TECHNICAL SPECIFICATIONS

The New Mexico Standard Specifications for Public Works Construction, 2006 Edition, as amended with updates are incorporated here by reference and shall govern the construction of this project except where revised, amended, or supplemented by the project Supplemental Technical Specifications.

SUPPLEMENTAL TECHNICAL SPECIFICATIONS REPLACEMENT AND EQUIPPING OF SOCORRO WASTEWATER SLUDGE FILTER PRESS

The following revisions and/or additions to the Technical Specifications are hereby made a part of the Contract Documents. The New Mexico Standard Specifications for Public Works construction, 2006 Edition, as amended with updates are incorporated here by reference and shall govern the construction of this project except where revised, amended, or supplemented by these Supplemental Technical Specifications.

Dimensions given on the plans or which shall be calculated will govern over scaled dimensions.

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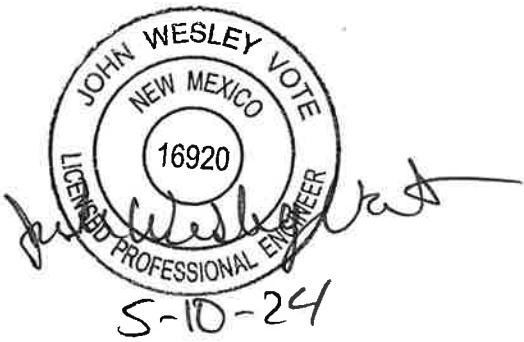
Spec Section Title/Description



SECTION 01 11 00 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 WORK INCLUDE

A. Work under this Contract generally consists of:

1. Demolition of the existing sludge building, re-equipping of the new sludge press and the ancillary sludge press plant wash system and associated metal valves and piping.

2. New CMU Sludge Building, including onsite associated grading and site piping modifications.

1.2 SPECIAL CONSIDERATIONS

A. Contractor shall coordinate with and notify the City of Socorro Utilities Department at least 14 days prior to starting up the sludge presses.

B. Any potable water utilized for construction of this project shall be from a City-designated fire hydrant and shall be metered. Per the Notice to Contractors, acquisition of the water meter and cost of water will be incidental to the project.

C. Contractor shall operate the entire system with assistance from the City's O&M staff for a period of 3 days prior to the City acceptance. The system shall be tested prior to acceptance per Specification 01 60 00.

D. At least (1) complete sludge filter press, including ancillary equipment shall be operational in three weeks. The system cannot be out of operation more than 4 weeks. The redundant sludge filter press system shall be operational within the 365 calendar day contractor schedule.

E. Contractor shall verify manufacturers meet the American Iron and Steel (AIS) requirements for funding.

F. Contractor must display the project sign in accordance with New Mexico CWSRF Contract Provision R12: B:L Public Awareness (signage) Requirements. Contract provision R12 referenced in Appendix A Building-A-Better-America Guide.

END OF SECTION

SECTION 01 12 16 - WORK SEQUENCE

PART 1 - GENERAL

1.1 RECOMMENED WORK SEQUENCE

A. Existing Sludge Building and Dewatering System

1. Demolition of the existing Sludge Building and all existing sludge dewatering system components, including associated piping.

2. Existing suspended natural gas heaters to be removed and reinstalled.

3. One existing sludge press to remain operational until at least one new sludge filter press is onsite.

B. New Sludge Building, Filter Press and Ancillary Components

1. Install associated Filter Presses, sludge wash water pumps, polymer tanks and pumps, compressors, control panels and startup.

2. Installing new sludge, polymer, and wash water piping.

3. Construction of new Sludge Building, including HVAC and electrical components.

C. Plant Wash Water System

1. Demolition and Removal of the existing Plant Wash Water Skid Mounted Pumps, control panel, existing piping, and hydropneumatic tank.

2. Install new Skid Mounted Wash Water Pumps, control panels, piping, fittings, valves, and hydropnuematic tank.

1.2 SPECIAL CONSIDERATIONS

A. Notify Owner a minimum of 14 days prior to requiring any connections to the existing sludge dewatering system and operation of existing valves / pumps.

B. Notify Owner of any changes to schedule, which requires coordination with other contractors on the site to avoid / minimize potential delays.

C. Plant’s existing wash water demolition and re-equipping must be completed within 96 hours.

D. The existing sludge dewatering system can be offline for a maximum of 4 weeks without at one new sludge press being operational.

END OF SECTION

SECTION 01 12 19 - CONTRACT CONSIDERATIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Schedule of Values.

B. Application for Payment.

C. Change procedures.

1.2 RELATED REQUIREMENTS

A. Section 01 21 00 – ALLOWANCES

1.3 SCHEDULE OF VALUES

A. Submit printed schedule in accordance with Article 14 of the EJCDC General Conditions. Contractor's standard form or electronic media printout will not be considered.

B. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.

C. Format: Utilize the Table of Contents of this Contract Document. Identify each line item with number and title of the major specification Section.

D. Include within each line item, a direct proportional amount of Contractor's overhead and profit.

E. Revise schedule to list approved Change Orders, with each Application for Payment.

1.4 APPLICATIONS FOR PAYMENT

A. Submit three copies of each application in accordance with Article 14 of the EJCDC General Conditions. Contractor's electronic media driven form similar to EJCDC document may be considered.

B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.

C. Payment Period: As specified in the Contract Documents, including Federal Forms.

D. Include an updated construction progress schedule and construction photographs as specified. WH-347,C3, C4, C5, C6, C10, C11, and C13 must be submitted with each pay application as show in Instruction to Bidders.

1.5 CHANGE PROCEDURES

A. Owner will advise of minor changes in the work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by issuing supplemental instructions.

B. Owner may issue a Notice of Change that includes a detailed description of a proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor will prepare and submit an estimate within 10 days.

C. The Contractor may propose a change by submitting a request for change to the Owner, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time.

D. Stipulated Sum/Price Change Order: Based on Notice of Change and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Owner.

E. Work Directive Change: Owner may issue a directive, EJCDC C-941 Change Order form signed by the Owner, the Engineer, Contractor, and funding Agency instructing the Contractor to proceed with a change in the Work. Document will describe changes in the Work and designate method of determining any change in Contract Sum/Price or Contract Time. Contractor shall promptly execute the change upon receipt of fully executed C-941 Change Order form.

F. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Owner will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.

G. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

H. Change Order Forms: Are included in Bid Documents.

I. Execution of Change Orders: Owner will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.6 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Owner, it is not practical to remove and replace the Work, the Owner will direct an appropriate remedy or adjust payment.

PART 2 - PRODUCTS

2.1 REQUIREMENTS

A. All products must meet the requirements of the American Iron and Steel Act (AIS).

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 21 00 – ALLOWANCES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Procedure for administration of Allowances.

1.2 RELATED REQUIREMENTS

A. Section 01 12 19: Contract Considerations

B. Section 01 40 00 – Quality Control

C. Section 01 45 29 – Testing Laboratory Services

1.3 CASH ALLOWANCE

A. The cash allowance is a sum of money included in the Contract Price to cover the cost of a service, all inclusive, to be provided under the Contract by the Contractor or a party other than the Contractor.

B. The allowance is included in the Bid Form.

C. The sum of a cash allowance is an estimated amount.

D. The Contractor will be reimbursed only for the costs invoiced or by the party providing the service, and no mark up, such as overhead and profit shall be charged by the Contractor.

E. Services may be less than, equal to, or greater than, the estimated allowance amount. Contractor will be paid only the actual cost of the services.

F. Unknown and Unmarked piping, fittings, hangers, and supports.

G. Material testing.

H. Startup and Testing.

I. HVAC controls.

1.4 ADJUSTMENT OF BONDS AND INSURANCE

A. Adjustment to Contractor's bonds and insurance on account of adjustment to cash allowance will only be dealt with in the final pay application considering the final cost of the project in comparison to the Bid Price.

1.5 ENGINEER RESONSIBILITIES

A. Consult with Contractor in consideration of supplier of services.

1.6 CONTRACTOR RESPONSIBILITIES

A. Execute purchase agreement with designated supplier.

B. For additional information, refer to specific specification sections referenced in Part 3 of this section.

1.7 PAYMENT PROCEEDURES

A. Payment will be made under the Bid Item for the specified allowance.

B. Contractor to submit invoices on a monthly basis with pay application.

C. Pay application will not be accepted without invoices for allowance services performed during the pay application pay period.

D. Pay invoice on approval of Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PROJECT ALLOWANCES

A. Utility Allowance: Allow the amount of $10,000.00. For unknown and not shown piping, fittings, hangers, and supports.

B. Laboratory Testing Services-Allowance: Allow the amount of $5,000.00. For additional information, see Section 01 45 29 - Testing Laboratory Services.

C. Startup and Testing Allowance: Allow the amount of $5,000.00. For pressure testing and start up.

END OF SECTION

SECTION 01 31 19 – PROJECT MEETINGS

PART 1 - GENERAL

A. SECTION INCLUDES

1. Coordination and project conditions.

2. Field engineering.

3. Preconstruction meeting.

4. Site mobilization meeting.

5. Progress meetings.

6. Pre-installation conferences.

1.2 RELATED REQUIREMENTS

A. N/A

1.3 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of the various Sections of this Contract Document to assure efficient and orderly sequence of installation of interdependent construction.

B. Verify that utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Coordinate space requirements and installation of mechanical and electrical Work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas where noted, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion.

F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.4 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of New Mexico and acceptable to the Engineer.

B. Contractor to locate and protect survey control and reference points.

C. Control datum for survey is that shown on Drawings.

D. Confirm drawing dimensions and elevations.

E. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

1.5 PRECONSTRUCTION MEETING

A. Owner will schedule a conference after Notice of Award.

B. Attendance Required: Owner, Engineer, and Contractor.

C. Agenda:

1. Submission of executed bonds and insurance certificates.

2. Distribution of Contract Documents.

3. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.

4. Designation of personnel representing the parties in Contract, and the Engineer.

5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders.

6. Scheduling.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, participants, and those affected by decisions made.

1.6 SITE MOBILIZATION MEETING

A. Owner will schedule a meeting at the Project site prior to Contractor occupancy.

B. Attendance Required: Engineer, Contractor, Contractor's Superintendent, and major Subcontractors.

C. Agenda:

1. Use of premises by Owner and Contractor.
2. Owner's requirements.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Survey and site layout.
6. Security and housekeeping procedures.
7. Schedules.
8. Application for payment procedures.
9. Procedures for testing.
10. Procedures for maintaining record documents.
11. Requirements for start-up of equipment.
12. Inspection and acceptance of equipment put into service during construction period.

D. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, participants, and those affected by decisions made.

1.7 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at a minimum biweekly interval, or as directed by Owner.

B. Make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Engineer, as appropriate to agenda topics for each meeting.

D. Agenda:

1. Review minutes of previous meetings.
2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems which impede planned progress.

5. Review of submittals schedule and status of submittals.

6. Review of off-site fabrication and delivery schedules.

7. Maintenance of progress schedule.

8. Corrective measures to regain projected schedules.

9. Planned progress during succeeding work period.

10. Coordination of projected progress.

11. Maintenance of quality and work standards.

12. Effect of proposed changes on progress schedule and coordination.

13. Other business relating to Work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Engineer, participants, and those affected by decisions made.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 23- CONSTRUCTION SURVEY AND LAYOUT DATA

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work under this section includes furnishing the necessary labor and material to supplement existing horizontal and vertical control and to layout and locate the facilities in accordance with the drawings. Also, any boundary of property surveys as required due to destruction of existing monuments shall meet the "Minimum Standards for Land Surveying in New Mexico" as adopted by the New Mexico State Board of Registration for Professional Engineers and Surveyors and as required hereinafter. The definitions, conditions, and requirements of Supplementary Condition (SC) 4.4 shall also be followed as if contained herein. In case of discrepancy, the requirements of the Supplementary Conditions shall be followed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LAYOUT

A. The Contractor will be responsible for all surveys, and layout of the construction described herein. Layout includes location of the centerlines of construction, limits of work, reference points, all structural elements, and project features.

B. Benchmarks will be provided for construction layout and Contractor should survey on elevation datum provided. The layout survey shall establish positions in accordance with the drawings. Any series of observations and measurements made for the purpose of restoring any real property boundary, including easements, rights-of-way, and work limits shall be performed by a Professional Surveyor registered in New Mexico in accordance with the New Mexico Engineering and Surveying Practice Act.

C. The drawings include horizontal and vertical "reference monuments" which may be used in the layout of the project. The successful bidder (the Contractor) will be provided with electronic data in AutoCAD format that provides control data and line locations as shown. The Contractor is cautioned that the use of single horizontal or vertical "reference monument" may not be accurate due to disturbance of said monuments or misidentification.

D. All vertical surveys and layouts by the Contractor, or his agents, shall be considered invalid unless at least two vertical "reference monuments" are utilized in a closed level circuit. No horizontal or vertical "reference monuments" shall be utilized until the Contractor, or his agents, has satisfied himself/themselves that the stated data for the monuments is consistent with the horizontal and vertical

datum for the project. The Contractor, or his agents, may establish additional "reference monuments" for his/their use, provided that accuracy of these monuments is in accordance with minimum accuracy standards for land surveys in New Mexico.

3.2 QUALIFICATION OF SURVEY AND LAYOUT PERSONNEL AND PROCEDURES

A. Prior to commencement of any boundary or right-of-way survey, the Contractor shall notify the Owner and Engineer of names and qualifications of the personnel who will perform all layout and survey work. The notification shall include the following:

1. Name and New Mexico registration number of the Professional Surveyor who will be in responsible charge of the work.

2. Name and experience of field personnel.

3. Types of equipment and accuracy of equipment to be used in the horizontal and vertical layout and surveys.

4. Schedule of time and manpower requirements to be utilized for layout and surveys.

5. Certification that Work will be accomplished in accordance with the "Minimum Standards for Surveying in New Mexico."

PART 4 - MEASUREMENT AND PAYMENT

4.1 MEASUREMENT AND PAYMENT FOR CONSTRUCTION STAKING (SURVEY LAYOUT)

A. Payment shall be made on a lump sum basis for all work under this section and all requirements under Supplementary Condition (SC) 4.4. All labor, materials, fees, and incidentals as required to produce a complete and finished product are to be merged into the lump sum provided in the Bid Form.

END OF SECTION

SECTION 01 33 00 – SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed Products list.

D. Product data.

E. Shop Drawings.

F. Samples.

G. Design data.

H. Test reports.

I. Certificates.

J. Manufacturer's instructions.

K. Manufacturer's field reports.

L. Erection drawings.

M. Construction photographs.

1.2 SUBMITTAL PROCEDURES

A. Transmit each submittal to the City of Socorro Project Manager on Owner approved transmittal form.

B. Sequentially number the transmittal forms. Re-submittals to have original number with a sequential alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier; pertinent Drawing and detail number(s), and specification Section number, as appropriate.

D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

E. Schedule submittals to expedite the Project, and deliver to Owner at business address. Coordinate submission of related items.

F. For each submittal for review, allow 7 calendar days excluding delivery time to and from the contractor.

G. Identify all variations from Contract Documents and Product or system limitations, which may be detrimental to successful performance of the completed Work.

H. Provide space for Contractor and Engineer review stamps.

I. When revised for resubmission, identify all changes made since previous submission.

J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

K. Submittals not requested will not be recognized or processed.

1.3 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial Construction schedule in triplicate by date of Pre-Construction Conference or date of Notice to Proceed, whichever is earliest.

B. Revise and resubmit as required.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

D. Submit a CPM-based, computer-generated, horizontal bar chart with separate line for each major section of Work or operation identifying first work day of each week, or other Engineer accepted chart.

E. Progress Schedule shall, at a minimum, contain the following:

1. Progress Schedule Heading:

a. Name of Contractor

b. Name of Engineer

c. Name and Address of Project

d. Owner Project Number

e. Current Date of submitted schedule

2. Calendar Months of construction

3. Start date of each task/activity

4. "Milestone" dates for each required inspection

5. Start and completion dates for critical tasks or activities

6. Percentage of total costs or work for each task/activity, etc.

7. Duration of time for each task/activity, start to finish

8. Percentage of completion, updated monthly

9. Proposed Construction Curve marked in black and actual construction curve marked in red

10. Submit updated Progress Schedule each month in conjunction with Certificate of Payment

F. CPM Software: Computer based programs which lend themselves to construction management and which are acceptable to the Owner are: Microsoft Projects Plus or Primavera. Use of other software shall be approved by the Owner.

G. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

H. Indicate estimated percentage of completion for each item of Work at each submission.

I. Indicate submittal dates required for Shop Drawings, product data, samples, and product delivery dates, including those furnished by Owner and under Allowances.

1.4 PROPOSED PRODUCTS LIST

A. Within 30 calendar days after date of the Recommendation of Award submit complete list of major equipment or products proposed for use as defined in the Technical Specifications. Included in the list shall be the name of manufacturer, trade name, model number of each Product, and corresponding Section of the Contract Documents.

B. For Products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

C. Contractor shall refer to the City's "Approved Product Listing"

1.5 PRODUCT DATA

A. Product Data for Review:

1. Submitted to City of Socorro Project Manager for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in SECTION 01 70 00 - CONTRACT CLOSEOUT.

B. Product Data for Information:

1. Submitted for the Engineer's knowledge as contract administrator and for the Owner.

C. Product Data for Project Close-Out:

1. Submitted for the Owner's benefit during and after project completion.

D. Submit the number of copies which the Contractor requires, plus three copies which will be retained by the Engineer. The number of copies submitted shall be no less than five copies.

E. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.

F. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

G. After review, distribute in accordance with Submittal Procedures article above and provide copies for Record Documents described in Section 01 70 00.

1.6 SHOP DRAWINGS

A. Shop Drawings for Review:

1. Submitted to City of Socorro Project Manager for distribution for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01 70 00.

B. Shop Drawings for Information:

1. Submitted for the City of Socorro Project Manager's knowledge as contract administrator for the Owner.

C. Shop Drawings for Project Close-Out:

1. Submitted to the City of Socorro Project Manager for the Owner's benefit during and after project completion.

D. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. Submit the number of opaque reproductions which Contractor requires, plus three copies which will be retained by Engineer. The number of copies submitted shall be no less than five copies.

1.7 SAMPLES

A. Samples for Review:

1. Submitted to City of Socorro Project Manager for distribution for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01 70 00.

B. Samples for Information:

1. Submitted for the City of Socorro Project Manager's knowledge as contract administrator for the Owner.

C. Samples for Selection:

1. Submitted to City of Socorro Project Manager for aesthetic, color, or finish selection.

2. Submit samples of finishes, textures, and patterns for Owner's selection.

3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01 70 00.

D. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

E. Include identification on each sample, with full Project information.

F. Submit the number or samples specified in individual specification Sections; one of which will be retained by Engineer.

G. Reviewed samples which may be used in the Work are indicated in individual specification Sections.

H. Samples will not be used for testing purposes unless specifically stated in the specification section.

1.8 DESIGN DATA

A. Submit to the City of Socorro Project Manager.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.9 TEST REPORTS

A. Submit to the City of Socorro Project Manager.

B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.10 CERTIFICATES

A. When specified in individual specification Sections, submit certification by manufacturer, installation/application Subcontractor, or the Contractor to City of Socorro Project Manager, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing to the City of Socorro Project Manager, in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

C. Refer to Section 01 40 00 - Quality Control, Manufacturer' Field Services article.

1.12 MANUFACTURER'S FIELD REPORTS

A. Submit reports to the City of Socorro Project Manager.

B. Submit report in duplicate within 30 days of observation to City Project Manager for information.

C. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.13 ERECTION DRAWINGS

A. Submit drawings for the Engineer's benefit as contract administrator or for the Owner.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

C. Data indicating inappropriate or unacceptable Work may be subject to action by the Owner or Engineer.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 40 00 - QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Quality assurance-control of installation.

B. Tolerances.

C. References and standards.

D. Mock-up.

E. Testing services.

F. Inspection services.

G. Manufacturers' field services.

1.2 QUALITY ASSURANCE-CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply fully with manufacturers' instructions, including each step-in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, contractor shall request clarification from Owner before proceeding with the work.

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on Shop Drawings or as instructed by the manufacturer.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.3 TOLERANCES

A. Monitor fabrication and installation tolerance of Products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Owner before proceeding.

C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.4 REFERENCES AND STANDARDS

A. Products or workmanship specified by association, trade, or other consensus standards, work shall comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.

C. Obtain copies of standards when required by product specification sections.

D. Neither the contractual relationship, duties, or responsibilities of the parties in the Contract, nor those of the Engineer, shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.5 TESTING SERVICES

A. Contractor shall Employ and pay for the services of an independent testing laboratory to perform specified services and testing associated with soil and density, concrete, and asphalt sampling and testing, based upon Allowance as stated in "Section 01 21 00 Allowances". SEE also "Section 01 45 29-Testing Laboratory Service" for testing covered under the Testing allowance.

B. Contractor shall also pay for specified services of manufacturers or independent testing firms to perform Factory Tests or other remote testing required by the Contract Specifications or Referenced Standards covering various manufactured and supplied equipment. Certification of results shall be included where required by the various specifications. Cost for those testing services shall be borne by the manufacturer/supplier or Contractor and shall be included in the various Contract Sums, but SHALL NOT be included under the Testing Allowance.

C. Owner reserves the right to request additional testing. Additional testing that is found to be of non-conformance with specified requirements shall be paid for by contractor. Additional testing that is found to meet specified requirements shall be paid for by Owner.

1.6 INSPECTION SERVICES

A. Inspection will be performed by the City of Socorro, or its assignees. Inspection services do not include field services and inspections provided by manufacturers as specified in specific sections herein.

B. Inspecting may occur on or off the project site. Perform off-site inspecting as required by the Owner.

C. Owner’s representative and/or Owner will prepare daily reports indicating compliance or non-compliance with Contract Documents.

D. Cooperate with the Owner; furnish safe access and assistance by incidental labor as requested. Notify Owner 24 hours prior to expected time for operations requiring services.

E. Inspection services do not relieve Contractor of performing Work to contract requirements.

1.7 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, and adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of manufacturer or product observer to Engineer 30 days in advance of required observations.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Refer to Section 01 33 00 - SUBMITTALS, MANUFACTURERS' FIELD REPORTS article.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01 41 26 – PERMIT REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work under this section includes the miscellaneous construction as required to satisfy the requirements of various permits from local, state, and federal agencies to build within public property and rights-of-way and to address storm water runoff from new development and redevelopment projects.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CITY OF CITY OF SOCORRO RIGHT-OF-WAY PERMIT

A. The City of City of Socorro, New Mexico will give permission to construct and maintain the Project within City Property and upon public right-of-way in the locations provided for in these plans, provided the formal permit or permits for street cuts are directly obtained from the City by the Contractor. The permit requirements include:

1. Adequate and safe traffic control during construction, with access to homes and businesses.

2. Reconstructed roadway surfaces to be left in as good or better condition as before construction.

B. The Contractor is responsible for payment of any and all permit fees required for completion of this work.

3.2 STORM WATER NPDES REQUIREMENTS

A. The Contractor shall be solely responsible for conforming with all requirements of the "National Pollutant Discharge Elimination System - Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges", as published December 8, 1999, as required by Section 402(p) of the Clean Water Act (CWA), as amended.

B. Contractor shall be solely responsible for conforming with the Phase II Final Rule, including:

1. Preparation and filing of the Notice of Intent (NOI)

2. Preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP).

3. Preparation and implementation of a Temporary Erosion and Sediment Control Plan (TESCP).

4. Utilizing recognized Best Management Practices (BMP) to prevent sediment laden run-off from leaving the project site.

5. Preparation and submittal of the Notice of Termination (NOT).

3.3 STATE OF NEW MEXICO CONSTRUCTION INDUSTRY DIVISION (NMCID) – BUILDING PERMIT REQUIREMENTS

A. The Contractor shall be solely responsible for obtaining and conforming with all requirements of the CID construction permit in accordance with the latest Building Codes, UPC, NEC, and NECSP, including all required inspections.

3.4 POWER COMPANY OF NEW MEXICO (PNM)

A. Contractor shall be responsible for coordination with PNM to install the required electrical service and permitting.

PART 4 - MEASUREMENT AND PAYMENT

4.1 PAYMENT FOR CITY OF CITY OF SOCORRO BUILDING PERMITS

A. There shall be no separate payment for work required to comply with provisions of this section, and any such costs shall be merged into the unit prices for other items of this contract.

4.2 PAYMENT FOR STORM WATER NPDES REQUIREMENTS

A. Payment shall be made for this item as shown in the Bid Form. The bid item entitled "Erosion Control NPDES/SWPPP, all CIP" shall be paid as a Lump Sum and shall include all costs incurred by the Contractor associated with preparation, filing, and publishing of all written documents required by the Phase II Final Rule. The bid item shall also include all costs incurred by the Contractor associated with implementation, placing, and removing of temporary erosion controls required under the Phase II Final Rule.

4.3 PAYMENT FOR STATE OF NEW MEXICO CONSTRUCTION INDUSTRY DIVISION – BUILDING PERMIT

A. There shall be no separate payment for work required to comply with provisions of this section, and any such costs shall be merged into the unit prices for other items of this contract.

END OF SECTION

SECTION 01 45 29 - TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Employ and pay for the services of an independent testing laboratory to perform specified services and testing associated with soil and density, concrete, and asphalt.

1.2 RELATED REQUIREMENTS

A. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approval of public authorities.

B. Notice to Contractors –Material Testing and Quality Control New Mexico Department of Transportation (NMDOT)

C. Section 01 12 19: Contract Considerations

D. Section 01 21 00: Allowances

E. Section 01 40 00 – Quality Control

1.3 SUBMITTALS

A. Submit to City of Socorro Project Manager for review of the name of proposed Laboratory to perform required testing and their statement of qualifications.

1.4 QUALIFICATION OF LABORATORY

A. Meet basic requirements of ASTM E329, "Standard Specification Agencies Engaged in Testing and/or Inspection of Materials Used in Construction."

B. Authorized to operate in the State in which the Project is located by the local governing authority for the AASHTO Accreditation Program.

C. Testing Equipment:

1. Calibrated at reasonable intervals by devices of accuracy traceable to either:

a. National Bureau of Standards

b. Accepted values of natural physical constants

D. Office Location: The location at which specified services and testing will be performed or from which Testing Laboratory staff will mobilize to perform field work shall be within 100 miles of the project site.

1.5 LABORATORY DUTIES

A. Cooperate with City of Socorro Project Manager and Contractor; provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:

1. Comply with specified standards

2. Ascertain compliance of materials with requirements of Contract Documents

C. Promptly notify City of Socorro Project Manager and Contractor of observed irregularities or deficiencies of work or products.

D. Promptly submit written report of each test and inspection; two (2) copies to City of Socorro Project Manager, and copies as required to Contractor. Each report shall include:

1. Date issued

2. Project title and number

3. Testing laboratory number, address, and telephone number

4. Name and signature of laboratory inspector

5. Date and time of sampling and inspection

6. Record of temperature and weather conditions

7. Date of test

8. Identification of product and specification section

9. Location of sample or test in the project

10. Type of inspection or test

11. Results of tests and compliance with Contract Documents

12. Interpretation of test results when requested by the City of Socorro Project Manager.

E. Perform additional tests as required by the City of Socorro Project Manager.

F. In all cases, City of Socorro Project Manager shall determine the number, type and location of tests.

G. Provide signature and seal of a Professional Engineer, licensed in the State where work is being performed, and who is employed by the Laboratory on all test results.

1.6 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

1. Release, revoke, alter or enlarge on requirements of Contract Documents

2. Approve or accept any portion of the Work

3. Perform any duties of the Contractor

1.7 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel; provide access to Work, and manufacturer's operations.

B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete and other material mixes which require control by the testing laboratory.

D. Furnish copies of Product test reports as required.

E. Furnish Incidental Labor and Facilities:

1. To provide access to Work and Facilities

2. To obtain and handle samples at the Project site or at the source of the product to be tested.

3. To facilitate inspections and testing

4. For storage and curing of test samples

F. Make arrangements with laboratory and pay for additional samples and tests required for Contractor's convenience and retests required for previously failed tests.

G. Notify testing laboratory at least 48 hours in advance of all testing required by job progress or conditions, or the City of Socorro Project Manager.

H. Provide on-site facilities as required for initial curing of concrete cylinders.

1.8 PAYMENT

A. An allowance is included in the Bid Proposal to cover field testing performed by an independent testing laboratory. In accordance with Section 01 21 00, the Owner shall reimburse the Contractor for the actual cost of all such testing based on invoices received from the laboratory.

B. The testing allowance stated in the Bid Proposal is an estimated dollar amount. The final dollar amount reimbursed to the Contractor for testing may be less than, equal to, or greater than the stated allowance.

C. Actual reasonable sample shipping costs will be paid to the Contractor in the same manner and under the testing allowance.

D. Costs for testing described in Paragraph 1.7 B are not eligible for reimbursement.

E. Mileage charged by the Testing Lab cannot exceed the current Internal Revenue Services (IRS) rate when work is performed.

END OF SECTION

SECTION 01 50 00 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Sanitary facilities.

B. Temporary Controls: Protection of the Work and water control.

C. Construction Facilities: Access roads, parking, and onsite office trailer or other building as deemed necessary by Contractor.

1.2 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures, minimum two toilets. Provide at time of project mobilization.

1.3 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.4 SECURITY

A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft.

1.5 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

C. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

1.6 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2 feet or as required. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LOCATION OF CONSTRUCTION YARD/MATERIALS STORAGE AREA

A. Contractor shall coordinate with the City of Socorro to identify an area acceptable to the City within the fenced area of Well Site 13.

END OF SECTION

SECTION 01 60 00 – DEMONSTRATION OF SYSTEMS/COMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pre-operational, Startup, and Commissioning.

B. Related Sections include but are not necessarily limited to:

1. Division 1 - General Requirements.

1.2 DEFINTIONS

A. Pre-operational Period: The period of time after the initial installation/construction.

B. Startup Period: A period of time (anticipated one week) immediately following the completion of the pre-operational period during which the CONTRACTOR initiates flow through the facility, starts up process equipment, calibrates and adjusts systems, initiates the OWNER supplied programming and SCADA interface, confirms the equipment is working as a system, and treats raw water to desired water quality parameters. During this period, the CONTRACTOR and OWNER's O&M agents will verify system operation parameters.

C. Commissioning Period: A specified consecutive period of time (40 Hours) immediately following the completion of the startup period during which the CONTRACTOR operates the facility with support from the OWNER's O&M agent. Contractor shall operate the entire system with assistance from the City's O&M agents to the new onsite detention area for a period of 40-hours prior to the City's acceptance by verified OWNER supplied drinking water test results. The system shall be operated at a minimum of 4 hour cycles of constant runtime, including testing prior to acceptance per Specification 01 60 00.

D. Post Demonstration Period: The period of time after successful completion of the commissioning period but before final acceptance of Project during which the CONTRACTOR completes all punch list items and Project closeout procedures, and the OWNER has accepted ownership of the facility (30 Days).

1.3 SUBMITTALS

A. General:

1. Approved Operation and Maintenance manuals prior to start of startup.

2. Written request for OWNER and ENGINEER to witness each system start-up. Request to be received by OWNER minimum two weeks before scheduled training of OWNER's personnel on that system.

3. Equipment installation and start-up certifications.

4. Letter verifying completion of all pre-operational testing and start-up activities including receipt of all specified items from manufacturers/suppliers as final item prior to initiation of commissioning.

PART 2 - PRODUCUTS (Not Used)

PART 3 - EXECUTION

3.1 EXECUTION

A. General:

1. Demonstration of systems and commissioning of the facilities constructed under this Contract shall be performed in three phases, as indicated in Section 1.1.A.

B. Pre-operational Period:

1. CONTRACTOR requirements:

a. Properly connect, align, calibrate, and adjust all system components. Check out procedures include but are not limited to:

1) Ring out all power, control and monitoring circuits prior to connection.

2) Voltage check of all circuits.

3) Phase sequence check.

4) Connecting piping system cleanliness check.

5) Alignment check of all connected machinery.

6) Pressure and vacuum testing of all closed systems, including piping.

7) Check of lubrication.

8) Calibration of all safety equipment.

