. nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

F. Downspouts: Formed from 26 ga. nominal-thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre-painted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot long sections, complete with elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Pipe Flashing: Pre-molded, EPDM pipe collar with flexible aluminum ring bonded to base.

H. Materials:

1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.

    a. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
    b. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with EPDM sealing washers bearing on weather side of metal panels.

    c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.

2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
3. Metal Panel Sealants:

    a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, non-sag, nontoxic, non-staining tape of manufacturer's standard size.
    b. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.10 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.

1. Engage land surveyor to perform surveying.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.

    a. Joint Type: Snug tightened or pretensioned.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.

3. Locate canopy framing as indicated.
4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.

1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.

B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

C. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

E. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.

3.5 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

1. Install ridge caps as metal roof panel work proceeds.
2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.

1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
4. At metal panel splices, nest panels with minimum 6 inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

C. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels 4 inches minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.
7. Install screw fasteners in predrilled holes.
8. Install flashing and trim as metal wall panel work proceeds.

9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, non-accumulative, on level, plumb, and on location lines as indicated, and within 1/8 inch offset of adjoining faces and of alignment of matching profiles.

3.7 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1 ½ inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.

2. Tie downspouts to underground drainage system indicated.

E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.8 CLEANING AND PROTECTION

A. Touchup Painting: After erection, promptly clean, prepare, and prime or re-prime field connections, rust spots, and abraded surfaces of prime-painted structural framing and accessories.

1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

B. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

C. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 13 34 19

SECTION 31 10 00

SITE CLEARING

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. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Temporary erosion- and sedimentation-control measures.

B. Related Sections:

1. Division 01 Section "Temporary Facilities and Controls" for temporary utility services, construction and support facilities, security and protection facilities, and temporary erosion- and sedimentation-control measures.
2. Division 01 Section "Execution" for field engineering and surveying.
3. Division 31 Section "Structure Demolition" for demolition of buildings, structures, and site improvements.
4. Division 31 Section "Selective Structure Demolition" for partial demolition of buildings or structures.

1.3 DEFINITIONS

A. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow.

D. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil and is the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably

free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other nonsoil materials.

E. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction, and indicated on Drawings.

F. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

G. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or videotape.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated. Retain one option in first paragraph below. First option is a generic term that is known in various states by different names listed in the other options.

D. Utility Locator Service: Notify Diggers Hotline for area where Project is located before site clearing.

E. Do not commence site-clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

I. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 31 Section "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

B. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #79, Alkyd Anticorrosive Metal Primer or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich. VOC limit in subparagraph below is the EPA limit for rust-preventive architectural coatings; revise to suit Project.

1. Use coating with a VOC content of (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag, Wrap a 1-inch blue vinyl tie tape flag around each tree trunk at 54 inches above the ground.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. General: Protect trees and plants remaining on-site according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Architect.

3.4 EXISTING UTILITIES

A. Owner will arrange for disconnecting and sealing indicated utilities that serve existing structures before site clearing, when requested by Contractor.

1. Verify that utilities have been disconnected and capped before proceeding with site clearing.

B. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.
2. Owner will arrange to shut off indicated utilities when requested by Contractor.

C. Locate, identify, and disconnect utilities indicated to be abandoned in place.

D. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's written permission.

E. Excavate for and remove underground utilities indicated to be removed.

F. Removal of underground utilities is included in Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 33 Sections.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
3. Use only hand methods for grubbing within protection zones.
4. Chip removed tree branches and stockpile in areas approved by Architect. Dispose of off-site in accordance with local specifications.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth indicated on Drawings to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects more than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles to 72 inches.
2. Do not stockpile topsoil within protection zones.
3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
4. Stockpile surplus topsoil to allow for re-spreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 31 20 00

EARTH MOVING

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. Preparing subgrades for slabs-on-grade walks pavements turf and grasses and plants.
2. Excavating and backfilling for buildings and structures.
3. Drainage course for concrete slabs-on-grade.
4. Sub base course for concrete walks pavements.
5. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Sections:

1. Division 01 Section "Construction Progress Documentation Photographic Documentation" for recording pre-excavation and earth moving progress.
2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
4. Division 14 Section "Hydraulic Elevators" "Hydraulic Freight Elevators" for excavating well hole to accommodate elevator-cylinder assembly.
5. Divisions 21, 22, 23, 26, 27, 28, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
6. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
7. Division 31 Section "Dewatering" for lowering and disposing of ground water during construction.
8. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
9. Division 31 Section "Drilled Concrete Piers and Shafts" for excavation of shafts and disposal of surplus excavated material.

10. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
11. Division 32 Section "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.
12. Division 33 Section "Subdrainage" for drainage of foundations slabs-on-grade walls and landscaped areas.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Sub base Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub base, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Warning Tape: 12 inches (300 mm) long; of each color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to ASTM D 698 ASTM D 1557.

C. Seismic survey report from seismic survey agency.

D. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

A. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.

2. Seismographic monitoring during blasting operations.

B. Pre-excavation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify utility locator service "Miss Utility" "Call Before You Dig" "Dig Safe System" "One Call" "Diggers Hotline" for area where Project is located before beginning earth moving operations.

D. Do not commence earth moving operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Section "Temporary Facilities and Controls," Division 31 Section "Site Clearing," are in place.

E. Do not commence earth moving operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than 3 inches (76 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: +2% Above or Below Optimum Moisture Content

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Sub base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C 33; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include

rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

    a. 24 inches (600 mm) outside of concrete forms other than at footings.

    b. 12 inches (300 mm) outside of concrete forms at footings.

    c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.

    d. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.

    e. 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Pile Foundations: Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
3. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches (300 mm) each side of pipe or conduit As indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
4. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Division 01 Section "Temporary Tree and Plant Protection."

3.7 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.

4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Backfill voids with satisfactory soil while removing shoring and bracing.

D. Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

E. Place and compact final backfill of satisfactory soil to final subgrade elevation.

3.12 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.

5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 ASTM D 1557:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 100 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 100 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 90 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 90 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 1/2 inch (38 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1 inch (25 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.16 SUBSURFACE DRAINAGE

A. Subdrainage Pipe: Specified in Division 33 Section "Subdrainage."

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D 698 with a minimum of two passes of a plate-type vibratory compactor.

2. Place and compact impervious fill over drainage backfill in 6-inch- (150-mm-) thick compacted layers to final subgrade.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place sub base course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place sub base course and base course under pavements and walks as follows:

1. Shape sub base course and base course to required crown elevations and cross-slope grades.
2. Place sub base course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place sub base course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact sub base course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 100 percent of maximum dry unit weight according to ASTM D 698 ASTM D 1557.

C. Pavement Shoulders: Place shoulders along edges of sub base course and base course to prevent lateral movement. Construct shoulders, at least 12 inches (300 mm) wide, of satisfactory soil materials and compact simultaneously with each sub base and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D 698 ASTM D 1557.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.

2. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.

3. Compact each layer of drainage course to required cross sections and thicknesses to not less than 100 percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab, but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length, but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

SECTION 32 13 13

CONCRETE PAVING

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. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

B. Related Sections:

1. Division 03 Section “Cast-in-Place Concrete” for general building applications of concrete.
2. Division 32 Section "Decorative Concrete Paving" for stamped concrete other than detectable warnings.
3. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

D. Samples for Verification: For each type of product or exposed finish, prepared as Samples of size indicated below:

1. Wheel Stops: 6 inches showing cross section; with fasteners.

E. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

F. Qualification Data: For qualified installer of detectable warnings, ready-mix concrete manufacturer and testing agency.

G. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

H. Material Test Reports: For each of the following:

1. Aggregates. Include service-record data indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.

I. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Concrete Testing Service: Engage a qualified testing agency to perform material evaluation tests and to design concrete mixtures.

E. ACI Publications: Comply with ACI 301 unless otherwise indicated.

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches by 96 inches
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Pre-installation Conference: Conduct conference at time and location established during preconstruction conference.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:

    a. Concrete mixture design.
    b. Quality control of concrete materials and concrete paving construction practices.
    c. Paving schedule by contractor
    d. Traffic control
    e. Maintaining access to facility

2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

    a. Contractor's superintendent.
    b. Independent testing agency responsible for concrete design mixtures.
    c. Ready-mix concrete manufacturer.
    d. Concrete paving subcontractor.
    e. Manufacturer's representative of stamped concrete paving system used for detectable warnings.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials and 55 deg F for water-based materials and not exceeding 95 deg F

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from steel wire into flat sheets.

B. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

C. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A, plain steel.

D. Reinforcing Bars: ASTM A 615/A 615M, Grade 60; deformed.

E. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A 615/A 615M, Grade 60 deformed bars.

F. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M or ASTM A 934/A 934M; with ASTM A 615/A 615M, Grade 60 deformed bars.

G. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.

H. Plain-Steel Wire: ASTM A 82/A 82M

I. Deformed-Steel Wire: ASTM A 496/A 496M.

J. Epoxy-Coated-Steel Wire: ASTM A 884/A 884M, Class A coated.

K. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 plain-steel bars. Cut bars true to length with ends square and free of burrs.

L. Tie Bars: ASTM A 615/A 615M, Grade 60 deformed.

M. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

N. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

O. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

P. Zinc Repair Material: ASTM A 780.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C 150, gray portland cement Type I/II. Supplement with the following:

a. Fly Ash: ASTM C 618, Class F
b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, proportions per NDOR 47B mix design, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

F. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

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. ChemMasters.
b. Davis Colors.
c. Dayton Superior Corporation.
d. Elementis Pigments.
e. Hoover Color Corporation.
f. Lambert Corporation.
g. LANXESS Corporation.
h. QC Construction Products.
i. Scofield, L. M. Company.
j. Solomon Colors, Inc.
k. Stampcrete International, Ltd.
l. SureCrete Design Products.

2. Color: As selected by Architect from manufacturer's full range

2.4 **FIBER REINFORCEMENT** – Not used on this project

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

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. Axim Italcementi Group, Inc.; Caltexol CIMFILM.
b. BASF Construction Chemicals, LLC; Confilm.
c. ChemMasters; Spray-Film.
d. Conspec by Dayton Superior; Aquafilm.
e. Dayton Superior Corporation; Sure Film (J-74).
f. Edoco by Dayton Superior; BurkeFilm.
g. Euclid Chemical Company (The), an RPM company; Eucobar.
h. Kaufman Products, Inc.; VaporAid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc.; E-CON.
k. Meadows, W. R., Inc.; EVAPRE.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group; MONOFILM.
n. Sika Corporation, Inc.; SikaFilm.
o. SpecChem, LLC; Spec Film.
p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.

E. White, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B, dissipating.

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. Anti-Hydro International, Inc.; A-H Curing Compound #2 WP WB.
b. ChemMasters; Safe-Cure 2000.
c. Conspec by Dayton Superior;.
d. Dayton Superior Corporation; Day-Chem White Pigmented Cure (J-10-W).
e. Edoco by Dayton Superior; Resin Emulsion Cure V.O.C. (Type II).
f. Euclid Chemical Company (The), an RPM company; Kurez VOX White Pigmented.
g. Kaufman Products, Inc.; Thinfilm 450.
h. Lambert Corporation; AQUA KURE - WHITE.
i. L&M Construction Chemicals, Inc.; L&M CURE R-2.
j. Meadows, W. R., Inc.; 1100-WHITE SERIES.
k. SpecChem, LLC; PaveCure Rez White.
l. Symons by Dayton Superior; Resi-Chem White.
m. Vexcon Chemicals Inc.; Certi-Vex Enviocure White 100.

2.6 RELATED MATERIALS

A. Joint Fillers: ASTM D 1751, asphalt-saturated cellulosic fiber in preformed strips.

2.7 DETECTABLE WARNING MATERIALS

A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.

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. Advanced Surfaces Inc.
b. Matcrete Precision Stamped Concrete Tools.
c. Southern Color N.A., Inc.
d. Stampcrete International Ltd.
e. Superior Decorative by Dayton Superior.

2. Size of Stamp: One piece matching detectable warning area shown on Drawings.

B. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation designed to facilitate release of stamp mats.

1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Advanced Surfaces Inc.; Liquid Release.
b. Matcrete Precision Stamped Concrete Tools; Liquid Release Agent.

c. Southern Color N.A., Inc.; SCC Clear Liquid Release.
d. Stampcrete International Ltd.; Stampcrete Liquid Release.

e. Superior Decorative by Dayton Superior; Pro Liquid Release.

2.8 PAVEMENT MARKINGS

A. Pavement-Marking Paint: MPI #97 Latex Traffic Marking Paint.

1. Color: As indicated.

2.9 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to NDOR 47-B, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 3625 psi.
2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45
3. Slump Limit: 1.5 inches (plus or minus 1.5 inches.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6.25 percent plus or minus 1.25 percent for 47B aggregate concrete.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F , reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and sub base surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared sub base surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll sub base in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
3. Correct sub base with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Division 31 Section "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted sub base surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Zinc-Coated Reinforcement: Use galvanized-steel wire ties to fasten zinc-coated reinforcement. Repair cut and damaged zinc coatings with zinc repair material.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M.

G. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
4. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.

3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.

4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows**,** to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a ¼ to 3/8-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

    a. Tolerance: Ensure that grooved joints are within 3 inches either way from centers of dowels.

2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

    a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.

3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from sub base surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten sub base to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or recycled water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact sub base and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

L. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F , uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

M. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 SPECIAL FINISHES

A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in paving surface as follows:

1. Immediately after float finishing, spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

B. Seeded Exposed-Aggregate Finish: Immediately after initial floating, spread a single layer of aggregate uniformly on paving surface. Tamp aggregate into plastic concrete and float finish to entirely embed aggregate with mortar cover of 1/16 inch.

1. Spray-apply chemical surface retarder to paving according to manufacturer's written instructions.
2. Cover paving surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
3. Without dislodging aggregate, remove mortar concealing the aggregate by lightly brushing surface with a stiff, nylon-bristle broom. Do not expose more than one-third of the average diameter of the aggregate and not more than one-half of the diameter of the smallest aggregate.
4. Fine-spray surface with water and brush. Repeat cycle of water flushing and brushing until cement film is removed from aggregate surfaces to depth required.

C. Slip-Resistive Aggregate Finish: Before final floating, spread slip-resistive aggregate finish on paving surface according to manufacturer's written instructions and as follows:

1. Uniformly spread 40 lb/100 sq. ft. (19.5 kg/10 sq. m) of dampened, slip-resistive aggregate over paving surface in two applications. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
2. Uniformly distribute approximately two-thirds of slip-resistive aggregate over paving surface with mechanical spreader, allow to absorb moisture, and embed by power floating. Follow power floating with a second slip-resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
3. Cure concrete with curing compound recommended by slip-resistive aggregate manufacturer. Apply curing compound immediately after final finishing.
4. After curing, lightly work surface with a steel wire brush or abrasive stone and water to expose nonslip aggregate.

D. Rock-Salt Finish: After initial troweling, uniformly spread rock salt over paving surface at the rate of 5 lb/100 sq. ft. (0.2 kg/10 sq. m).

1. Embed rock salt into plastic concrete with roller or magnesium float.
2. Cover paving surface with 1-mil- (0.025-mm-) thick polyethylene sheet and remove sheet when concrete has hardened and seven-day curing period has elapsed.
3. After seven-day curing period, saturate concrete with water and broom-sweep surface to dissolve remaining rock salt, thereby leaving pits and holes.

E. Pigmented Mineral Dry-Shake Hardener Finish: After initial floating, apply dry-shake materials to paving surface according to manufacturer's written instructions and as follows:

1. Uniformly spread dry-shake hardener at a rate of 100 lb/100 sq. ft. (49 kg/10 sq. m), unless greater amount is recommended by manufacturer to match paving color required.
2. Uniformly distribute approximately two-thirds of dry-shake hardener over the concrete surface with mechanical spreader; allow hardener to absorb moisture and embed it by power floating. Follow power floating with a second application of pigmented mineral dry-shake hardener, uniformly distributing remainder of material at right angles to first application to ensure uniform color, and embed hardener by final power floating.
3. After final power floating, apply a hand-trowel finish followed by a broom finish.
4. Cure concrete with curing compound recommended by dry-shake hardener manufacturer. Apply curing compound immediately after final finishing.

3.9 DETECTABLE WARNINGS

A. Block-outs: Form block-outs in concrete for installation of detectable paving units specified in Division 32 Section "Unit Paving". Tolerance for Opening Size: Plus 1/4 inch, no minus

B. Stamped Detectable Warnings: Install stamped detectable warnings as part of a continuous concrete paving placement and according to stamp-mat manufacturer's written instructions.

1. Before using stamp mats, verify that the vent holes are unobstructed.
2. Apply liquid release agent to the concrete surface and the stamp mat.
   Stamping: After application and final floating of pigmented mineral dry-shake hardener, accurately align and place stamp mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the stamp-mat surface to prevent distortion in shape of omes. Press and tamp until mortar begins to come through all of the vent holes. Gently remove stamp mats.
3. Trimming: After **24** hours, cut off the tips of mortar formed by the vent holes.

4. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

3.10 CONCRETE PROTECTION AND CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Curing after finishing concrete but not before water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.11 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 1/4 inch
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/2 inch .
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch .
6. Vertical Alignment of Dowels: 1/4 inch .
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
8. Joint Spacing: 3 inches
9. Contraction Joint Depth: Plus 1/4 inch, no minus.

10. Joint Width: Plus 1/8 inch, no minus.

3.12 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement are verified.

B. Allow concrete paving to cure for a min of **28** days and dry before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce markings of dimensions indicated with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils (0.4 mm).

1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to concrete surface. Mask an extended area beyond edges of each stencil to prevent paint application beyond stencil. Apply paint so that it cannot run beneath stencil.
2. Broadcast glass beads uniformly into wet markings at a rate of 6 lb/gal. (0.72 kg/L).

3.13 FIELD QUALITY CONTROL

A. Testing Agency: **Owner to engage** a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or 5000 sq. ft. (465 sq. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

J. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

K. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

L. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 33 05 00

COMMON WORK RESULTS FOR UTILITIES

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. Piping joining materials.
2. Transition fittings.
3. Dielectric fittings.
4. Sleeves.
5. Identification devices.
6. Grout.
7. Flowable fill.
8. Piped utility demolition.
9. Piping system common requirements.
10. Equipment installation common requirements.
11. Painting.
12. Concrete bases.
13. Metal supports and anchorages.

1.3 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. ABS: Acrylonitrile-butadiene-styrene plastic.

D. CPVC: Chlorinated polyvinyl chloride plastic.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. RCP: Reinforced concrete pipe

1.4 SUBMITTALS

A. Product Data: For the following:

1. Dielectric fittings.
2. Identification devices.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Steel Piping Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:

1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Transition Couplings NPS 1-1/2 and Smaller:

1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
2. Aboveground Piping: Specified piping system fitting.

C. AWWA Transition Couplings NPS 2 and Larger:

1. 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:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Cascade Waterworks Mfg. Co.
    b. Dresser, Inc.; DMD Div.
    c. Ford Meter Box Company, Inc. (The); Pipe Products Div.
    d. JCM Industries.
    e. Smith-Blair, Inc.
    f. Viking Johnson.
    g. or equal approved by Architect or Contracting officer representatives

3. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

D. Plastic-to-Metal Transition Fittings:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Spears Manufacturing Co.
    b. or equal approved by Architect or Contracting officer representatives

3. Description: CPVC, CPVC, and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.

E. Plastic-to-Metal Transition Unions:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Colonial Engineering, Inc.
    b. NIBCO INC.
    c. Spears Manufacturing Co.
    d. or equal approved by Architect or Contracting officer representatives

3. Description: MSS SP-107, CPVC, CPVC, and PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cascade Waterworks Mfg. Co.
b. Fernco, Inc.
c. Mission Rubber Company.
d. Plastic Oddities.
e. or equal approved by Architect or Contracting officer representatives

3. Description: ASTM C 1173 with elastomeric sleeve ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Hart Industries, International, Inc.
e. Watts Water Technologies, Inc.
f. Zurn Plumbing Products Group; Wilkins Div.
g. or equal approved by Architect or Contracting officer representatives

3. Description: Factory fabricated, union, NPS 2 (DN 50) and smaller.

a. Pressure Rating: 150 psig (1035 kPa) minimum at 180 deg F (82 deg C).
b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Flanges:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Capitol Manufacturing Co.
b. Central Plastics Company.
c. Epco Sales, Inc.
d. Watts Water Technologies, Inc.
e. or equal approved by Architect or Contracting officer representatives

3. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 (DN 65 to DN 100) and larger.

    a. Pressure Rating: 175 psig (1200 kPa) minimum.
    b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Central Plastics Company.
    d. Pipeline Seal and Insulator, Inc.
    e. or equal approved by Architect or Contracting officer representatives

3. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 (DN 65) and larger.

    a. Pressure Rating: 150 psig minimum.
    b. Gasket: Neoprene or phenolic.
    c. Bolt Sleeves: Phenolic or polyethylene.
    d. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

1. 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:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Calpico, Inc.
    b. Lochinvar Corporation.
    c. or equal approved by Architect or Contracting officer representatives

3. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 (DN 80) and smaller.

    a. Pressure Rating: 300 psig at 225 deg F.
    b. End Connections: Threaded.