9) Manual rotation/movement of moving parts to assure freedom of movement.

10) "Bump starting" of electrical motors to verify proper rotation.

11) Check of valving orientation and position status for manual operating mode.

b. Clean water testing of tankage for integrity.

1) Verify proper instrumentation and control signal generation, transmission, reception and response.

2) Check that all tagging/identification systems are in place.

3) Achieve successful bacteriological test for piping and arsenic treatment vessels.

2. OWNER shall assist the CONTRACTOR with programming of each system prior to verifying functional integrity.

3. Provide all labor, supervision, utilities, equipment, vehicles, and required items necessary to perform work during this period. The CONTRACTOR shall be responsible for the disposal cost of waste chemicals.

4. Provide certificate signed by equipment manufacturer's representative and CONTRACTOR that equipment was correctly installed and is ready for operation.

C. Startup Period

1. CONTRACTOR Requirements

a. Initiate flow through the treatment facility with the assistance from the Owner's O&M Agents.

b. Startup process equipment with the assistance from the Owner's O&M Agents.

c. Calibrate and adjust system.

d. Provide training of OWNER personnel on all equipment during the startup period.

1) OWNER personnel training on individual systems will not be considered as meeting the Contract requirements unless:

2) All pretraining deliverables are received and approved.

3) During training, all system malfunctions are addressed.

4) All provisions of field/classroom training specifications are met.

5) Training not in compliance with the above will be performed again in its entirety by the manufacturer at no additional cost to OWNER.

e. Provide the OWNER with manpower as needed to operate the facilities.

f. Maintain the facilities.

g. Provide temporary piping as needed and dispose of flow from the onsite facilities. Sanitary sewer is not available to receive flows during startup.

h. Assist with operating the facilities and treat water to demonstrate compliance with water quality standards.

i. Assist with collecting water quality samples.

j. Perform the required OWNER supplied system programming and OWNER supplied SCADA interface.

2. ENGINEER Responsibilities

a. Prepare start-up plan.

3. OWNER Responsibilities

a. Perform lab water quality tests at his cost.

b. Provide raw water.

c. Assist with operating the facilities and treat water to demonstrate compliance with water quality standards.

d. Assist with collecting water quality samples.

e. Supply and assist with system programming and supplied SCADA interface.

D. Commissioning Period

1. CONTRACTOR Responsibilities

a. Complete punch list items.

b. Provide OWNER with manpower as needed to operate the facilities.

c. Maintain the facilities.

d. Upon completion of this period, treated water will be discharged to OWNER's distribution system.

2. ENGINEER Requirements

a. Prepare commissioning plan.

3. OWNER Responsibilities

a. Perform lab water quality tests at his cost.

b. Provide raw water.

c. Assist with operating the facilities and process existing waste activated sludge to demonstrate compliance with dewatering quality standards.

d. Assist with collecting water quality samples.

e. Supply and assist with system programming and supplied SCADA interface.

END OF SECTION

SECTION 01 60 50 – EQUIPMENT OPERATION AND MAINTENANCE

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. This section of the specification describes the project requirements for equipment manufacturer representatives' instruction of the OWNER's operation and maintenance personnel in the proper operation and maintenance of the equipment furnished under the Contract.

B. The CONTRACTOR shall require the equipment manufacturer or supplier to include the costs for the on-site operation and maintenance equipment instructions specified herein in their price quotations for the equipment to be furnished under the Contract.

C. It is the goal and intent of the equipment operation and maintenance instruction specified herein to provide the OWNER's operation and maintenance personnel with technically accurate and current information on the theory, design, practical operation and maintenance, appropriate hands-on or field experience such that the equipment, systems and/or components can be efficiently operated and maintained by the OWNER's staff upon completion of the instruction program.

1.2 OPERATION AND MAINTENANCE INSTRUCTIONS

A. An experienced and authorized representative of the manufacturer or supplier of each item of equipment listed below shall conduct an instruction program on the proper operation and maintenance of the equipment. Instruction shall be given only by qualified persons who are familiar with the equipment and systems installed in the work. The required amount of continuous on-site instruction for each item of equipment is specified in Divisions 26, 33, 43, and 46.

B. Equipment manufacturer operation and maintenance manuals, conforming to the requirements of individual specifications and specification 01 33 00 section 1.11 of these specifications shall be available for use in training.

C. The CONTRACTOR shall be solely responsible for scheduling the respective equipment operation and maintenance instruction sessions with the ENGINEER and OWNER. The instruction sessions shall be conducted with the installed equipment being fully tested, adjusted and operational. The equipment operation and maintenance instruction may be scheduled to immediately follow the manufacturer or supplier's representatives field inspection and final adjustment of the equipment provided that the representative can certify that the equipment has been installed in accordance with manufacturer's instructions and procedures and the equipment and controls operate properly.

D. The equipment operation and maintenance instruction sessions shall, as a minimum, cover the material presented in the manufacturer's O&M user manuals which shall serve as the manual for the instruction program, and the instruction sessions shall consist of both classroom instruction and field hands-on instruction. The instruction sessions for equipment or systems shall include separate material presentations for the mechanical, electrical and instrumentation portions of the equipment or system. The manufacturer's representative who will be conducting the training program shall prepare an outline of the material to be covered during both the classroom and hands- on field portions of instruction. The outline shall briefly describe what is to be discussed under each item, audio visual aids and other materials to be used in support of the O&M user manual material. The CONTRACTOR shall submit the training program outline to the ENGINEER at least thirty (30) days in advance of the start of the program to allow the ENGINEER adequate time to review its contents. The format and contents of the respective equipment instruction programs shall be changed to incorporate the OWNER's and ENGINEER's review comments on the program outline.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.1 OPERATION TRAINING - THE OPERATION TRAINING SESSIONS SHALL INCLUDE, BUT NOT BE LIMITED TO, THE FOLLOWING:

A. Overview of the equipment and auxiliary or support systems covering nomenclature, function and theory of operation.

B. General safety requirements for operation of the equipment and auxiliary or support systems, including suggested safety equipment.

C. Pre-startup safety and equipment check.

D. Equipment and auxiliary or support systems startup procedures covering manual and automatic modes, if applicable.

E. Equipment or system operation and monitoring requirements; including specifics on normally expected ranges for items such as oil, water pressure and temperature, discharge pressures, sensory observations, and procedures to change operation parameters (such as air or flow rate).

F. Equipment and systems shut down procedures covering manual and automatic and modes (if available).

G. Operational troubleshooting of equipment and auxiliary or support systems.

H. Procedure for handling non-routine operational problems such as response to alarms, power failures, emergency shutdown, and auxiliary or support system failures.

3.2 MAINTENANCE TRAINING - THE MAINTENANCE TRAINING SESSIONS SHALL BE COORDINATED AS EXPLAINED HERE UNDER

A. If a session is specific to a discipline (electrical, mechanical, electrical/ instrumentation) include only appropriate maintenance items for that discipline; if sessions are to include multiple disciplines, include all items for all disciplines and indicate in submittal outline which discipline the material refers to.

B. All disciplines shall include, but not be limited to, the following:

1. Overview of the equipment and auxiliary or support systems covering nomenclature, function and theory of operation.

2. General safety requirements for maintenance of the equipment and auxiliary support systems appropriate to each discipline including suggested equipment and practices. Cover local and remote lockout procedures, safe procedure for handling alarms and built-in safety devices during preventive and corrective maintenance.

3. Overview of pre-startup, routine operation monitoring, and shutdown procedures covering automatic and manual modes (if applicable).

C. Each specific discipline shall include, but not be limited to, the following:

1. Provide preventive maintenance procedures to be followed; include parts, lubrication quantities, types, frequencies, application points, and time requirements to perform procedures.

2. Specific procedures to cover adjustments required for alignment, wear, calibration for all preventive maintenance and corrective maintenance procedures including time required to perform.

3. Special tools, techniques or procedures required for either preventive or corrective maintenance of equipment or its' auxiliary or support systems.

4. Assembly and disassembly procedures required for preventive or corrective maintenance (the use of models, "exploded" views, part listed, hands-on field training or other audio-visual materials are recommended

for this area of training). Include time requirements for procedures performed.

5. Maintenance troubleshooting of equipment and auxiliary systems.

3.3 CERTIFICATES OF INSPECTION

A. Provide Certificate signed by equipment manufacturer, CONTRACTOR and OWNER documenting that training was successfully completed.

END OF SECTION

SECTION 01 70 00 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Spare parts and maintenance Products.

G. Warranties and bonds.

H. Maintenance service.

1.2 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for City of Socorro and Engineer review.

B. Provide submittals also that are required by governing or other authorities to City of Socorro Project Manager.

C. Submit final Application for Payment identifying total adjusted Contract Sum/Price, previous payments, and amount remaining due.

1.3 FINAL CLEANING

A. Contractor provide final cleaning after final acceptance.

B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, and polish transparent and glossy surfaces.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Clean or replace filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.4 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.5 PROJECT RECORD DOCUMENTS

A. Maintain on site, a set of the following record documents; record actual revisions to the Work:

1. Drawings.

2. Specifications.

3. Addenda.

4. Change Orders and other modifications to the Contract.

5. Reviewed Shop Drawings, Product Data, and Samples.

6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store Record Documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:

1. Manufacturer's name and product model and number.

2. Product substitutions or alternates utilized.

3. Changes made by Addenda and modifications.

F. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to finish floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

4. Field changes of dimension and detail.

5. Details not on original Contract Drawings.

G. Submit documents to City of Socorro Project Manager with claim for final Application for Payment.

1. Submittal shall include the following:

a. Two complete sets of record drawings comprised of the following:

1) Qty 4 bond set of 24”x36”

2) Qty 1 bond set of 11” x 17”

3) Qty 1 thumb drive

b. Record Specifications

c. Close-out documentation, including:

2. All previously approved change orders, in sequential order

3. Listing of approved shop drawings

4. Consent of Surety form, provided by surety

5. Certificate and Release of Lien Forms

6. Affidavit of Wages Paid.

H. OPERATION AND MAINTENANCE DATA

1. Submit two full copies of preliminary draft of proposed formats and outlines of contents before start of Work, including access to an electronic version (PDF) with individual tabbed sections. Owner will distribute draft for review and return one copy with comments.

2. Submit data bound in 8-1/2 x 11-inch text pages, contained in sets of multiple 3- ring binders with highly durable plastic covers, including access to an electronic version (PDF) with individual tabbed sections.

3. Prepare binder covers and electronic documents with printed title as follows: "OPERATION AND MAINTENANCE INSTRUCTIONS" "CITY OF SOCORRO-BELT FILTER PRESS"

a. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

b. Contents: Prepare a Table of Contents for each volume, with each Product or System description, including belt filter presses, polymer systems, pumps, wash water pumps, controls, and plant wash water system typed on 24-pound white paper, in three parts as follows:

1) Part 1: Directory, listing names, addresses, and telephone numbers of Engineer, Contractor, Subcontractors, and major equipment suppliers.

2) Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

c. Significant design criteria.

d. List of equipment.

e. Parts list for each component.

f. Operating instructions.

g. Maintenance instructions for equipment and systems.

h. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

4. Part 3: Project documents and certificates, including the following:

a. Shop Drawings and product data.

b. Air and water balance reports.

c. Certificates.

d. Photocopies of warranties and bonds.

I. Submit one draft copy of completed volumes in final form 30 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Owner/Engineer comments. Revise content of documents as required prior to final submission.

J. Submit Three (3) sets of final volumes as revised, along with final thumb drive and / or electronic downloaded files within ten (10) days of receipt of Owner/Engineer comments.

1.6 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra Products in quantities specified in individual Specification sections.

B. Deliver to Project site and place in location as directed by the Owner; obtain receipt prior to final payment.

1.7 WARRANTIES AND BONDS

A. Provide duplicate notarized copies.

B. Execute and assemble transferable warranty documents from subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in three side ring binder with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.8 MAINTENANCE SERVICE

A. Furnish service and maintenance of components indicated in specification sections during the warranty period.

B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

D. Maintenance services shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 02 41 10 - CUTTING AND PATCHING

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. This Section includes procedural requirements for cutting and patching.

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. Products: List products to be used and contractor(s) or entities that will perform the Work.

4. Dates: Indicate when cutting and patching will be performed.

5. Utility Services and Mechanical/Electrical Systems: As applicable, list services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and calculations showing integration of reinforcement with original structure.

7. ENGINEER’S Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. 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 result in increased maintenance or decreased operational life or safety.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, which results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

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

B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The CONTRACTOR'S attention is directed to the fact that the existing facilities

must be kept in service throughout the construction period and that no interruption will be permitted that adversely affects operation of the facilities. When permission is obtained from the OWNER, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum flow.

B. The CONTRACTOR shall make his own investigations and determine the nature of work involved in making the connections and modifications to existing facilities in the manner intended by the Plans. The CONTRACTOR shall then coordinate the items requiring interruptions with the Engineer and OWNER, and proceed only when approval is obtained from the OWNER and within the time frame permitted by the OWNER.

C. All work involved in making connections which will require that existing facilities be taken out of service shall be carefully planned and coordinated with both the ENGINEER and the OWNER so that "down time" of the existing facilities may be held to a minimum. On occasions when more than one parallel existing facility (basin, pump, pipeline, etc.) must be taken out of service for the purpose of making a connection, work shall proceed on a 24- hour schedule until the facilities are back in operation.

D. Sequencing and coordination requirements are described in Section 1.3 - Submittals.

E. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.

2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. 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.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. 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, if applicable.

3.3 PERFORMANCE

A. 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.

2. 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 at no additional cost. If possible, review proposed procedures with original Installer and comply with original Installer's written recommendations.

3. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

4. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

5. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

6. Excavating and Backfilling: Comply with requirements in applicable specification sections where required by cutting and patching operations.

7. 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.

8. Proceed with patching after construction operations requiring cutting are complete.

B. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work at no additional cost. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate 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 eliminate evidence of patching and refinishing.

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.

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 weather-tight condition.

C. The CONTRACTOR shall dewater and clean existing basins, pipelines and equipment as specified and, when necessary to complete the work, shall be the responsibility of the CONTRACTOR. No additional payment will be made for such work.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials at no additional cost.

END OF SECTION

SECTION 02 41 13 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following selective demolition work when shown on the Drawings:

1. Demolition, removal, and disposal of selected portions of building or structure.

2. Demolition, removal, and disposal of selected site elements.

3. Salvage of existing items to be reused or recycled.

B. Related Sections include the following:

1. Section 02 41 10 "Cutting and Patching" for cutting and patching procedures.

2. Excavation and Backfilling

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled elsewhere in the Contract Documents.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, and locations of temporary partitions and means of egress.

B. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, which might be misconstrued as damage caused by selective demolition operations. Comply with photographic documentation requirements in Division 1. Submit seven days before Work begins.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program, if required.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Pre-Demolition Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. OWNER will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so OWNER'S operations will not be disrupted.

B. OWNER will maintain conditions existing at time of inspection for bidding purpose as far as practical.

C. Notify ENGINEER of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is unknown whether hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify ENGINEER and OWNER. OWNER will

remove hazardous materials under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to ENGINEER.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

1. Comply with requirements specified in Division 1

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.

2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building at no additional cost.

3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing at no additional cost.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities at no additional cost.

1. Comply with requirements for access and protection specified in Section 01 50 00.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain, at no additional cost.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished, at no additional cost.

3.4 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations at no additional cost and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.

2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire- suppression devices during flame-cutting operations.

4. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

5. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items, at no additional cost:

1. Clean salvaged items.

2. Pack or crate items after cleaning. Identify contents of containers.

3. Store items in a secure area until delivery to OWNER.

4. Transport items to OWNER'S storage area designated by OWNER.

5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items, at no additional cost:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.

2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

D. Existing Items to Remain at no additional cost: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by ENGINEER, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 HAZARDOUS MATERIALS

A. This Section does not address removal of hazardous materials or substances such

as asbestos or polychlorinated biphenyls (PCBs). If these materials or substances are or could be found on-site, stop work in the area and notify the OWNER and ENGINEER.

B. OWNER will contract with a licensed remediation or abatement firm to determine if dangerous materials exist in the demolition area. If they exist, the firm will proceed with the removal.