F. Dielectric Nipples:

1. 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:

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. Perfection Corporation.
    b. Precision Plumbing Products, Inc.
    c. Victaulic Company.
    or equal approved by Architect or Contracting officer representatives

3. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.

    a. Pressure Rating: 300 psig at 225 deg F
    b. End Connections: Threaded or grooved.

2.4 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Division 22 Section "Common Work Results for Plumbing."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.5 IDENTIFICATION DEVICES

A. General: Products specified are for applications referenced in other Division 33 Sections. If more than single type is specified for listed applications, selection is Installer's option.

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.

    1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
    2. Location: Accessible and visible.

C. Stencils: Standard stencils prepared with letter sizes complying with recommendations in ASME A13.1. Minimum letter height is 1-1/4 inches for ducts, and 3/4 inch for access door signs and similar operational instructions.

    1. Material: Fiberboard Brass.

2. Stencil Paint: Exterior, oil-based, alkyd-gloss black enamel, unless otherwise indicated. Paint may be in pressurized spray-can form.
3. Identification Paint: Exterior, oil-based, alkyd enamel in colors according to ASME A13.1, unless otherwise indicated.

D. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

E. Pressure-Sensitive Pipe Markers: Manufacturer's standard preprinted, color-coded, pressure-sensitive-vinyl type with permanent adhesive.

F. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

G. Full-band or strip-type pipe markers, at least three times either letter height and of length required for label.

H. Lettering: Manufacturer's standard preprinted captions as selected by Architect.

I. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.

1. Arrows: Either integrally with piping system service lettering to accommodate both directions of flow, or as separate unit on each pipe marker to indicate direction of flow.

J. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.

1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches 2-1/2 inches for larger pipes.
2. Color: Comply with ASME A13.1, unless otherwise indicated.

K. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-sequenced numbers. Include 5/32-inch hole for fastener.

1. Material: 0.032-inch- thick, polished brass, or aluminum.
2. Material: 0.0375-inch- thick stainless steel.
3. Material: 3/32-inch- thick plastic laminate with 2 black surfaces and a white inner layer.
4. Material: Valve manufacturer's standard solid plastic.
5. Size: 1-1/2 inches in diameter, unless otherwise indicated.
6. Shape: As indicated for each piping system.

L. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

M. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.

1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
2. Thickness: [1/16 inch] [1/8 inch], unless otherwise indicated.

3. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
4. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.

N. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:

1. Green: Cooling equipment and components.
2. Yellow: Heating equipment and components.
3. Brown: Energy reclamation equipment and components.
4. Blue: Equipment and components that do not meet criteria above.
5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
6. Terminology: Match schedules as closely as possible. Include the following:

    a. Name and plan number.
    b. Equipment service.
    c. Design capacity.
    d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.

7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

O. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.

1. Size: 3-1/4 by 5-5/8 inches.
2. Fasteners: Brass grommets and wire.
3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

P. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.

1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.7 FLOWABLE FILL

A. Description: Low-strength-concrete, flowable-slurry mix.

1. Cement: ASTM C 150, Type I, portland.
2. Density: **115- to 145-lb/cu. ft.**
3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
4. Aggregates: ASTM C 33, natural sand, fine.
5. Admixture: ASTM C 618, fly-ash mineral.
6. Water: Comply with ASTM C 94/C 94M.
7. Strength: **100 to 200 psig** at 28 days.

PART 3 - EXECUTION

3.1 PIPED UTILITY DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove piped utility systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping. Fill abandoned piping with flowable fill, and cap or plug piping with same or compatible piping material.
3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make operational.
5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 DIELECTRIC FITTING APPLICATIONS

A. Dry Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 and Smaller: Dielectric unions.

2. NPS 2-1/2 to NPS 12: Dielectric flanges or dielectric flange kits.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:

1. NPS 2 and Smaller: Dielectric couplings, couplings, or dielectric nipples [nipples].

2. NPS 2-1/2 to NPS 4: Dielectric nipples.

3. NPS 2-1/2 to NPS 8: Dielectric nipples or dielectric flange kits.

4. NPS 10 and NPS 12: Dielectric flange kits.

3.3 PIPING INSTALLATION

A. Install piping according to the following requirements and Division 33 Sections specifying piping systems.

B. 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 the Coordination Drawings.

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 to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Sleeves are not required for core-drilled holes.

J. Permanent sleeves are not required for holes formed by removable PE sleeves.

K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas [2 inches above finished floor level.

2. Install sleeves in new walls and slabs as new walls and slabs are constructed.

    a. [PVC] [Steel] Pipe Sleeves: For pipes smaller than NPS 6.
    b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.4 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. 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 unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented 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. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
4. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
5. PVC Nonpressure Piping: Join according to ASTM D 2855.
6. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.5 PIPING CONNECTIONS

A. 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. Install dielectric fittings at connections of dissimilar metal pipes.

3.6 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.7 PAINTING

A. Painting of piped utility systems, equipment, and components is specified in Division 09 painting Sections.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: According to ASME A13.1.

2. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
3. Locate pipe markers on exposed piping according to the following:

    a. Near each valve and control device.
    b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
    c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
    d. At manholes and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.

1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.9 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use [3000-psi], 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete

3.10 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.11 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 33 05 00

SECTION 33 10 00

POTABLE WATER UTILITIES

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. THIS WORK shall consist of constructing the potable water line of the type and dimensions shown on the plans, laid in trenches and backfilled in conformity with the lines and grades established by the Engineer. Contractor shall verify existing pipe size, type of material, and location (vertical and horizontal) prior to construction.
2. Excavating and backfilling for lines.
3. Construction and materials shall conform with the standards of the Colorado Department of Public Health and Environment, Colorado Department of Health and Human Services, the United States Environmental Protection Agency and other local standards.

1.3 Related Sections:

1. Division 01 Section “Photographic Documentation" for recording preexcavation and earth moving progress.
2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
4. Divisions 21, 22, 23, 26, 27, 28, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
5. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
6. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
7. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
8. Division 32 Section "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the sub base course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Pipe
2. Pipe fittings
3. Valves & Boxes
4. Dresser Couplings

5. Service Goods
6. Steel casing

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify "Diggers Hotline" for area where Project is located before beginning earth moving operations.

D. Do not commence pipe construction operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Section "Temporary Facilities and Controls," and Division 31 Section "Site Clearing," are in place.

E. Do not commence pipe construction operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 GENERAL

A. ALL MATERIALS AND EQUIPMENT TO BE USED shall be approved by the Engineer before being installed. All materials, unless otherwise stipulated, are to be new and of the best grade

of their respective kinds for the purpose designated. The Contractor shall furnish to the Engineer the name of the manufacturer of the materials, and other equipment which he is contemplating to install, together with their performance capabilities and other pertinent information.

B. WATER PIPE:

1. DUCTILE IRON PIPE SHALL BE Class 50 and shall conform to AWWA C 151, AWWA C 111, and AWWA C 104. Pipe shall have a 1-mil bituminous coating and shall be cement mortar lined with 1/16 inch mortar. Pipe shall be Griffin , Tyler, or equal.
2. EXPOSED PIPE SHALL BE FLANGED –Class 53 Ductile Iron Pipe and shall conform to AWWA C 151, AWWA C 115, and AWWA C 104. Pipe shall have a 1-mil bituminous coating and shall be cement mortar lined with 1/16 inch mortar.
3. POLYVINYL CHLORIDE (PVC) PRESSURE PIPE FOR WATER MAIN. PIPE SHALL MEET the requirements of AWWA C 900 for PVC 1120 Class 150 pipe, and shall be DR 18 with cast iron equivalent outside diameter. ALL PIPE SHALL BE SUITABLE for pressure conduit. Provisions shall be made for expansion and contraction at each joint with an elastomeric ring. The bell shall consist of an integral wall section with a locked-in, solid cross section elastomeric ring which meets the requirements of ASTM F-477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C 900. The bell shall be extruded in one continuous process with the barrel.

C. FITTINGS

1. FITTINGS shall be cast from gray iron or ductile iron and shall be mechanical joint-type conforming to the latest revision of ANSI A 21.10 (AWWA C 110, C 153) and ANSI A 21.11 (AWWA C 111). Fittings shall be capable of withstanding, without bursting, hydrostatic tests of 3 times the rated working pressure. Fittings shall gave a one mil bituminous coating and shall be cement mortar lined with 1/16 inch mortar. Compact mechanical joint ductile iron fittings meeting this specification, similar to Trinity Valley, shall be acceptable.

D. **DRESSER COUPLINGS** shall be Clow mechanical joint cast iron solid sleeves (short) or equal.

E. **SERVICE GOODS** (2-inches or less)

1. GENERAL. All service goods shall conform to the latest revision of AWWA C800, including Appendix on "Collected Standards for Service Line Materials". All connections requiring a threaded fitting shall be sealed with TFE paste.
2. CORPORATION STOPS shall be Ford BALLCORP, Mueller Ball Corporation, or equal, brass, with AWWA thread inlet and packed joint or flared outlet, suitable for the type of pipe proposed. Corporation stops shall be tapped using a brass Ford Style FRS 202 stainless steel repair type double band saddle, Mueller, or equal service saddle. Connections between saddle, corporation stop and pipe shall be compatible.
3. CURB STOPS shall be Ford or Mueller, Ball Valve curbstops with quarter turn check and suitable for pipe proposed. Connections to existing services, including fittings, are the responsibility of the Contractor. Curb box shall be 60" extension type, cast iron lid and arch base, stationary rod and 2 hole Erie pattern lid. 2-inch curb box shall include curb box base. Curb stops connected to existing lines shall be full 1" to 3/4" existing service pipe, which may be steel, pvc, or copper.
4. PE PIPE: PE PIPE shall be CTS, SDR 7, high density polyethylene rated for a working pressure of 200 psi and listed with the National Sanitation Foundation Testing Laboratory,

Inc. Materials shall meet ASTM D 2239 and meet or exceed 3406 specifications. Pipe shall be as manufactured by Vanguard Plastics, Clow or equal. Service pipe shall include stainless steel stiffeners. Service pipe shall be 1-inch, otherwise noted. Use clamping method recommended by pipe supplier and furnish copy of the instructions to the Engineer. Pipe shall be printed with manufacturer's name and respective nominal size, working pressure, ASTM specification, NSF approval, AWWA approval, SDR, and Plastic Pipe Institute rating.

5. **COPPER PIPE** shall be Type K Copper rated for a working pressure of 250 psi and listed with the National Sanitation Foundation Testing Laboratory, Inc. Service pipe shall be 1-inch, unless otherwise noted. Pipe shall be printed with manufacturer's name and respective nominal size, working pressure, ASTM specification, NSF approval, AWWA approval and rating
6. FITTINGS for service pipe shall be included as an Incidental Expense and no separate payment shall be made for service pipe fittings. Fittings for non-metallic pipe shall be pack joint type as manufactured by Ford, Mueller or equal. Threaded fittings for connection to metal pipe shall be NPT type.

F. BACKFILL

1. SAND AND GRAVEL shall be pit-run sand and gravel and locally available. It is permissible to use dry mined " blow-sand" for backfill around the pipe.
2. FLOWABLE BACKFILL

    a. Remove all unsuitable material, or as directed by the Engineer.
    b. Use flowable backfill as directed by the Engineer, or in excavated areas in frozen ground

        1) Materials

            a) Portland Cement - Type I or II.
            b) Coarse Aggregate - Locally available.
            c) Air Entrainment Agent meeting ASTM C260-77.
            d) Potable Water acceptable for concrete production

        2) Mix

            a) Proportions
            b) Portland Cement per cubic yard - (50 lbs)
            c) Air Entrainment Agent (4 oz. (+1/2 oz)).
            d) Coarse Aggregate - (+3100 lbs)
            e) Water (40 - 44 gallons)
            f) Slump - of a free flowing nature.

G. PLUG FOR WATER LINES shall be 350 psi restrained cap or plug conforming to the latest revision of AWWA C 110.

H. GATE VALVES 4-inch and larger shall be iron body, resilient seat, bronze mounted, mechanical joint (buried) or flanged (exposed), NRS type and shall conform to AWWA Specification C-500. They shall be manufactured with O-ring stem packing and shall be designed for a working pressure of 200 psi. The operating nut shall be 2-inch square and shall have an arrow cast thereon indicating the direction of operation which shall be by turning counterclockwise. Exposed valves shall have a handwheel. Each valve shall have the manufacturer's name or trademark, pressure rating and year of casting imprinted on the body. Valves shall be compatible with pipe specified in paragraph 2.02 of this Section. Valves shall be Mueller, Clow

I. or equal, and include a valve box, if buried. Valve shall rest upon a soil retardant base or be wrapped in visqueen to keep soil from penetrating into the valve box.