C. PCBs are heavy, oil-like liquids or solids, clear to yellow in color, produced in the U.S. from 1929 to 1977; their manufacturer banned in 1979. PCBs were used as dielectric fluids in electrical transformers, capacitors, and fluorescent light ballasts; also in adhesives and calking compounds.

D. Asbestos used in many construction products was banned in 1978. In construction completed before 1978, asbestos is typically found in four forms; as sprayed- or troweled-on surfaces for ceilings or walls; as the thermal insulation around pipes or ducts; as fire proofing on structural members; and in various materials, such as shingles, roofing tiles, and gypsum board patching compounds.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain OWNER'S property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off OWNER'S property and legally dispose them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

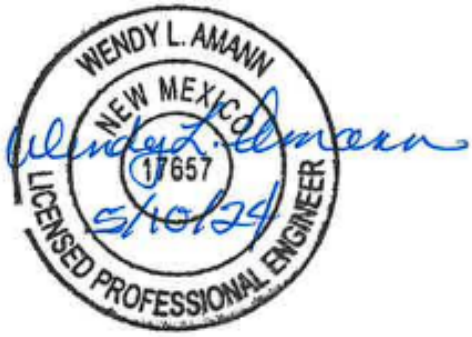
END OF SECTION

PROJECT MANUAL

PROJECT: CITY OF SOCORRO
WASTEWATER TREATMENT PLANT
BELT FILTER PRESS REPLACEMENT

OWNER: CITY OF SOCORRO
Public Utilities – General Services
111 School of Mines Road
Socorro, NM 87801
Contact: Lloyd Martinez, P.E, Director

"The technical material and data contained in the specifications were prepared under the supervision and direction of the undersigned, whose seal as a Registered Engineer, licensed to practice in the State of New Mexico, is affixed below." "All questions about the meaning or intent of these documents shall be submitted only to the Engineer of Record, stated above, in writing.



ENGINEER OF RECORD: Huitt-Zollars, Inc.
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Contact: Wes Vote, P.E.
wvote@huitt-zollars.com
(505) 892-5141ph (505) 892-3259 fax

SECTION 03 10 00 - CONCRETE FORMWORK

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 01 33 00 – Submittals

B. Section 01 40 00 – Quality Control

C. Section 31 00 00 – Earthwork

D. Section 03 20 00 – Concrete Reinforcement:

E. Section 03 30 00 – Cast-in-Place Concrete

1.2 QUALITY ASSURANCE

A. Codes and Standards: Comply with the following codes and standards including current editions, revisions, and supplements.

1. International Code Council – International Building Code.

2. ACI 347, Recommended Practices for Concrete Formwork.

3. PS 1 Construction and Industrial Plywood.

4. PS 20 American Softwood Lumber Standard.

5. ACI 301, Specifications for Structural Concrete for Buildings.

B. Inspection: Forms and Formwork are subject to inspection by Architect. Notify Architect prior to placing concrete. Damaged or improperly installed formwork will be rejected.

C. Coordination: Coordinate with other trades, installing all inserts, conduits, sleeves, anchors, etc., properly prior to placement of concrete.

PART 2 - PRODUCTS

2.1 FORM MATERIALS:

A. Forms for Exposed Finish Concrete:

1. General: Construct all formwork for cast-in-place concrete with plywood, metal, metal-framed plywood-faced or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Provide form material in the largest practicable sizes to minimized number of joints.

2. Plywood: Use B-B plyform, sanded, Class 1, EXTDFPA grade trademarked of the American Plywood Association, PS 1-66.

3. Lumber: For forming studs and whalers, use 2” nominal thickness, construction grade Douglas Fir. For concealed concrete surfaces, use construction grade Douglas Fir, shiplap or tongue and groove, nominal 1” thickness.

4. Concrete Column Forms: Sonotube Finish Free Concrete Forms with Duraglas Coating.

B. Forms for Unexposed Finish Concrete: Use plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Form coating compounds shall be first quality of their respective kinds and shall be non-staining, non-grain raising, free of mineral oils and other non-drying ingredients, and leaving no bond-inhibiting residues on concrete. The following products are acceptable form coatings and require no further approval.

D. Chamfer Strips: ¾” by ¾” wood, PVC, or rubber.

E. Expansion Joint Material: Asphalt saturated fiberboard, ½” thick, meeting the requirements of ASTM D 1751.

F. Felt: Asphalt-saturated organic felt, weighing 30 pounds per 100 square feet, meeting the requirements of ASTM D 226.

2.2 TIES AND SPREADERS:

A. Form ties and spreaders shall be prefabricated, rod, architectural snap types, flat band or threaded internal disconnecting type, of sufficient strength to resist all imposed loads of fresh concrete and with external holding devices of adequate bearing area. Ties shall permit tightening and spreading of forms and leave no metal closer than one (1) inch from surfaces. All form ties shall be a type which does not leave an open hole through the concrete which permits neat and solid patching at every hole.

B. Wire ties and wood spreaders shall not be used.

2.3 ROUGH HARDWARE:

A. Accessories: Furnish and install all bolts, anchors, expansion joints and bolts, strap anchors, etc., required for all embedded work.

PART 3 - EXECUTION

3.1 FORM TYPES:

A. Concealed Surfaces: For footings, foundation walls, grade beams and surfaces indicated to be covered by other materials, use boards, plywood, reinforced plastic, sonotubes or metal forms as specified in paragraph 2.1 above.

B. Exposed Surfaces: Use plywood or metal forms as specified in paragraph 2.1 above.

3.2 INSTALLATION:

A. General:

1. Install in accordance with ACI 301, Chapter 6.

2. Construct forms to exact shapes, sizes, lines and dimensions as required to obtain accurate alignment, location and grades, and level and plumb work in finished structure. Provide for openings, offsets, recesses, moldings, blocking, bulkheads, anchorages and other required features. Make forms easily removable without hammering or prying against concrete. Use metal spreaders to provide accurate spreading of forms. Construct forms so that no sagging, leakage or displacement occurs during and after pouring of concrete.

3. Install form liner at retaining wall in full conformance with manufacturer's recommendations and established procedures. If form liner becomes displaced during concrete placement, resulting in poor aesthetic quality of retaining wall surface, retaining wall shall be removed and reinstalled at Contractor's expense.

3.3 EMBEDDED ITEMS AND ROUGH HARDWARE:

A. Conduits, electrical under floor ducts or Pipes shall be located to avoid reducing the strength of the construction, and in no case shall pipes other than conduits be placed in a slab 4-1/2" or less in thickness. Conduit buried in concrete slabs shall not have an outside diameter greater than 1/4 of the thickness of the slab nor be placed over top reinforcing steel.

B. Pipe Sleeves may pass through slabs or walls, provided that they are not exposed to rusting or other deterioration and are of uncoated or galvanized iron or steel. Sleeves shall be large enough to pass any hub or coupling on the pipeline.

C. Conduits may be embedded in walls provided they are not larger in outside diameter than 1/3 the thickness of the wall, are not spaced closer than three diameters on center, and do not impair the strength of the structure.

END OF SECTION

SECTION 03 20 00 - CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 01 33 00 – Submittals

B. Section 01 40 00 – Quality Control

C. Section 03 10 00 – Concrete Formwork

D. Section 03 30 00 – Cast-in-Place Concrete

1.2 QUALITY ASSURANCE:

A. Codes and Standards: Comply with the following codes and standards including current editions, revisions and supplements.

1. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete.

2. ACI 318, Building Code Requirements for Reinforced Concrete.

3. Concrete Reinforcing Steel Institute, Manual of Standard Practice.

B. Testing Agency Qualifications: An independent agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.3 SUBMITTALS:

A. Reinforcement Shop Drawings: In advance of fabrication, complete Shop Drawings necessary for the fabrication of each component part of the concrete reinforcing. Comply with ACI SP-066. Shop drawings shall, at a minimum, contain the following items:

1. Bar schedules.

2. Stirrup spacing.

3. Diagrams of bent bars.

4. Arrangements and assemblies required for the fabrications and placement of concrete reinforcement and embedded rough hardware.

5. Special reinforcement at openings through concrete structures.

6. Locations of splices and details of mechanical splice couplers.

7. Tie spacing and hoop spacing.

8. Supports for concrete reinforcement.

B. Material Test Reports: Steel Reinforcement:

1. Certified mill test reports

C. Qualification Statements: For testing and inspection agency

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Reinforcement:

1. Deformed Steel Reinforcing Bars: ASTM A 615, Grade 60. Ties and stirrups may be Grade 40. The surface of reinforcement and accessories shall be clean and free of any oil, grease, grit, dust or other surface contaminants at time of coating.

2. Supports for Reinforcing Bars and Welded Wire Fabric: CRSI MSP-1, hot-dipped galvanized. Supports shall include bolsters, chairs, spacers and all other devices necessary for proper spacing, supporting, and fastening reinforcing bars and wire fabric in place. Precast blocks with integral tie wire may be used for supporting reinforcing in bottom of mat of footings.

3. Tie Wires: ASTM A1064, annealed steel, not less than 0.0508 inch in diameter.

B. Reinforcement Accessories: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

PART 3 - EXECUTION

3.1 FABRICATION:

A. General:

1. Shop fabricate reinforcing bars to conform to required shapes and dimensions, with fabrication tolerances complying with ACI 315. In case of fabricating errors, do not re-bend or straighten reinforcement in a manner that will injure or weaken the material.

B. Unacceptable Materials:

1. Reinforcement with the following defects will not be permitted in the Work:

a. Bar lengths, depths and bends exceeding specified fabrication tolerances, unless approved by Engineer.

b. Bends or kinks not indicated on Drawings or final Shop Drawings.

c. Bars with reduced cross-section due to excessive rusting or other cause.

3.2 CONCRETE COVER:

Install reinforcement to achieve the following minimum coverage of concrete, unless noted otherwise on the Drawings:

A. Concrete cast against and permanently exposed to earth:

1. Minimum Cover: 3 inches

B. Concrete exposed to earth or weather:

1. No. 6 through No. 18 bar: 2 inches

2. No. 5 bar, W31 or D31 wire, and smaller: 1-1/2 inches

C. Concrete not exposed to weather or in contact with ground:

1. Slabs, walls, joists:

a. No. 11 bar and smaller: ¾ inches

b. Beams, columns:

1) Primary reinforcement, ties, stirrups, spirals: 1-1/2 inches

3.3 INSTALLATION:

A. General:

1. Comply with the specified codes and standards and Concrete Reinforcing Steel Institute recommended practice for “Placing Reinforcing Bars”, for details and methods of reinforcement placement and supports, and as herein specified.

2. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

B. Reinforcement:

1. Position, support and secure reinforcement against displacement by formwork, construction or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
    a. Hold reinforcement steel in slabs above substrate using metal chair spacers of quality required to hold steel at proper height and alignment.

    b. Hold welded wire fabric in slabs using plastic or metal chairs with sand plates designed for use with welded wire fabric to hold at proper height and alignment. Pulling in place welded wire fabric with a hooked-bar shall not be used and is not an acceptable means of properly setting fabric in place, and shall be reason for rejection and removal of slab.

    c. Dowels shall be installed and secured prior to pour. Wet setting of dowels is unacceptable and reason for rejection.

2. Place reinforcement to obtain the minimum coverage for concrete protection. Arrange, space, and securely tie bars and bar supports together with 16 gage wire to hold reinforcement accurately in position during concrete placement operations. Set wire ties so that ends are directed away from exposed concrete surfaces.
3. Provide sufficient numbers of supports and of strength to carry reinforcement. Do not place reinforcing bars more than two (2) inches beyond last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.
4. Splices: Provide standard reinforcement splices by lapping ends, placing bars in contact and tightly wire tying lap splices 36 bar diameters for #6 and smaller, 48 bar diameters for #7 and larger or 24 inches minimum, unless greater splice length is shown on Drawings. Comply with requirements of

ACI 318 for minimum lap of spliced bars.

C. Tolerances:

1. Comply with ACI 117.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement welding.

END OF SECTION

SECTION 03 30 00 – CAST IN PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Section 01 33 00 – Submittals

B. Section 01 40 00 – Quality Control

C. Section 03 10 00 – Concrete Formwork

D. Section 03 20 00 – Concrete Reinforcement

1.2 QUALITY ASSURANCE:

A. Qualification of Manufacturer: Manufacturer of ready-mix concrete shall show experience of producing concrete for similar size projects for a minimum of 5 years and shall conform to ASTM C 94.

B. Codes and Standards: Comply with the following codes and standards including current editions, revisions and supplements.

1. ACI 301, Specifications for Structural Concrete for Buildings.

2. ACI 306.1, Standard Specification for Cold Weather Concreting.

3. CI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.

4. ACI 318, Building Code Requirements for Reinforced Concrete.

5. International Code Council – International Building Code.

C. Quality Control: Testing Laboratory, test costs, and test reports in accordance with SECTION 01 40 00 QUALITY CONTROL and Paragraph 3.1 below.

1.3 SUBMITTALS:

A. Manufacturer's Literature: Description and recommended installation/application instructions for admixtures, curing compounds, sealers/hardeners, coatings, patching compounds, grouts, filler strips, leveling compounds, etc.

B. Concrete Test Reports: Reports of concrete compression, yield, air content, and slump tests. Testing Laboratory shall submit two copies of the report to Engineer and one copy to the Contractor. See Part 3.11 for required testing.

C. Material Test Reports: For each of the following, from a qualified testing agency.

1. Portland cement.

2. Fly ash.

3. Aggregates.

4. Admixtures.

5. Epoxies

6. Cement bonding agents.

D. Material Certificates: For each of the following, signed by manufacturers.

1. Cementitious materials.

2. Admixtures.

3. Curing compounds.

E. Design Mix: Mix design shall conform to the requirements of ACI 301, Section 4. Submit design mix prior to placing any concrete, with the following information:

1. Mixture identification.

2. Minimum 28-day compressive strength.

3. Durability exposure class.

4. Maximum water:cement ratio.

5. Design slump.

6. Air content.

7. Nominal maximum aggregate size.

8. Intended placement method.

9. Material content per cubic yard of each class of concrete furnished.

10. Results of laboratory tests performed within past six months indicating that aggregate from the proposed source meet requirements of ASTM C 33.

11. Dry weights of cement, saturated surface-dried weights of fine and coarse aggregate, quantities, type and name of admixtures, weight of water,

ready-mix delivery tickets, ASTM C 94, design mix certification that mix designs conform to specification by Testing Laboratory.

12. All fly ash shall conform to Class F.

F. Exterior Concrete: All exterior concrete shall contain between six (6) and eight (8) percent entrained air.

1. Shop Drawings: Submit shop drawings indicating dimensions drawn to a minimum scale of 1/8" = 1'-0" with reinforcing requirements shown. Contractor shall be responsible for verifying dimensions. Photocopy of structural plan will not be acceptable.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Portland Cement: ASTM C 150 (4,000 psi), Types I or II, low alkali. Use only one brand and supplier throughout the Project. Do not change brand without prior approval.

B. Aggregates: ASTM C 33. Furnish clean, crushed rock or washed gravel coarse aggregate from single source.

1. Alkali-Silica Reaction: Comply with one of the following:

a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

2. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water Reducing Admixtures: ASTM C 494, Type A.

D. Air-Entraining Admixtures: ASTM C 260, CRD C 13, AASHTO M 154.

E. Water Reducing and Retarding Admixture: ASTM C 494, Type D.

F. High Range Water Reducing Admixture: ASTM C 494, Type F.

G. Water: Potable.

H. Concrete Patching Compound:

1. Description: Fast setting, non-shrink patching material used for repairing/patching honeycomb, spalls, cracks, holes left by tie wires or spreaders and construction faults in concrete.

I. Non-Shrink Grout: Corps of Engineers CRD-C 588.

J. Curing Sheet: ASTM C 171, polyethylene, non-staining white types.

K. Floor Filling/Leveling Materials: Cement based, self-leveling.

L. Filler Strips: Provide widths and depths as indicated on the Drawings.

1. Bituminous Type: ASTM D 1751, non-extruding, resilient type, for exterior use as required.

2. Non-Bituminous Type: ASTM D 1752, Type I or II, non-extruding, resilient type, for interior use where expansion material is required.