J. VALVE BOXES for 4-inch and larger valves shall be two piece, screw type, cast iron with drop covers, adjustable for the depths shown. Valve boxes shall be Clow, Mueller or equal.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Tracer wire shall be installed on all non-metallic water pipe. Tracer wire shall be Trace wire to be fourteen (14) gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors to be 3M DBR, or approved equal, and shall be watertight to provide electrical continuity.

C. Concrete shall conform to specifications listed under 03 30 00

D. Granular bedding shall be pit-run sand and gravel locally mined or native sand.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXEXCUTION

A. PIPE

1. INSTALL EACH SECTION OF PIPE to rest solidly upon pipe bed, with recesses excavated to accommodate bells and joints. Clean interior of pipe thoroughly of all foreign matter before lowering into trench, and keep clean during laying operations by means of plugs or other approved methods. Do not lay pipe in water or when trench or weather conditions are unsuitable for work. When work is not in progress, close the open ends of pipe and fittings so that no trench water, earth, of other substances enter pipes or fittings. Replace any section of pipe found to be defective, before or after laying, with new pipe without additional expense to the Owner. Provide a minimum cover over the top of the pipe of 5 feet from existing ground surface or finished grade, whichever is lower, and avoid interference with other utilities The top lift shall be concrete or asphalt matching the surface of the road adjoining. HANDLE PIPE AND ACCESSORIES in such as to insure delivery on the work in a sound, undamaged condition.
2. HANDLE PIPE AND ACCESSORIES in such as to insure delivery on the work in a sound, undamaged condition.
3. CUT PIPE in a neat and workmanlike manner without damage to pipe. Unless otherwise authorized by the Engineer, cut by means of an approved type of mechanical cutter.
4. ANY STRUCTURES along or near the trench shall be protected from any and all damage. The pipe line shall be laid where staked by the Engineer and it shall be the Contractor's obligation to clear the right-of-way to a width sufficient for his needs in constructing the line. Where timber and brush are to be cut in order to clear such right-of-way, the Contractor shall transport all such cuttings to a landfill. Where fences are in the way of construction, the Contractor shall remove and replace fences in a workmanlike manner. The Contractor shall promptly repair all property damaged by him in the process of work. Trees, stumps, brush and debris shall be cleared within 10 feet either side of the centerline of the water or sewer line or as required to do the Work. Guy anchors and pole supports shall be provided as required to construct the line. Foundations, vaults, abandoned pipelines and rocks shall be removed within 6 feet either side of the centerline of the water line as designated by the Engineer.PIPE AND FITTINGS
5. INSTALL PVC PIPE IN ACCORDANCE with the latest revision of ASTM C 2321, as modified by these specifications.
6. TO CLOSE OFF A DEAD END consisting of a pipe bell, a locking type end plug shall be used. The plug shall be securely backed up to prevent any movement.
7. JOINT DEFLECTION ANGLES shall not exceed manufacturers recommendations. If alignment or grade cannot be obtained within manufacturers recommended deflection, then the Contractor shall at his own expense, install either special bends or a sufficient number of short pipe lengths to provide angular deflections within manufacturers recommendations.
8. PIPE shall be plugged at the end of each days work.
9. TAP PVC PIPE USING A KNIFE CUTTER.

B. TRAFFIC AND PUBLIC PROTECTION

1. WHEN CROSSING roads or other points where the Engineer deems necessary, the Contractor shall bridge the trenches in an approved manner so as to prevent serious inconvenience in vehicular traffic and to provide access to public and private property. Where pipe lines are constructed in a road and parallel to the same, the road shall be kept open to traffic at all times by providing at least one open lane. No single traffic lane shall extend for more than 500 feet without provisions being made for the passing of traffic. The length of trench which shall be open or partly open at any time, including trenches where backfill is not completed, shall in general not exceed 500 feet, unless by special approval of the Engineer. The Contractor shall furnish, place, and maintain sufficient flags, flares. barricades, signs, etc., along the location of his work to provide adequate and proper protection to the public. Contractor shall follow the requirements of the MUTCD.

C. TESTING

1. AN AIR TEST shall be performed as a measure of exfiltration. The test shall follow ASTM F1417, Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air, latest revision. The pressure gage must use 0.1 psi increments for measurement. The sewer main shall be tested at a pressure of 3.5 p.s.i.g. and the pressure drop shall not exceed 1.0 p.s.i.g. in the time calculated using the following equation:

$$T = 0.085 \times \left(\frac{D \times K}{Q} \right)$$

Where:
T = shortest time (in seconds) allowed for the air pressure to drop 1.0 psig.
K = 0.000419*D*L (but not less than 1.0)
Q = leak rate in cubic feet/minute/square feet of internal surface =0.0015 CFM/SF
D = measure average inside diameter of pipe (in)
L = length of test section (ft)

Based on the above equation, times per 100' foot of pipe are shown in the below table for reference.

Pipe Diameter in inches	**Time in Minutes/100 feet of pipe**
8"	2.53
10"	3.96
12"	5.70
15"	8.90
24"	22.8

2. AN INFILTRATION TEST shall be performed by installing a suitable flow measurement device at the low end of the sewer line and measuring the amount of water flowing through the low end of the sewer line for a specific period of time. Infiltration shall not exceed 50 gallons/inch diameter/mile/day.
3. AN ALIGNMENT TEST shall be performed between manholes to determine whether any displacement of pipe has occurred. Lamping shall be done after pipe trench is compacted and brought to grade or pavement subgrade. "Full moon" shall be visible for grade alignment. No less than "half moon" shall be visible for horizontal alignment.
4. A 5% DEFLECTION TEST shall be preformed on flexible sewer pipe. A rigid ball or mandrel, sized at 95% of the inside diameter of the pipe, shall pass freely through the pipe without the aid of mechanical pulling devices. The test shall be performed after the backfill has been in place at least 30 days.

5. ALL LEAKS and/or defects appearing during the test shall be repaired and the line retested.
6. BACKFILLING. When all joints and pipes are found to be tight during the tests, to the satisfaction of the Engineer, the tests may be stopped and the backfill may be completed.

D. BACKFILLING

1. BACKFILL MATERIAL free from rocks or lumps shall be hand placed along side and to a depth of one foot over the top of the pipe. The backfill material shall be placed and compacted in a manner to avoid lateral displacement of the pipe. Compaction shall be in accordance with Section 312000.
2. DURING BACKFILLING OPERATIONS, hydrants, valve boxes or other vertical fixtures shall be held vertical and the top adjusted, where required, to correspond with the elevation established for the fixture.
3. A UTILITY SERVICE CONNECTIONS Abandon existing water service connections and make new utility service connections in a sequence and a manner that will interrupt service for no longer than eight (8) hours. Give adequate notice to those people whose water service will be interrupted.

E. UTILITY CROSSINGS

1. SEWER AND WATER MAINS that cross must be laid so that the top of sewer pipe is at least 18 inches below the bottom of the water pipe. When the sewer line cannot be buried to meet the above requirement, relocate the water main to provide the 18 inch separation, or reconstruct with slip-on or mechanical joint cast iron pipe for a distance of 10 feet on each side of the sewer. Center one full length of water main over the sewer so that both joints will be as far from the sewer as possible. Field verification of water lines will be coordinated by the contractor and owner prior to sewer line installation.
2. HORIZONTAL SEPARATION between sewer and water mains shall be 10 feet measured edge to edge, except by special permission of the appropriate reviewing agency. Maintain bottom of the water main at least 18 inches above the top of the sewer main.
3. THRUST BLOCKS
4. MAJOR FITTINGS or fittings that could blow off the line under pressure shall be braced by a concrete wedge block. The block shall be placed between the fitting and the undisturbed vertical trench wall.

F. TESTING

1. WATERLINE

a. A HYDROSTATIC TEST shall be performed. The water main shall be tested at a minimum pressure of 150% of the normally expected service pressure at the highest point in the line. The test shall be conducted for one hour. The allowable pressure loss during the test period shall be 5 psig. Test pressure shall not exceed pipe design or thrust-restraint pressure.
b. PERFORM A LEAKAGE TEST after completing the hydrostatic test. Maintain the pressure determined for the Hydrostatic Test for two hours. Measure the water loss by pumping water from a drum or some other measurable container. The maximum allowable leakage shall be determined from the following equation

$$Q = \frac{LD\ x(P)^{1/2}}{148{,}000}$$

Q = Quantity of make up water in gallons per hour
D = Nominal pipe diameter in inches

P = Average test pressure, psig
L = Length of pipe tested in feet.

2. PRELIMINARY FLUSHING

a. PRIOR TO DISINFECTION, the water main shall be flushed at a minimum velocity of 3 feet per second.

b. DISINFECT - WATER MAIN AND SERVICE LINES

1) THE DISINFECTANT to be used may be either chlorine or chlorine water, calcium hypochlorite (HTH, Perchloron, Pittchlor, etc,), liquid sodium hypochlorite or chlorinated lime-water mixture. Disinfectant method and material shall be in accordance with the pipe manufacturer's recommendation. DISINFECTION SHALL CONFORM TO THE LATEST REVISION OF AWWA STANDARD C651, WHICH SHALL GOVERN IN THE EVENT OF A CONFLICT WITH THESE SPECIFICATIONS..

2) THE DISINFECTANT shall be applied at one extremity of a pipe section and bled at the opposite extremity. The length of the sections and the dosage for such sections shall be determined by the Engineer; however, a uniform dose of at least 25 ppm at the end of the section will be required.

3) THE DISINFECTING PERIOD shall be 24 hours, unless unfavorable or unsanitary conditions dictate a longer retention period. The chlorine residual at the end of the line after the retention period shall be not less than 10 ppm. The line shall then be bled until all chlorinated water is removed.

4) SAMPLES FOR BACTERIOLOGICAL EXAMINATION shall then be taken, two at in a 24-hour interval and sent to the State Department of Health or a testing laboratory acceptable to the State. The results of the tests shall be delivered to the Engineer within three days of receipt of the results. Both samples taken consecutively must show absence of bacteria.

5) IF THE SAMPLES fail the bacteriological examination, the Contractor shall repeat the disinfection procedure and resubmit water samples. Continue this procedure until State standards can be met. The costs of additional disinfection and testing shall be born by the Contractor.

END OF SECTION 33 10 00

SECTION 33 30 00

SANITARY SEWERAGE UTILITIES

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. Constructing sanitary sewer pipe of the type and dimensions shown on the plans in conformity with the lines and grades established by the Engineer.
2. Excavating and backfilling for lines.
3. Construction and materials shall conform with the standards of the Colorado Department of Public Health and Environment, Colorado Department of Health and Human Services, the United States Environmental Protection Agency and other local standards.

1.3 Related Sections:

1. Division 01 Section “Photographic Documentation" for recording pre-excavation and earth moving progress.
2. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
3. Division 03 Section "Cast-in-Place Concrete" for granular course if placed over vapor retarder and beneath the slab-on-grade.
4. Divisions 21, 22, 23, 26, 27, 28, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.
5. Division 31 Section "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
6. Division 31 Section "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.
7. Division 32 Section "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
8. Division 32 Section "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.4 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the sub base course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Sub base Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub base, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Pipe
2. Pipe tap connections and fittings

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify "Diggers Hotline" for area where Project is located before beginning earth moving operations.

D. Do not commence pipe construction operations until temporary erosion- and sedimentation-control measures, specified in Division 01 Section "Temporary Facilities and Controls," and Division 31 Section "Site Clearing," are in place.

E. Do not commence pipe construction operations until plant-protection measures specified in Division 01 Section "Temporary Tree and Plant Protection" are in place.

F. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

G. Do not direct vehicle or equipment exhaust towards protection zones.

H. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 GENERAL

A. General: ALL MATERIALS AND EQUIPMENT TO BE USED shall be approved by the Engineer before being installed. All materials, unless otherwise stipulated, are to be new and of the best grade of their respective kinds for the purpose designated. The Contractor shall furnish to the Engineer the name of the manufacturer of the materials, and other equipment which he is contemplating to install, together with their performance capabilities and other pertinent information.

B. SEWER PIPE: shall be made of compounds conforming to the latest revision of ASTM D-1784 with a cell classification of 12454-B or 13364-B. Pipe shall meet the requirements of ASTM D-3034 and F679 and shall meet a SDR or 35. Sewer service pipe shall be Schedule 40 PVC. Pipe shall be furnished in nominal 20-foot lengths. Pipe and bell shall be produced in one continuous extrusion process. A rubber ring water stop shall be furnished by the pipe manufacturer and installed by the Contractor at each PVC pipe connection to any manhole.

Gaskets shall be permanently bonded to the bell at the factory using a permanent adhesive. Use of pre-manufactured A-loks is discouraged due to the variable nature of the pipeline. Gravity sewer or storm sewer pipe called out on the plans as C900 shall follow Section 33 10 00 requirements.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

B. Cleanout ring and covers. Cast iron manhole ring and cover shall be No. 1005 as manufactured by Deeter Foundry; Lincoln, Nebraska or approved equal.