M. Curing-Sealing-Hardener Compound: ASTM C 309, FS TT-C-00800A.

N. Curing Compound: ASTM C 309 and ASTM C 156, clear, non-staining and non-discoloring, non-residual cure for concrete to receive toppings or adhered-type floor covering.

2.2 PROPORTIONING AND DESIGN OF MIXES:

A. Prepare design mixes for each type on concrete. Admixtures shall not be used for cement replacement to reduce minimum cement content.

B. Concrete:

1. See General Structural Notes on the Contract Drawings for 28-day compressive strength requirements.

2. Maximum w/c ratio: 0.45.

3. Slump limit: 5 inches +/- 1 inch.

4. Air content:

a. 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size, 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size, 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-1/2-inch nominal maximum aggregate size.

C. Basis of Mix Designs:

1. Control concrete mixes in accordance with Section 4, Specification for Reinforced Concrete for Buildings (ACI-301).

PART 3 - EXECUTION

3.1 NOTIFICATION OF OWNER OR OWNER'S REPRESENTATIVE PRIOR TO PLACING CONCRETE:

A. Contractor shall notify Owner or Owner's Representative at least 24 hours prior to placing any concrete.

3.2 PREPARATION FOR CONCRETE PLACEMENT:

A. Formwork: Comply with requirements of ACI 301, Section 2, and the completed cast-in-place shall conform to the tolerances specified in that referenced standard specification.

B. General: Before placing concrete, inspect and verify that formwork, reinforcing steel and items to be embedded or cast-in-place have been installed. Notify other trades to complete the installation of embedded items, coordinate trades in setting such work, as required. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen substructure or substructure containing frozen materials. Remove excess water from forms before concrete is deposited. Remove hard concrete, debris, and foreign materials and ice from interior of forms and from inner surfaces of mixing and conveying equipment. Do not add water at job site without permission and approval by Engineer or Contractor's superintendent. Report on batch ticket the amount of water added at the job site.

C. Wetting: Wet wood forms sufficiently to tighten up cracks. Wet other materials sufficiently to reduce suction and maintain concrete workability.

D. Earth Subgrade: Lightly dampen 24 hours in advance of concrete placing, but do not muddy. Re-roll where necessary for smoothness and remove loose material.

E. Removing Forms:

1. General: Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided curing and protection operations are maintained.

2. Formwork Supporting Weight of Concrete: Such as beam soffits, joists, slabs, and other structural elements may not be removed in less than 14 days or until concrete has attained at least 75 percent of design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete locations or members.

3. Form-Facing Materials: May be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing materials without loosening or disturbing shores and supports.

3.3 HOT AND COLD WEATHER OPERATIONS:

A. Hot Weather Concreting Operations:

1. When concrete is placed under conditions of hot weather concreting, provide extra protection of concrete, as specified within ACI 305. Hot weather is defined as air temperatures which exceed 80 degrees F.

2. During curing operation cover concrete with wet burlap or cotton mats. Keep mats constantly wet for seven (7) days minimum. Keep mats covered with sheet polyethylene. Leave mats in place for three (3) days after discontinuing wetting process.

B. Cold Weather Concreting Operations:

1. When concrete is placed under conditions of cold weather concreting (defined as a period when the mean daily temperature drops below 40 degrees F. for more than three (3) successive days), take additional precautions as specified herein and in “Specifications for Cold Weather Concreting” by American Concrete Institute (ACI 306) when placing, curing, monitoring and protecting fresh concrete.

2. During the curing operation, maintain the temperature of the placed concrete as constant as possible, and protect from rapid atmospheric temperature changes.

3. Maintain the concrete in a continually moist condition during the curing process by leaving the forms in place as long as possible and by use of steam and/or moisture retaining covers on unformed surfaces.

4. Following the curing operation, avoid rapid changes in concrete temperature. Do not allow the internal temperature of the concrete to change at a rate which exceeds 50 degrees F. in any 24-hour period or 5 degrees F. in any one hour.

3.4 CONCRETE PLACING

A. Notify Engineer and testing and inspection agencies 24 hours prior to commencement of concrete placement.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect and Structural Engineer of record in writing, but not to exceed the amount indicated on the concrete delivery ticket. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Joints in Concrete:

1. Locate joints in concrete where indicated on the Drawings or at points of low stress.

2. Keep hardened concrete wet for at least 24 hours before placing new concrete.

D. Conveying and Placing:

1. Do not place concrete until reinforcing steel and forms have been approved by Engineer and other authorities having jurisdiction.

2. Do not drop concrete from its point of release at mixer, hoppers, tremies, or conveyances more than six (6) feet for concealed concrete and three (3) feet for exposed concrete and otherwise prevent segregation of aggregate.

3. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one portion to another.

4. Place concrete into forms immediately after mixing in a manner that will prevent separation of ingredients and in horizontal layers not over 18 inches thick. Deposit concrete continuously such that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

a. If a section cannot be placed continuously, provide construction joints as indicated.

b. Deposit concrete to avoid segregation.

c. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

5. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

E. Consolidating: Consolidate concrete in accordance with ACI 301. Consolidate each layer of concrete with mechanical vibrating equipment. Transmit vibration directly to concrete, in no case through forms. Supplement vibration by forking or spading by hand adjacent to forms. Consolidate concrete into corners and angles of forms and around reinforcement and embedded fixtures.

1. Do not use vibrators to transport concrete inside forms.

2. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.

3. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.

F. Operation of Vibrators: Employ skilled and experienced workmen to operate vibrators. Do not transport concrete in forms with vibrators nor allow vibrator to contact forms or reinforcing. In vibrating freshly placed concrete, push the vibrator down vertically into preceding layers that are still completely plastic and slowly withdraw, producing maximum obtainable density in concrete without creating voids or segregation. Under no circumstance disturb concrete that has stiffened or partially set. Vibrate at intervals not exceeding 2/3 the effective visible vibration diameter of the submerged vibrator. Avoid excessive vibration that causes concrete segregation.

G. Correction of Segregation: Before placing next lift, and at top of last placement for vertical elements, remove concrete containing excess water or fine aggregate, or showing deficiency of coarse aggregate and fill the space with compacted concrete of correct proportions.

3.5 CURING FORMED CONCRETE:

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301and ACI 306.1 for cold weather protection during curing.

2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.

3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h), calculated in accordance with ACI 305.1, before and during finishing operations.

B. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

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 for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.6 RUBBED CONCRETE FINISH:

A. Preparation: Remove form marks, offsets, high spots and other defects and in uniform planes, in good condition to receive concrete coating. Fill honeycombed areas 3/8” or more in depth with concrete patching compound specified above. Surface of concrete to be coated shall be clean, free of laitance, dirt, dust, grease, form oil, efflorescence, paint and foreign materials which may be detrimental to adhesion of concrete coating.

B. Application: Mix concrete coating materials with clean water and bonding agent following manufacturer’s recommendations. Apply a light trowel coat of concrete coating compound over entire surface to be treated, making sure the material is firmly pressed into voids and leveled. Allow this coat to cure thoroughly before applying the final trowel application. When surface is set to point where the coating will not roll or lift, float uniformly using a sponge to achieve desired texture.

3.7 EQUIPMENT PADS:

A. Cast-in-place equipment pads for mechanical and electrical apparatus as indicated and/or as detailed on the Drawings. Verify exact sizes and location prior to forming concrete.

3.8 GROUTING:

A. Mixing: Mix approved non-shrink grout with sufficient water to cause it to flow under its own weight for grout. Field produced grout mix where non-shrink grout is required shall conform to ASTM C 270 and be proportioned by volume as follows:

1. One (1) part Portland cement.

2. 1/2 parts Type “S” hydrated lime or lime putty.

3. 4-1/2 parts sand.

B. Placing and Curing: Place fluid grout from one side and puddle for complete filling of voids; do not remove dams or forms until grout attains initial set. Finish exposed surfaces smooth and cure with damp burlap at least three (3) days.

3.9 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Engineer.
2. Remove and replace concrete that cannot be repaired and patched to Engineer’s approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

a. Limit cut depth to 3/4 inch.
b. Make edges of cuts perpendicular to concrete surface.
c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
d. Fill and compact with patching mortar before bonding agent has dried.
e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement, so that, when dry, patching mortar matches surrounding color.

a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

    a. Correct low and high areas.
    b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

3. After concrete has cured at least 14 days, correct high areas by grinding.

4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.

    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.

6. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.

c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
d. Place, compact, and finish to blend with adjacent finished concrete.
e. Cure in same manner as adjacent concrete.

8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
b. Dampen cleaned concrete surfaces and apply bonding agent.
c. Place patching mortar before bonding agent has dried.
d. Compact patching mortar and finish to match adjacent concrete.
e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.10 INSPECTION AND TESTING OF CONCRETE:

A. General:

1. The Contractor shall engage at his expense, an independent testing laboratory approved by Engineer, to conduct and interpret tests and reports and retests and reports. Testing Laboratory will perform tests as specified herein and as directed by Engineer. Retesting due to non-compliance shall be at Contractor’s expense.

2. Concrete will be sampled and tested for quality control during the placement of the concrete as follows:

a. Sampling fresh concrete ASTM C 172 except modified for slump.

1) As required for each test.

b. Slump test per ASTM C 94 ASTM C 143

1) One (1) for each concrete sample at point of discharge and one (1) for each set of compressive strength tests.

c. Air content by ASTM C 138, C 173, or C 231

1) One (1) for each set of method compressive strength tests.

d. Concrete Temperature: ASTM C1064/C1064M

1) One (1) test hourly when air temperature is 40 degrees F and below 80 degrees F and above. One (1) test for each composite sample.

e. Compression test specimens per ASTM C 31

1) One (1) set of four (4) 6-in by 12-in cylinders for each compressive strength test. Two (2) shall be laboratory cured and two (2) shall be field cured.

2) Quantity of testing:

a) One (1) set for each 25 cubic yards or fraction thereof of each concrete class placed in any one day.

f. Compression testing per ASTM C 39

1) Specimens shall be tested at following rates and intervals:

a) Four (4) specimen at seven (7) days. Four (4) specimens at twenty-eight (28) days. Hold four (4) cylinders in reserve.

b) A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

B. Batch Plant Tickets: Submit certification of ready mixed concrete. If concrete is altered by addition of water, admixtures, etc. on site, these alterations must be recorded on the batch ticket and a copy sent directly to the Engineer. Other batch plant tickets shall be retained on site for review by Engineer.

C. Defective Work: Acceptance or rejection of concrete shall be based on ACI 318-05 Building Code Requirements for Reinforced Concrete.

1. Concrete proven to be defective for any reason may be ordered to be removed and replaced at discretion of Engineer. If drilled core tests are required by Engineer to determine exact strength of concrete in question,

costs of drilling and testing will be at Contractor's expense. Indications of strength below requirements shall make it mandatory that cement or water ratio be changed immediately to improve strength at Contractor's expense.

2. When there is evidence that strength of concrete structure in place does not meet Specification requirements, cores drilled from hardened concrete for compressive strength determination shall be made in accordance with ASTM C 42, and as follows:

    a. At least three (3) representative cores shall be taken from each member or area of concrete-in-place that is considered potentially deficient. Location of cores will be determined by Engineer.

    b. Cores shall be tested after moisture conditioning in accordance with ASTM C 42 if concrete they represent will be more than superficially wet under service.

END OF SECTION

SECTION 03 40 01 – EPOXY RESIN/PORTLAND CEMENT BONDING AGENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Epoxy Resin

2. Portland Cement Bonding Agent

1.2 REFERENCES

A. American Society for Testing of Materials (ASTM):

1. C 109 - Test Method for Compressive Strength of Hydraulic Cement Mortars.

2. C 348 - Test Method for Flexural Strength of Hydraulic Cement Mortars.

3. C 496 - Test Method for Splitting Strength of Cylindrical Concrete Specimens.

4. C 882 - Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Sika Corporation, Lyndhurst, New Jersey, Sika Armatec 110.

B. Substitutions: The use of other than the specified product will be considered providing the CONTRACTOR request its use in writing to the ENGINEER. This request shall be accompanied by:

1. A certificate of compliance from an approved independent testing laboratory that the proposed substitute product meets or exceeds specified test standards.

2.2 PERFORMANCE CRITERIA

A. Properties of the Mixed Epoxy Resin/Portland Cement Adhesive:

1. Pot life: 75-105 minutes.

2. Contact time: 24 hours.

3. Color: Dark gray.

B. Properties of the Cured Epoxy Resin/Portland Cement Adhesive:

1. Compressive strength in accordance with ASTM C 109.

a. 1 day: 810 pounds per square inch minimum.

b. 7 day: 6,000 pounds per square inch minimum.

c. 28 day: 8,000 pounds per square inch minimum.

C. Splitting tensile strength in accordance with ASTM C 496.

1. 28 days: 540 pounds per square inch minimum.

D. Flexural Strength:

1. 1,100 pounds per square inch minimum in accordance with ASTM C 348.

E. Bond strength in accordance with ASTM C 882 modified at 14 days.

1. 0 hours open time: 1,900 pounds per square inch minimum.

2. 24 hours open time: 1,500 pounds per square inch minimum.

F. The epoxy resin/portland cement adhesive shall not produce a vapor barrier.

G. Material must be proven to prevent corrosion of reinforcing steel when tested under the procedures as set forth by the Federal Highway Administration Program Report Number FHWA/RD86/193. Proof shall be in the form of an independent testing laboratory corrosion report showing prevention for corrosion of the reinforced area.

2.3 MATERIALS

A. Epoxy Resin/Portland Cement Adhesive:

1. Component “A” shall be an epoxy resin/water emulsion containing suitable viscosity control agents. It shall not contain butyl glycidyl ether.

2. Component “B” shall be primarily a water solution of a polyamine.

3. Component “C” shall be a blend of selected portland cements and sands.

4. The material shall not contain asbestos.

PART 3 – EXECUTION

3.1 MIXING AND APPLICATION

A. Mixing the Epoxy Resin: Shake contents of Components “A” and Component “B”. Empty all of both components into a clean, dry mixing pail. Mix thoroughly for 30 seconds with a jiffy paddle on a low-speed with 400 to 600 revolutions per minute

drill. Slowly add the entire contents of Component “C” while continuing to mix for 3 minutes until uniform with no lumps. Mix only that quantity that can be applied within its pot life.

B. Placement Procedure:

1. Apply to prepared surface with stiff-bristle brush, broom, or “hopper type” spray equipment.

a. For hand applications: Place fresh, plastic concrete/mortar while the bonding bridge adhesive is wet or dry, up to 24 hours.

b. For machine applications: Allow the bonding bridge adhesive to dry for 12 hours minimum.

C. Adhere to all limitations and cautions for the epoxy resin/Portland cement adhesive in the manufacturers current printed literature.

3.2 CLEANING

A. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent area.

END OF SECTION

SECTION 03 40 02 – EXPOXIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Epoxy.

2. Epoxy gel.

3. Epoxy bonding agent.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. D 638 - Test Method for Tensile Properties of Plastics.

2. D 695 - Test Method for Compressive Properties of Rigid Plastics.

3. D 790 - Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Provide epoxy materials that are new and use them within shelf life limitations set forth by manufacturer.

2. Perform and conduct work of this Section in neat orderly manner.

1.4 SUBMITTALS

A. Not Used.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Epoxy: Water-insensitive two-part type low viscosity epoxy adhesive material containing 100 percent solids and meeting or exceeding following characteristics when tested in accordance with standards specified: Manufacturers: One of the following or equal:

1. Master Builders, Inc., Concressive Standard LVI.

2. Sika Chemical Corp’s, Armatec 1C or 110 Epocem.

3. Sika Chemical Corp's, Sikadur 35 Hi-Mod LV.

Physical Characteristic	Test Method	Required Results
Tensile Strength	ASTM D 638	8,000 pounds per square inch at 14 days and 77 deg. F cure.
Flexure Strength	ASTM D 790	11,000 pounds per square inch at 14 days and 77 deg. F cure.
Compressive Strength	ASTM D 695	16,000 pounds per square inch at 24 hours and 77 deg. F cure.
Bond Strength	N/A	Concrete shall fail before failure of epoxy.
Gel Time in 5-Mil Film	N/A	Four hours maximum at 77 deg. F
Elongation	ASTM D 638	1 percent minimum at 14 days and 77 deg. F

B. Epoxy Gel: Manufactures: One of the following or equal:

1. Sika Chemical Corp.'s, Sikadur 31 Hi-Mod Gel.

C. Epoxy Bonding Agent: Manufacturers: One of the following or equal:

1. Master Builders, Inc., Concressive 1001 Liquid LPL.

2. Sika Chemical Corp.'s, Sikadur 32 Hi-Mod.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install and cure epoxy materials in accordance with manufacturer's installation instructions.

B. Epoxy:

1. Apply in accordance with manufacturer's installation instructions.

C. Epoxy Gel:

1. Apply in accordance with manufacturer's installation instructions.

2. Use for vertical or overhead work, or where high viscosity epoxy is required.

3. Epoxy gel used for vertical or overhead work may be used for horizontal work.

3.2 EPOXY BONDING AGENT:

A. Apply in accordance with manufacturer's installation instructions.

B. Bonding agent will not be required for filling form tie hole or for normal finishing and patching of similar sizes small defects.

END OF SECTION

SECTION 04 10 00 - MORTAR AND GROUT

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 01 33 00 – Submittals.

B. Section 01 40 00 – Quality Control.

C. Section 03 30 00 – Cast-in-Place Concrete.

D. Section 04 22 00 – Concrete Masonry Units.

1.2 QUALITY ASSURANCE:

Comply with the following codes and standards including current editions, revisions and supplements.

A. ASTM C 143, Test for Slump of Portland Cement Concrete.

B. ASTM C 270, Mortar for Unit Masonry

C. ASTM C 476, Mortar and Grout for Reinforced Masonry

D. International Code Council – International Building Code.

1.3 SUBMITTALS:

A. Design Mix: Submit certification of specified grout mix design, prepared by an approved testing laboratory.

B. Field Test Reports: Testing Laboratory shall submit two copies of test reports indicating compression, yield and slump of grout. Verification of site mixed mortar proportions shall be noted and report. All reports shall be submitted directly to Architect.

1.4 ENVIRONMENTAL REQUIREMENTS:

Heat mixing water or sand when air temperature is below 40 degrees F and heat sand and water when air temperature is below 32 degrees F, to assure mortar temperatures between 40 degrees F and 120 degrees F until used. Do not heat water or aggregates above 120 degrees F. Maintain grout temperature above 70 degrees until time of placement.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.

C. Hydrated Lime: ASTM C 207, Type S.

D. Mortar Aggregate: ASTM C 144, sand, clean and sharp.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

3. White-Mortar Aggregates: Natural white sand or crushed white stone.

4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Grout Aggregate: ASTM C 404, maximum size 3/8 inch sieve.

F. Admixtures: May be used only with prior written approval of Engineer.

G. Cold-Weather Admixture: Non-chloride, non-corrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

H. Water: Clean and free of deleterious amounts of acids, alkalis, or organic materials, and potable.

2.2 MIXES:

A. Mortar:

1. Type “S”, minimum strength 1800 psi at 28 days, use with unit masonry. Proportion by volume as follows:

a. One (1) part Portland cement.

b. ¼ to ½ parts hydrated lime or lime putty.

c. 2-1/4 to 3 parts fine aggregates times the sum of volume of cement and lime used.

2. Color: Submit actual mortar for approval of color mixture.

3. Mixing Procedures: Measure materials by volume or equivalent weight. Do not measure by shovel. Mix ingredients in clean mechanical batcher for 3 to 5 minutes. Use maximum amount of water to produce workable consistency. Do not retemper stiffened mortar.

B. Grout (minimum strength 2000 psi at 28 days) supplied by ready mix concrete supplier.

C. General: Coarse grout may be used in grout spaces in masonry 2 inches or more in horizontal dimension and in grout spaces in filled-cell construction 4 inches or more in both horizontal dimensions, otherwise use fine grout.

PART 3 - EXECUTION

3.1 PREPARATION OF MIXES:

A. Mortar: Mix mortar materials in a mechanical mixer with approximately one-half (1/2) of the water and fine aggregate placed into the mixer first. Cementitious materials, and remaining water and sand should then be added and mixed for not less than 5 minutes. Hand mixing shall not be used unless specifically approved by Architect.

B. Grout: Grout at time of placement shall have a slump of 8 to 10 inches, as determined by ASTM C 143.

3.2 USAGE:

A. Use mortar and grout within 1 1/2 hours of initial mixing or arrival on site. Discard mortar and grout that have begun to set. Retempering mortar or grout will not be permitted.

3.3 QUALITY ASSURANCE:

A. General:

1. The Contractor shall engage at his expense, an independent testing laboratory approved by Architect, to conduct and interpret tests and reports and retests and reports. Testing Laboratory will perform tests as specified herein. Retesting due to non-compliance shall be at Contractor’s expense.

2. Concrete grout will be sampled and tested for quality control during the placement of each grout pour as follows:

    a. Sampling fresh concrete ASTM C 172

    b. Slump test ASTM C 143

    c. Air content ASTM C 138

    d. Compression test ASTM C1019

        1) One (1) specimen at seven (7) days. Two (2) specimens at twenty-eight (28) days. One (1) specimen held for fifty-six (56) days.

3. Mortar Proportions

    a. Verify site mixed proportions prior to beginning of masonry work and at each site visit for grout testing if masonry work is in progress.

4. Testing Laboratory shall submit test reports as specified in Section 01 45 29.

END OF SECTION

SECTION 04 22 00 - CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE:

A. Section 01 33 00 – Submittals.

B. Section 01 40 00 – Quality Control.

C. Section 03 20 00 – Concrete Reinforcement.

D. Section 03 30 00 – Cast-in-Place Concrete.

E. Section 04 10 00 – Mortar and Grout.

1.2 QUALITY ASSURANCE:

A. Comply with the following codes and standards including current editions, revision and supplements.

1. International Code Council – International Building Code.

2. ASTM C 90, Hollow Load Bearing Concrete Masonry Units.

3. ASTM A 82, Cold Drawn Steel Wire for Concrete Reinforcement.

4. ASTM A 615, Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.

B. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

1.3 SUBMITTALS:

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315.

C. Manufacturer's Literature: Description and specifications of concrete masonry units specified, including accessories.

D. Material Certificates: With manufacturer's literature independent laboratory test reports certifying that the following are in strict accordance with the provisions specified. Test reports shall be current and shall be dated within previous year.

1. Masonry units.

2. Grout mixes. Include description of type and proportions of ingredients.

3. Reinforcing bars.

4. Joint reinforcement.

5. Anchors, ties, and metal accessories.

1.4 DELIVERY, STORAGE AND HANDLING:

A. Store masonry units above ground on level platforms which allow air circulation under staked units, cover and protect units against wetting prior to use; handle units on pallets or flat bed barrows. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.5 ENVIRONMENTAL CONDITIONS:

A. Cold Weather Conditions:

1. Protect in-place unit masonry construction when air temperature is below 40 degrees F., and as follows:

a. Average daily air temperature 40 degrees F. to 32 degrees F., protect masonry from rain or snow for 48 hours after erection. Anchor covers securely. Cover shall extend a minimum of 24 inches down the wall.

b. Average night air temperature 32 degrees F. to 25 degrees F., cover masonry after erection with insulating blankets. Anchor covers securely.

2. If night temperatures are forecast to drop below 25 degrees F., provide heat sources on both sides of masonry construction or single side on veneer construction when backing is properly insulated and install wind break for wind velocities in excess of 15 mph or cover masonry with insulating blankets overnight.

B. Hot Weather Conditions: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. Protect masonry construction from direct exposure to wind and sun when erected in an ambient air temperature of 90 degrees F. in shade with Relative Humidity less than 50 percent or when the Relative Humidity is less than 40 percent at any temperature for at least 24 hours. Dampen, but do not saturate, masonry units immediately before installation. Perform work in the early morning hours.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) in accordance with TMS 602/ACI 530.1/ASCE 6.

2.3 UNITS:

A. ASTM C 90, Type I.

1. Minimum Compressive Strength: 1500 psi avg. gross area, 1900 psi avg. net area.

2. Drying Shrinkage: 0.035 percent or less with moisture not to exceed 25

percent.

3. Medium Weight Block; Aggregates: Scoria.

    a. Sizes: 8 x 8 x 16

    b. Manufactured to dimensions 3/8 inch less-than-nominal dimensions.

4. Colors: Match existing masonry on the site; confirm with Owner and Architect.

5. Finish: See Architectural Drawings.

6. Provide nominal 2 inch thick soaps, face dimensions to match concrete unit masonry, premanufactured corners, bond beam and half units as required for a complete and proper installation.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content is not more than 0.1 percent when tested in accordance with ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91.

E. Mortar Cement: ASTM C1329.

F. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

3. White-Mortar Aggregates: Natural white sand or crushed white stone.

4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C404.

H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

I. Water: Potable.

2.5 ACCESSORIES:

A. Reinforcing:

1. Reinforcement Bars: ASTM A 615, Grade 60, new deformed billet steel reinforcing bars.

2. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951.

a. Exterior Walls: Hot-dip galvanized carbon steel.

b. Wire Size for Side Rods: 0.148-inch diameter minimum.

c. Wire Size for Cross Rods: 0.148-inch diameter minimum.

d. Spacing of Cross Rods: Not more than 16 inches.

e. Provide in lengths of not less than 10 feet.

B. Control Joint:

1. Description: ASTM D 2287, Durometer Hardness of 80 in accordance with ASTM D 2240 factory synthetic rubber or PVC width compatible with masonry.

2.6 FOAM INSULATION

A. Polymer foamed in-place plastic insulation, non-toxic, biodegradable, odor-free with no off-gassing; containing no chlorofluorocarbons (CFCs);

1. Surface burning characteristics: Flamespread 25, smoke developed 40, when tested in accordance with ASTM E 84.

2. Formaldehyde Content: Not greater than 3 percent.

3. R-value per inch thickness at 25 degrees F: 4.50, minimum, when tested in accordance with ASTM C 518.

4. Water Vapor Absorption: 10% by volume at 24 hours, at 25 degrees F (-4 degrees C), at 100% relative humidity, when tested in accordance with ASTM D 2842.

5. Product and Manufacturer: R-501 Foam Insulation, Polymaster, Inc.: www.polymaster.com or equal.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Inspection: Inspect foundations to assure surfaces to support unit masonry work are as follows:

1. To proper grades and elevations.

2. Free of dirt and other deleterious material.

3. Surfaces not properly prepared have been satisfactorily corrected.

4. Layout, dimensions, location of wall openings, and positioning of reinforcement have been verified.

B. Reinforcement:

1. Verify foundation dowels are of proper size and length and accurately spaced to line up with core spaces of unit masonry.

2. If foundation dowels do not line up with core spaces of unit masonry, it may be bent if maximum slope of bent bar does not exceed 1 inch horizontally per 6 inches of height. Do not heat bars to bend.

3.2 INSTALLATION:

A. General Requirements:

1. Install block in running bond pattern. Do not install cracked, broken or chipped masonry units. Cut using masonry saw and fit exposed units. Do not use wet saws to cut integral color block. Lay unit masonry plumb, true to line, and with level sources accurately spaced within following tolerances:

a. Variation from Unit to Adjacent Unit: 1/32 inch maximum.

b. Variation from Plane of Wall: 1/4 inch as measured from a 20 foot straightedge placed at any location on the surface.

c. Variation from Plumb: 1/4 inch per story noncumulative.

d. Variation from Level Coursing: 1/4 inch in 20 feet.

e. Variation from Joint Thickness: 1/8 inch in four (4) feet.

f. Head and Bed Joint: ± 1/8 inch.

2. Conditions of Beds and Units: Clean, properly wetted sufficiently long before laying to allow absorption of surface moisture. Lay masonry in full bed of mortar, properly jointed with other work. Mortar shall not project into cores which are to be grouted.

3. Bed Joints: Fully fill bed joints; avoid deep or excessive "furrowing". Fully bond intersections, and external and internal corners.

4. Head Joints: Butter both units with sufficient mortar to completely fill joint; shove into place. Insert closures against well buttered stretchers, such that head joints are completely filled. Do not pound corners of jambs to fit stretcher units.

5. Joining of Work: Where fresh masonry joins masonry that is partially set or totally set, exposed surface of set masonry shall be cleaned and lightly wet prior to laying fresh masonry. Loose masonry and mortar shall be removed. If it becomes necessary for construction purposes to "stop off" horizontal run of masonry, this shall be done only by racking back in each course. Toothing not permitted. If units are displaced after mortar has stiffened, remove, clean joints and units of mortar and re-lay with fresh mortar.

6. Control Joints: Install at intervals as indicated on Drawings.

7. Tooling Joints:

a. Nominal Thickness: 3/8 inch.

b. Non-exposed joints to be struck flush.

8. Protection of Work: Protect surrounding areas from mortar drippings or other damage during construction. Remove misplaced mortar or grout immediately. Protect face materials against staining. Protect door jambs and corners from damage.

B. Reinforcing: Where possible, use deep-cut bond beam units for horizontal reinforcing steel.

1. Hold vertical reinforcement in position at top and bottom at intervals not exceeding 80 diameters of reinforcement. Accurately set and place reinforcement as indicated.

2. Where necessary, hold vertical steel firmly in place with frames or similar devices.

3. Maintain minimum 1/2 inch clear distance between masonry and reinforcement. Make laps and splices at least 48 bar diameters or 24 inches minimum unless otherwise indicated.

4. Place horizontal steel as erection progresses, laps wire tied.

C. Laying and Grouting: Concrete masonry unit walls shall be laid to nominal thickness as indicated; and with steel reinforcing as indicated. Grout cells solid where steel reinforcing occurs.

1. Exposed units half or whole block, reinforcing with bond beam reinforcement at 48 inches o.c. vertically.

2. Butter entire bearing surface and head joints, units laid in running bond, joints approximately 3/8 inch thick. Shove vertical joints tight.

3. Build reinforced masonry to preserve unobstructed vertical continuity of cells or voids to be filled. Walls and cross webs forming cells to be filled shall be full-bedded in mortar to prevent leakage of grout. Head (or end) joints shall be solidly filled with mortar for a distance in from face of wall or unit not less than thickness of longitudinal face shells. Provide bond by lapping units in successive vertical courses or by equivalent mechanical anchorage.

4. Filled vertical cells shall have vertical alignment sufficient to maintain a clear, unobstructed continuous vertical cell measuring not less than 2 inches by 3 inches.

5. Grouting lifts for courses containing rebar shall not exceed 4 feet in height. Any overhanging mortar or other obstruction or debris shall be removed from the insides of such cell walls. The reinforcement shall be present and secured prior to grouting. Stabbing of rebar verticals after grout is present is prohibited and cause for rejection.

6. Consolidated grout at time of placement as to insure all voids are filled. 15 to 35 minutes after first placement, depending on temperature and absorption conditions, reconsolidate grout to collapse air pockets. For consolidation and reconsolidation of grout spaces greater than one foot in depth, use a low-velocity vibrator with a ¾ inch head. Monitor setting rate of grout to insure reconsolidation is completed before grout plasticity is lost.

7. When grouting is stopped for 1 hour or longer including at the top of grout pour, horizontal construction joints shall be formed by stopping the pour of grout 1-1/2 inch below the top of the uppermost unit.

3.3 POINTING AND CLEANING:

A. Cut out defective joints and holes in exposed masonry and repoint with mortar. Dry brush masonry surface after mortar has set at end of each day's work and after final pointing. Clean exposed masonry with stiff brush and clear water only, do not saturate, sandblast, water blast or use a wire brush to clean mortar or masonry.

3.4 FIELD QUALITY CONTROL:

A. Leave work area and surrounding surfaces clean and free of mortar spots, droppings and broken masonry. Perform cleaning operations in conformance with NCMA Technical Bulletin 8-2. Remove and install with new; defective and unacceptable work at Contractor's expense and to acceptance of Architect. Perform special inspections as indicated on the Drawings.

END OF SECTION

PROJECT MANUAL

PROJECT: CITY OF SOCORRO
WASTEWATER TREATMENT PLANT
BELT FILTER PRESS REPLACEMENT

OWNER: CITY OF SOCORRO
Public Utilities – General Services
111 School of Mines Road
Socorro, NM 87801
Contact: Lloyd Martinez, P.E, Director

"The technical material and data contained in the specifications were prepared under the supervision and direction of the undersigned, whose seal as a Registered Architect, licensed to practice in the State of New Mexico, is affixed below." "All questions about the meaning or intent of these documents shall be submitted only to the Architect of Record, stated above, in writing.