C. Concrete shall conform to Specification section 03 30 00

D. Granular bedding shall be pit-run sand and gravel locally mined or native sand.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXECUTION

A. PIPE

1. INSTALL EACH SECTION OF PIPE to rest solidly upon pipe bed, with recesses excavated to accommodate bells and joints. Clean interior of pipe thoroughly of all foreign matter before lowering into trench, and keep clean during laying operations by means of plugs or other approved methods. Do not lay pipe in water or when trench or weather conditions are unsuitable for work. When work is not in progress, close the open ends of pipe and fittings so that no trench water, earth, of other substances enter pipes or fittings. Replace any section of pipe found to be defective, before or after laying, with new pipe without additional expense to the Owner. Provide a minimum cover over the top of the pipe of 5 feet from existing ground surface or finished grade, whichever is lower, and avoid interference with other utilities. Where mains cross pavement, the trench shall be backfilled with sand to within 18-inches of the surface and may be puddled and vibrated in place. The top lift shall be native soil to the surface of the road adjoining.for rock excavation or removal of obstructions.
2. HANDLE PIPE AND ACCESSORIES in such as to insure delivery on the work in a sound, undamaged condition.
3. CUT PIPE in a neat and workmanlike manner without damage to pipe. Unless otherwise authorized by the Engineer, cut by means of an approved type of mechanical cutter.
4. MAKE CONNECTIONS WITH EXISTING PIPE LINES to new pipe lines in a workmanlike manner, using suitable and proper fittings to suit conditions encountered. Connection shall be made at a time, and under conditions, which will cause the least interference with service and as authorized by the Owner. Provide suitable facilities for proper dewatering, drainage, and disposal of water removed from dewatered lines and excavations.
5. ANY STRUCTURES along or near the trench shall be protected from any and all damage. The pipe line shall be laid where staked by the Engineer and it shall be the Contractor's obligation to clear the right-of-way to a width sufficient for his needs in constructing the line. Where timber and brush are to be cut in order to clear such right-of-way, the Contractor shall transport all such cuttings to the landfill. Where fences are in the way of construction, the Contractor shall remove and replace fences in a workmanlike manner. The Contractor shall promptly repair all property damaged by him in the process of work. Trees, stumps, brush and debris shall be cleared within 10 feet either side of the centerline of the sewer line or as required to do the Work. Guy anchors and pole supports shall be provided as required to construct the line. Foundations, vaults, abandoned pipelines and rocks shall be removed within 6 feet either side of the centerline of the sewer line as designated by the Engineer.

B. PIPE AND FITTINGS

1. INSTALL PVC PIPE IN ACCORDANCE with the latest revision of ASTM D 2321
2. TO CLOSE OFF A DEAD END consisting of a pipe bell, a locking type end plug shall be used. The plug shall be securely backed up to prevent any movement.
3. JOINT DEFLECTION ANGLES shall not exceed manufacturers recommendations. If alignment or grade cannot be obtained within manufacturers recommended deflection, then the Contractor shall at his own expense, install either special bends or a sufficient number of short pipe lengths to provide angular deflections within manufacturers recommendations.
4. PIPE shall be plugged at the end of each days work.

C. TRAFFIC AND PUBLIC PROTECTION

1. WHEN CROSSING roads or other points where the Engineer deems necessary, the Contractor shall bridge the trenches in an approved manner so as to prevent serious inconvenience in vehicular traffic and to provide access to public and private property. Where pipe lines are constructed in a road and parallel to the same, the road shall be kept open to traffic at all times by providing at least one open lane. No single traffic lane shall extend for more than 500 feet without provisions being made for the passing of traffic. The length of trench which shall be open or partly open at any time, including trenches where backfill is not completed, shall in general not exceed 500 feet, unless by special approval of the Engineer. The Contractor shall furnish, place, and maintain sufficient flags, flares. barricades, signs, etc., along the location of his work to provide adequate and proper protection to the public. Contractor shall follow the requirements of the MUTCD.

D. TESTING

1. AN AIR TEST shall be performed as a measure of exfiltration. The test shall follow ASTM F1417, Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air, latest revision. The pressure gage must use 0.1 psi increments for measurement. The sewer main shall be tested at a pressure of 3.5 p.s.i.g. and the pressure drop shall not exceed 1.0 p.s.i.g. in the time calculated using the following equation:

$$T = 0.085 \times \left(\frac{D \times K}{Q} \right)$$

Where:
T = shortest time (in seconds) allowed for the air pressure to drop 1.0 psig.
K = 0.000419*D*L (but not less than 1.0)
Q = leak rate in cubic feet/minute/square feet of internal surface =0.0015 CFM/SF
D = measure average inside diameter of pipe (in)
L = length of test section (ft)

Based on the above equation, times per 100' foot of pipe are shown in the below table for reference.

Pipe Diameter in inches	**Time in Minutes/100 feet of pipe**
8"	2.53
10"	3.96
12"	5.70
15"	8.90
24"	22.8

2. AN INFILTRATION TEST shall be performed by installing a suitable flow measurement device at the low end of the sewer line and measuring the amount of water flowing through the low end of the sewer line for a specific period of time. Infiltration shall not exceed 50 gallons/inch diameter/mile/day.
3. AN ALIGNMENT TEST shall be performed between manholes to determine whether any displacement of pipe has occurred. Lamping shall be done after pipe trench is compacted and brought to grade or pavement subgrade. "Full moon" shall be visible for grade alignment. No less than "half moon" shall be visible for horizontal alignment.

4. A 5% DEFLECTION TEST shall be preformed on flexible sewer pipe. A rigid ball or mandrel, sized at 95% of the inside diameter of the pipe, shall pass freely through the pipe without the aid of mechanical pulling devices. The test shall be performed after the backfill has been in place at least 30 days.
5. ALL LEAKS and/or defects appearing during the test shall be repaired and the line retested.
6. BACKFILLING. When all joints and pipes are found to be tight during the tests, to the satisfaction of the Engineer, the tests may be stopped and the backfill may be completed.

E. BACKFILLING

1. BACKFILL MATERIAL free from rocks or lumps shall be hand placed along side and to a depth of one foot over the top of the pipe. The backfill material shall be placed and compacted in a manner to avoid lateral displacement of the pipe. Compaction shall be in accordance with Section 312000.
2. DURING BACKFILLING OPERATIONS, hydrants, valve boxes or other vertical fixtures shall be held vertical and the top adjusted, where required, to correspond with the elevation established for the fixture.
3. A UTILITY SERVICE CONNECTIONS Abandon existing water service connections and make new utility service connections in a sequence and a manner that will interrupt service for no longer than eight (8) hours. Give adequate notice to those people whose water service will be interrupted.

F. UTILITY CROSSINGS

1. SEWER AND WATER MAINS that cross must be laid so that the top of sewer pipe is at least 18 inches below the bottom of the water pipe. When the sewer line cannot be buried to meet the above requirement, relocate the water main to provide the 18 inch separation, or reconstruct with slip-on or mechanical joint cast iron pipe for a distance of 10 feet on each side of the sewer. Center one full length of water main over the sewer so that both joints will be as far from the sewer as possible. Field verification of water lines will be coordinated by the contractor and owner prior to sewer line installation.
2. HORIZONTAL SEPARATION between sewer and water mains shall be 10 feet measured edge to edge, except by special permission of the appropriate reviewing agency. Maintain bottom of the water main at least 18 inches above the top of the sewer main.

END OF SECTION 33 30 00