ENGINEER OF RECORD: Huitt-Zollars, Inc.
333 Rio Rancho Drive NE
Suite 101
Rio Rancho, NM 87124
Contact: Wes Vote, P.E.
wvote@huitt-zollars.com
(505) 892-5141ph (505) 892-3259 fax

SECTION 07 21 13 - BUILDING INSULATION

PART 1 - GENERAL

1.1 THE REQUIREMENT

A. The CONTRACTOR shall provide building insulation, complete and in place, in accordance with the Contract Documents.

B. RELATED REQUIREMENTS:

1. Section 13 34 19 “Metal Building Systems” for insulation system related to Metal Building Systems.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. ASTM C 549 Perlite Loose Fill Insulation

C. ASTM C 578 Rigid, Cellular Polystyrene Thermal Insulation

D. ASTM C 665 Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

E. ASTM C 1289 Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

F. ASTM C 1320 Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Construction

G. ASTM D 41 Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing

H. ASTM D 312 Asphalt Used in Roofing

I. ASTM D 2178 Asphalt Glass Felt Used in Roofing and Waterproofing

J. ASTM D 2626 Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing

K. ASTM D 4397 Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications

L. ASTM E 84 Test Method for Surface Burning Characteristics of Building Materials

M. ASTM E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 C

1.3 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 - Contractor Submittals.

B. Product Information: Manufacturer's literature, specifications, installation instructions, technical data, and general recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

D. Samples: Samples of materials and fabricated items proposed for use on the WORK. The samples shall be clearly marked to show the manufacturer's name and product identification.

E. Certifications: Manufacturer's certification that the proposed materials comply with this Section.

PART 2 - PRODUCTS

2.1 GENERAL

A. The materials and application of building insulation shall conform to the applicable requirement of the Underwriters Laboratories "Fire Resistance Index," Factory Mutual requirements, and the manufacturer's printed recommendations.

2.2 EXTRUDED POLYSTYRENE DRAINAGE PANELS

A. ASTM C 578, Type IV, 1.60 lb/cu. ft, 25 psi compressive strength (min), fabricated with a matrix of drainage and edge channels on one side.

B. Manufacturers, or equal

1. DiversiFoam Products

2. Dow Chemical Company

3. Owens Corning

2.3 FOIL-FACED POLYISOCYANURATE BOARD INSULATION

A. ASTM C 1289, Type I, Class 1, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively, based on tests performed on unfaced core on thicknesses up to 4-inches.

B. Manufacturers, or equal

1. Rmax

2. DOW Corporation, Thermax

3. Johns Manville Corporation, AP

2.4 SPRAY FOAM INSULATION

A. Insulation: HFC-blown type Closed Cell Foam: medium-density, MDI-based polyurethane thermoset rigid foam.

1. Physical and Mechanical Properties:

a. Core Density: 1.9-2.4 pcf when tested in accordance with ASTM D 1622.

b. Thermal Performance (aged): Tested in accordance with ASTM C 518 and/or ASTM C 177 at 75 degrees F (24 degrees C) mean temperature.

c. Closed Cell Content: 88-95 percent when tested in accordance with ASTM D 2842.

d. Compressive Strength: Greater than 25 psi when tested in accordance with ASTM D 1621.

e. Tensile Strength: 23 psi when tested in accordance with ASTM D 1623.

f. Water Absorption: Less than 2 percent by volume when tested in accordance with ASTM D 2842.

g. Dimensional Stability: Less than 9 percent by volume when tested in accordance with ASTM D 2126 at 75 degrees F/95 percent RH, 28 Day.

h. Water Vapor Transmission: 1.3 perm/inch when tested in accordance with ASTM E 96.

i. Air Permeability: 0.013 when tested in accordance with ASTM E 283 at 1 inch thickness, L/s/m2.

j. Fungi Resistance: Pass, with no growth when tested in accordance with ASTM C 1338.

2. Fire performance

a. Flame Spread: Less than 25 when tested in accordance with ASTM E 84.

b. Smoke: Less than 450 when tested in accordance with ASTM E 84.

B. Manufacturers, or equal

1. Certain Teed Corp, Insulation Group, Valley Forge, PA

2. DOW Corporation

2.5 SPRAYFOAM THERMAL BARRIER COATING

A. Sprayfoam Thermal Barrier Coating shall be spray-applied, intumescent fireproofing material approved for use over spray polyurethane foam interior insulation applications as a thermal barrier equivalent.

1. Approvals:

a. NFPA 286 over closed cell Foam for Walls, and Roof Decks.

b. ASTM E 84 and UL 723, 5 flame, 20 smoke

c. EPA requirements for Ultra Low VOC.

d. SCAQMD (California South Coast Air Quality Management District) requirements as a Supercompliant Coating.

2. Coating shall be capable of latex or oil base top coated.

B. Manufacturers, or equal

1. Fireshell F10E - NFPA 286 as manufactured by TPR2 Corp. (Thermal Product Research), Waterbury, CT

2. Flame Seal TB as manufactured by Flame Seal Products, Inc. Houston Texas or approved equal.

2.6 POLYETHYLENE VAPOR RETARDER

A. ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.

2.7 REINFORCED POLYETHYLENE VAPOR RETARDER

A. Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nylon cord or polyester scrim and weighing not less than 25 lb/1000 sq. ft., with maximum permeance rating of 0.0507 perm.

B. Manufacturers, or equal

1. Raven Industries, Inc.; DURA-SKRIM 6WW

2. Reef Industries, Inc.; Griffolyn T-65

2.8 FIRE - RETARDANT REINFORCED POLYETHYLENE VAPOR RETARDER

A. Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either a nonwoven grid of nylon cord or polyester scrim and weighing not less than 22 lb/1000 sq. ft. with maximum permeance rating of 0.1317 perm and flame-spread and smoke-developed indices of not more than 5 and 60, respectively.

B. Manufacturers, or equal

1. Raven Industries, Inc.; DURA-SKRIM 2FR

2. Reef Industries, Inc.; Griffolyn T-55 FR

2.9 FOIL POLYESTER FILM VAPOR RETARDER

A. Two layers of 0.5-mil thick polyester film laminated to an inner layer of one-mil thick aluminum foil, with zero water vapor transmission rate in flat condition and with maximum flame-spread and smoke-developed indices of 5 each.

B. Manufacturers, or equal

1. Alumiseal Corporation Zero Perm

2.10 ALUMINUM FOIL TAPE

A. Aluminum foil tape shall be 2-inches wide Aluma-Grip No. AF7-701 as manufactured by Hardcast, Inc., or equal.

2.11 STEEL DECK FASTENERS

A. Steel deck fasteners shall have integral stress distribution cap, shall be rust-resistant, and shall be per written recommendations of the insulation and roofing manufacturer.

PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials: Manufactured materials shall be delivered in original unbroken packages, containers, or bundles bearing the name of the manufacturer. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other factors.

B. Storage: Materials shall be carefully stored in an area that is protected from the elements in a manner recommended by the manufacturer to prevent damage.

C. Storage of Plastic Insulation

1. Do not expose to sunlight, except as necessary for installation.

2. Protect against ignition at all times. Do not deliver plastic insulating materials to the Site before installation time.

3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

3.2 PREPARATION

A. The CONTRACTOR shall verify conditions affecting the WORK of this Section and shall obtain accurate dimensions of openings, levels, and location and arrangements of embedded anchorage.

B. Clean substrates from substances harmful to insulations or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION OF INSULATION

A. Insulation shall be installed in accordance with the manufacturer's printed installation instructions. Extend insulation in thickness indicated to envelop entire area to be insulated. Apply single layer of insulation to produce thickness indicated unless multiple layers are required to make up total thickness.

B. Insulation shall be installed to provide maximum thermal benefits. The insulation shall be installed to completely fill or cover voids, providing a continuous layer of insulation. Insulation shall be cut neatly to snugly fit angles, corners, and irregular areas and be carefully fitted around pipes, conduits, outlets, switches, beams, etc., to maintain continuity of insulation. Gaps or bridges shall be avoided. Insulation shall be secured as recommended by the Code and the material manufacturers for job conditions.

C. Blocking for wall-mounted items and items installed within furring and walls shall be securely installed prior to installation of insulation. Cut and fit tightly around obstructions and fill voids with insulation.

D. Water-Piping Coordination: If water piping is located on inside of insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

E. Foam board insulation shall be secured by furring channels at 16 inches OC, max. Channels shall be secured to wall by concrete nails or pneumatically-driven fasteners spaced at not more than 16-inches OC.

F. Space between furred wall insulation and structural metal roof deck shall receive spray foam insulation equivalent to wall insulation R-value providing a continuous insulation layer. All spray foam insulation shall be coated with specified spray-applied, intumescent fireproofing material.

G. Below-grade insulation shall have insulation protective board installed between the insulation and backfill.

H. On units of plastic insulation, install small pads of adhesive spaced approximately 24-inches OC both ways on inside face, as recommended by manufacturer. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction.

I. Seal joints between closed-cell (nonbreathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with spray foam, or sealant as recommended by insulation manufacturer.

J. Vapor retarder shall be installed continuously on the warm side of wall insulation at exterior concrete or masonry walls that are furred.

3.4 VAPOR RETARDER MEMBRANE SYSTEM

A. General: Installation of the vapor retarder system shall not proceed until substrate construction and penetration WORK has been completed. The CONTRACTOR shall notify the ENGINEER at least 7 Days prior to starting of vapor retarder system installation for inspection of the completed WORK to be concealed under the system.

B. Installation: The vapor retarder system shall be installed per manufacturer's written instructions by experienced tradesmen specializing in installation of vapor retarders.

C. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

D. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16-inches OC.

E. Vapor retarder membrane shall be overlapped at framing members, such as studs, joists, furring, columns, and girts, wherever possible.

F. Vapor retarder membrane shall be attached to wood framing members by stapling at 12-inches OC with staples per written recommendations of the membrane manufacturer. Staples shall be covered with not less than 2-inch square tape strip to provide an unbroken membrane.

G. With metal framing members such as ceiling girts and other metal members where staples will not work, membrane shall be secured to framing with materials and methods recommended by vapor retarder manufacturer, such as adhesives and double-back tape.

H. Every membrane seam shall be lapped at least 4-inches (12-inches in cold climates), sealed, and taped.

I. The vapor retarder membrane shall be sealed, lapped, attached, and taped to other surfaces at extremities, windows, door frames, penetrations, floor, and ceiling

J. Special care shall be taken at penetrations such as electrical boxes, phone boxes, and pipe and wire penetrations, to make sure that a continuous unbroken membrane is maintained. The membrane shall be sealed and taped to the item that penetrates it.

K. Splits, tears, cuts, punctures, and damaged areas of the vapor retarder membrane shall be patched and repaired to insure vapor tightness. Cover with vapor retarder tape or another layer of vapor retarder.

L. A 1/8-inch bead of sealing compound shall be applied to the vapor retarder at framing members, blocking, and supports, wherever a finish material such as gypsum board, plywood, wainscots, insulation, support framing, or paneling will be anchored through it.

END OF SECTION

SECTION 07 91 00079100 - PREFORMED JOINT SEALS

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. Preformed, foam joint seals.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for liquid sealants applied over preformed seals in dual seal systems.

1.3 ACTION SUBMITTALS

A. Product Data: For each preformed joint seal product.

B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of preformed joint seal required, provide Samples with joint seals in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint seals.

D. Preformed Joint Seal Schedule: Include the following information:

1. Joint seal location and designation.
2. Joint width and movement capability.
3. Joint seal manufacturer and product name.
4. Joint seal color.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each preformed joint seal for tests performed by manufacturer and witnessed by a qualified testing agency.

1.5 WARRANTY

A. Special Warranty: Installer agrees to repair or replace preformed joint seals that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PREFORMED, FOAM JOINT SEALS

A. Preformed, Foam Joint Seals: Manufacturer's standard joint seal manufactured from urethane or EVA (ethylene vinyl acetate) foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths based on design criteria indicated, with factory- or field-applied adhesive for bonding to substrates.

1. Design Criteria:

a. Nominal Joint Width: As indicated on Drawings
b. Minimum Joint Width: As indicated on Drawings
c. Maximum Joint Width: As indicated on Drawings
d. Movement Capability: -25 percent/+25 percent

2. Joint Seal Color: As selected by Architect from full range of industry colors

2.2 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by preformed-joint-seal manufacturer for joint substrates indicated.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to preformed joint seal manufacturer, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces, and formulated to promote best adhesion to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with preformed joint seals and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive preformed joint seals, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting preformed-joint seal performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing preformed joint seals to comply with preformed joint seal manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of preformed joint seal, including dust, paints (except for permanent protective coatings tested and approved for seal adhesion and compatibility by seal manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimal bond with preformed joint seals. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.

B. Joint Priming: Prime joint substrates where recommended by preformed joint seal manufacturer or as indicated by tests or prior experience. Apply primer to comply with joint seal manufacturer's written instructions. Confine primers to areas of joint seal bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of adhesive or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION

A. General: Comply with preformed joint seal manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Installation of Preformed, Foam Joint Seals:

1. Install each length of seal immediately after removing protective wrapping.
2. Firmly secure compressed joint seals to joint gap side to obtain full bond using exposed pressure-sensitive adhesive or field-applied adhesive as recommended by manufacturer.
3. Do not pull or stretch material. Produce seal continuity at splices, ends, turns, and intersections of joints.
4. For applications at low ambient temperatures, heat foam joint seal material in compliance with manufacturer's written instructions.

3.4 PROTECTION

A. Protect preformed joint seals from damage resulting from construction operations or other causes so seals are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated seals immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION

SECTION 08 33 23 - OVERHEAD COILING DOORS

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. Insulated service doors.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.

2. Division 09 Section "Exterior Painting" and "Interior Painting" for finish painting of factory-primed doors.

3. Division 26 Sections for electrical service and connections for powered operators and accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design overhead coiling doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance, Exterior Doors: Exterior overhead coiling doors shall withstand the wind loads, the effects of gravity loads, and loads and stresses within limits and under conditions indicated according to SEI/ASCE 7.

1. Wind Loads:

a. Basic Wind Speed: 115 mph.

b. Wind Pressure: 17 psf

c. Exposure Category: B

2. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.

C. Seismic Performance: Overhead coiling doors shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified.

2. Seismic Component Importance Factor: 1.0.

D. Operation Cycles: Provide overhead coiling door components and operators capable of operating for not less than number of cycles indicated for each door. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.

1.4 SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:

1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.

2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

3. For fire-rated doors, description of fire-release system including testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

D. Delegated-Design Submittal: For overhead coiling doors 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. Detail fabrication and assembly of seismic restraints.

2. Summary of forces and loads on walls and jambs.

E. Qualification Data: For qualified Installer.

F. Seismic Qualification Certificates: For overhead coiling doors**,** accessories, and components, from manufacturer.

G. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling door manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc

coating; nominal sheet thickness (coated) of 0.028 inch and as required to meet requirements.

2. Insulation: Fill slats for insulated doors with manufacturer's standard thermal insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within slat faces.

3. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.

B. Endlocks and Windlocks for Service Doors: Malleable-iron casings galvanized after fabrication, secured to curtain slats with galvanized rivets or high-strength nylon. Provide locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Bottom Bar for Service Doors: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.

D. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain, and a continuous bar for holding windlocks.

2.2 HOOD

A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized steel sheet with G90 (Z275) zinc coating, complying with ASTM A 653/A 653M.

2.3 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Provide cylinders standard with manufacturer and keyed to building keying system.

2. Keys: Provide three (3) for each cylinder.

B. Chain Lock Keeper: Suitable for padlock.

C. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.4 CURTAIN ACCESSORIES

A. Weatherseals: Equip each exterior door with weather-stripping gaskets fitted to entire perimeter of door for a weathertight installation, unless otherwise indicated.

1. At door head, use 1/8-inch- thick, replaceable, continuous sheet secured to inside of hood.

2. At door jambs, use replaceable, adjustable, continuous, flexible, 1/8-inch-thick seals of flexible vinyl, rubber, or neoprene.

B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

1. Provide pull-down straps or pole hooks for doors more than 84 inches high.

2.5 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.6 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.

2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24 V, ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door Operator Location(s): Operator location indicated for each door.

1. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.

D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.

1. Electrical Characteristics:

a. Phase: Polyphase.

b. Volts: 208 V.

c. Hertz: 60.

2. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.

3. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.

4. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

5. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.

E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

F. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.

1. Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.

G. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Interior units, full-guarded, surface-mounted, heavy-duty weatherproof type, with general-purpose NEMA ICS 6, Type 4 enclosure.

H. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf.

I. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

2.7 DOOR ASSEMBLY

A. Insulated Service Door: Overhead coiling door formed with curtain of interlocking metal slats.

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. Cookson Company. Temp-Pro Insulated Rolling Door

b. Or approved equal

B. Operation Cycles: Not less than 20,000.

1. Include tamperproof cycle counter.

C. Curtain R-Value: 5.0 deg F x h x sq. ft./Btu

D. Door Curtain Material: Galvanized steel

E. Door Curtain Slats: Flat profile slats of 1-7/8-inch center-to-center height.

1. Insulated-Slat Interior Facing: Metal.

F. Curtain Jamb Guides: Galvanized steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.

G. Hood: Match curtain material and finish.

1. Shape: Round

2. Mounting: Face of wall mounting.

H. Locking Devices: Equip door with locking device assembly and chain lock keeper.

1. Locking Device Assembly: Single-jamb side locking bars, operable from inside with cylinders.

I. Electric Door Operator:

1. Usage Classification: Medium duty, up to 15 cycles per hour.

2. Operator Location: Top of hood or Front of hood or Wall.

3. Motor Exposure: Interior.

4. Emergency Manual Operation: Chain type.

5. Sensor Edge Bulb Color: Black

J. Door Finish:

1. Baked-Enamel or Powder-Coated Finish: Color as selected by Architect from manufacturer's full range.

2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.8 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Examine locations of electrical connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Perform installation and startup checks according to manufacturer's written instructions.

2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide weathertight fit around entire perimeter.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling doors.

END OF SECTION

SECTION 08 71 00 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Hardware for hollow metal doors.

B. Electrically operated and controlled hardware.

C. Lock cylinders for doors with balance of hardware specified in other sections.

D. Thresholds.

E. Smoke and draft control seals.

F. Weatherstripping and gasketing.

1.2 RELATED REQUIREMENTS

A. Section 13 34 39 – Metal Building Systems

1.3 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.

B. ASTM E283/E283M - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen 2019.

C. BHMA A156.1 - Standard for Butts and Hinges 2021.

D. BHMA A156.2 - Bored and Preassembled Locks and Latches 2017.

E. BHMA A156.3 - Exit Devices 2020.

F. BHMA A156.4 - Door Controls - Closers 2019.

G. BHMA A156.5 - Cylinders and Input Devices for Locks 2020.

H. BHMA A156.6 - Standard for Architectural Door Trim 2021.

I. BHMA A156.7 - Template Hinge Dimensions 2016.

J. BHMA A156.15 - Release Devices - Closer Holder, Electromagnetic and Electromechanical 2021.

K. BHMA A156.16 - Auxiliary Hardware 2018.

L. BHMA A156.18 - Materials and Finishes 2020.

M. BHMA A156.21 - Thresholds 2019.

N. BHMA A156.22 - Standard for Gasketing 2021.

O. BHMA A156.28 - Recommended Practices For Mechanical Keying Systems 2018.

P. BHMA A156.30 - High Security Cylinders 2020.

Q. BHMA A156.36 - Auxiliary Locks 2020.

R. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames 2016.

S. DHI (H&S) - Sequence and Format for the Hardware Schedule 2019.

T. DHI (KSN) - Keying Systems and Nomenclature 2019.

U. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames 2004.

V. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

W. ISO 9001 - Quality management systems -- Requirements 2015.

X. ITS (DIR) - Directory of Listed Products current edition.

Y. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Z. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

AA. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.

BB. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.

CC. UL (DIR) - Online Certifications Directory Current Edition.

DD. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

EE. UL 294 - Access Control System Units Current Edition, Including All Revisions.

FF. UL 437 - Standard for Key Locks Current Edition, Including All Revisions.

GG. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Sequence installation to ensure facility services connections are achieved in an orderly and expeditious manner.

C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; require attendance by affected installers and the following:

1. Architect.
2. Installer's Architectural Hardware Consultant (AHC).
3. Hardware Installer.
4. Owner's Security Consultant.
5. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

D. Keying Requirements Meeting:

1. Owner will schedule meeting at project site prior to Contractor occupancy.
2. Attendance Required:
3. Contractor.
4. Owner.
5. Architect.
6. Installer's Architectural Hardware Consultant (AHC).
7. Door Hardware Installer.
8. Owner's Security Consultant.
9. Best Keying Specialist.

E. Agenda:

1. Establish keying requirements.
2. Verify locksets and locking hardware are functionally correct for project requirements.
3. Verify that keying and programming complies with project requirements.
4. Establish keying submittal schedule and update requirements.
5. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
6. Key control system requirements.
7. Schematic diagram of preliminary key system.
8. Flow of traffic and extent of security required.
9. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
10. Deliver established keying requirements to manufacturers.

1.5 SUBMITTALS

A. See Section 01 33 00 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: A detailed listing that includes each item of hardware to be installed on each door.

1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. Comply with DHI (H&S) using door numbering scheme and hardware set numbers as indicated in Contract Documents.
3. Submit in vertical format.
4. List groups and suffixes in proper sequence.
5. Include complete description for each door listed.
6. Include manufacturers and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
7. Include account of abbreviations and symbols used in schedule.

D. Samples for Verification:

1. Submit minimum size of 2 by 4 inch (51 by 102 mm) for sheet samples, and minimum length of 4 inch (102 mm) for other products.
2. Submit sample of illustrating style, color, and finish.
3. Include product description with samples.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Manufacturer's qualification statement.

G. Installer's qualification statement.

H. Supplier's qualification statement.

I. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1. Include manufacturer's parts lists and templates.
2. Bitting List: List of combinations as furnished.

J. Keying Schedule:

1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

K. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

L. Project Record Documents: Record actual locations of concealed equipment, services, and conduit.

M. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 50 - Product Requirements, for additional provisions.

2. Lock Cylinders: Ten for each master keyed group.

3. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.6 QUALITY ASSURANCE

A. Standards for Fire-Rated Doors: Maintain one copy of each referenced standard on site, for use by Architect and Contractor.

B. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

D. Supplier Qualifications: Company with Architectural Hardware Consultant (AHC) to assist in work of this section.

E. Manufacturer Certifications: Provide products manufactured in facilities using quality management system certified for compliance with ISO 9001 and environmental management systems certified for compliance with ISO 14001.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.8 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

B. Manufacturer Warranty: Provide manufacturer warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion. Complete forms in Owner's name and register with manufacturer.

1. Closers: 30 Years, minimum.
2. Exit Devices: Five Years, minimum.
3. Locksets and Cylinders: 10 Yrs Mechanical 3 Yrs Finish, minimum.
4. Other Hardware: Two years, minimum.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Locks: Provide a lock for each door, unless it's indicated that lock is not required.

1. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's Series. As indicated in hardware sets.

2. Trim: Provide lever handle or pull trim on outside of each lock, unless otherwise indicated.

3. Strikes:

a. Finish: To match lock or latch.
b. Curved-Lip Strikes: Provide as standard, with extended lip to protect frame, unless otherwise indicated.
c. Center Strike at Pairs of Doors: 7/8 inch (22.2 mm) lip.

D. Door Pulls and Push Plates:

1. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.

2. On solid doors, provide matching door pull and push plate on opposite faces.

E. Closers:

1. Provide door closer on each exterior door, unless otherwise indicated.

2. Provide door closer on each fire-rated and smoke-rated door.

3. Spring hinges are not an acceptable self-closing device, unless otherwise indicated.

F. Overhead Stops and Holders (Door Checks):.

1. Provide stop for every swinging door, unless otherwise indicated.

2. Overhead Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop, unless otherwise indicated.

3. Overhead stop is not required if a floor or wall stop has been specified for the door.

G. Drip Guards: Provide at head of outswinging exterior doors unless protected by roof or canopy directly overhead.

H. Thresholds:

1. Interior Applications: Provide when specified at interior doors for transition between two different floor types, and over building expansion joints, unless otherwise indicated.

2. Exterior Applications: Provide at each exterior door, unless otherwise indicated.

I. Smoke and Draft Control Seals:

1. Provide gasketing for smoke and draft control doors (Indicated as "S" on Door Schedules) that complies with local codes, requirements of assemblies tested in accordance with UL 1784. Please refer to Chapter 6 NFPA 105 2019.

J. Weatherstripping and Gasketing:

1. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated.

2. Provide door bottom sweep on each exterior door, unless otherwise indicated.

3. Provide applicable gasketing on doors indicated as "Lightproof."

K. Electrically Operated and/or Controlled Hardware: Provide necessary power supplies, power transfer hinges, relays, and interfaces as required for proper operation; provide wiring between hardware and control components and to building power connection in compliance with NFPA 70.

L. Fasteners:

1. Provide stainless steel fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.

2. Aluminum fasteners are not permitted.

3. Provide Phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.

4. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.

5. Self-drilling (Tek) type screws are not permitted.

6. Provide stainless steel machine screws and lead expansion shields.

M. Provide wall grip inserts for hollow wall construction.

N. Fire-Resistance-Rated Applications: Comply with NFPA 80.

O. Provide stainless steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.2 PERFORMANCE REQUIREMENTS

A. Provide door hardware products that comply with the following requirements:

1. Applicable provisions of federal, state, and local codes.

2. NFPA 101.

3. Accessibility: ADA Standards and ICC A117.1.

4. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.

5. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified.

B. HINGES

1. Manufacturers: Conventional butt hinges.

a. BEST; dormakaba USA, Inc.
b. Hager.
c. McKinney.

2. Properties:

a. Butt Hinges: As applicable to each item specified.

1) Standard Weight Hinges: Minimum of two (2) permanently lubricated non-detachable bearings.

2) Heavy Weight Hinges: Minimum of four (4) permanently lubricated bearings on heavy weight hinges.

3) Template screw hole locations.

4) Bearing assembly installed after plating.

5) Bearings: Exposed fully hardened bearings.

6) Bearing Shells: Shapes consistent with barrels.

7) Pins: Easily seated, non-rising pins.

8) Fully plate hinge pins.

9) Non-Removable Pins: Slotted stainless steel screws.

10) UL 10C listed for fire-resistance-rated doors.

C. Sizes: See Door Hardware Schedule.

1. Hinge Widths: As required to clear surrounding trim.

2. Sufficient size to allow 180 degree swing of door.

D. Finishes: See Door Hardware Schedule.

1. Fully polish hinges; front, back, and barrel.

E. Grades:

1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.

2. Comply with BHMA A156.18 Materials and Finishes.

3. Continuous Hinges: Comply with BHMA A156.26, Grade 1.

F. Material: Base metal as indicated for each item by BHMA material and finish designation.

G. Types:

1. Butt Hinges: Include full mortise hinges.

2. Options: As applicable to each item specified.

H. Quantities:

1. Butt Hinges: Three (3) hinges per leaves up to 90 inches (2286 mm) in height. Add one (1) for each additional 30 inches (762 mm) in height or fraction thereof.

a. Hinge weight and size unless otherwise indicated in hardware sets:

1) For doors up to 36 inches (914 mm) wide and up to 1-3/4 inches (44.5 mm) thick provide hinges with a minimum thickness of 0.134 inch (3.4 mm) and a minimum of 4-1/2 inches (114 mm) in height.

I. Applications: At swinging doors.

1. Provide non-removable pins at out-swinging doors with locking hardware and all exterior doors.

J. Products:

1. Butt Hinges:

a. Ball Bearing, Five (5) Knuckle.

2.3 EXIT DEVICES

A. Manufacturers:

1. BEST, dormakaba USA, Inc.

2. Sargent, Von Duprin.

B. Properties:

1. Chassis:

    a. Construction: Investment cast steel, zinc dichromate plated.

    b. Compatibility: Standard Stile doors.

2. Touchpads: 'T" style metal touchpads and rail assemblies with matching chassis covers end caps.

3. Latch Bolts: Stainless steel deadlocking with 3/4 inch (19 mm) projection using latch bolt.

4. Lever Design: Match project standard lockset trims.

5. Cylinder: Include where cylinder dogging or locking trim is indicated.

6. Strike as recommended by manufacturer for application indicated.

7. Sound dampening on touch bar.

8. Dogging:

    a. Non-Fire-Resistance-Rated Devices: Cylinder 1/4 inch (6 mm).

    b. Fire-Resistance-Rated Devices: Manual dogging not permitted.

9. Touch bar assembly on wide style exit devices to have a 1/4 inch (6.3 mm) clearance to allow for vision frames.

10. All exposed exit device components to be of architectural metals and “true” architectural finishes.

11. Handing: Field-reversible.

12. Fasteners on Back Side of Device Channel: Concealed - exposed fasteners not allowed.

13. Vertical Latch Assemblies' Operation: Gravity, without use of springs.

    a. Latch Bolts: Stainless steel, with 1/2 inch (12.7 mm) throw.

C. Grades: Complying with BHMA A156.3, Grade 1.

1. Provide exit devices tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.

D. Standards Compliance:

1. UL Listed for Panic and Fire for Class II Circuitry.

2. Provide UL (DIR) listed exit device assemblies for fire-resistance-rated doors.

E. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.

F. Options:

1. Electrified Devices:

a. Latchbolt Retraction: Continuous-duty solenoid latchbolt retraction.

G. Products:

1. 2000.

2.4 LOCK CYLINDERS

A. Manufacturers:

1. BEST, dormakaba USA, Inc.

B. Properties:

1. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.

a. Provide cylinders from same manufacturer as locking device.
b. Provide cams and/or tailpieces as required for locking devices.
c. Provide cylinders with appropriate format interchangeable cores where indicated.

C. Grades:

1. Standard Security Cylinders: Comply with BHMA A156.5.

2. High Security Cylinders: Comply with BHMA A156.30 or UL 437.

D. Material:

1. Manufacturer's standard corrosion-resistant brass alloy.

E. Types: As applicable to each item specified.

1. Standard security small format interchangeable core (SFIC) type cylinders, with seven-pin, 1C - 7-pin cores.

2. High security type cylinders with seven-pin cores.

F. Applications: At locations indicated in hardware sets, and as follows

1. As required for items with locking devices provided by other sections, including at elevator controls.

    a. When provisions for lock cylinders are referenced elsewhere in the Project Manual to this Section, provide compatible type of lock cylinder, keyed to building keying system, unless otherwise indicated.

G. Products:

1. Rim/mortise.

2.5 CYLINDRICAL LOCKS

A. Manufacturers:

1. BEST, dormakaba USA, Inc.

2. Schlage

3. Sargent 11 Line

B. Properties:

1. UL listed for use on single or pairs of doors with fire-resistance-rating up to 3 hours and latchbolt throw of 1/2 inch (12.7 mm).

2. Mechanical Locks:

    a. Fitting modified ANSI A115.2 door preparation.

    b. Door Thickness Fit: 1-3/8 inches (35 mm) to 2-1/4 inches (57 mm) thick doors.

    c. Construction: Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.

        1) Through-bolted anti-rotational studs.

    d. Cast stainless steel latch retractor with roller bearings for exceptionally smooth operation and superior strength and durability.

    e. Bored Hole: 2-1/8 inch (54 mm) diameter.

    f. Backset: 5 inches (127 mm) unless otherwise indicated.

    g. Latch: Single piece tail-piece construction.

        1) Latchbolt Throw: 9/16 inch (14.3 mm), minimum.

    h. Cylinders:

1) Cylinder Core Types: Locks capable of supporting manufacturers' cores, as applicable.

i) Small format interchangeable.

i. Lever Trim:

1) Style: See Door Hardware Schedule.

2) Functionality: Allow the lever handle to move up to 45 degrees from horizontal position prior to engaging the latchbolt assembly.

3) Strength: Locksets outside locked lever designed to withstand minimum1,400 inch-lbs (158.2 Nm) of torque. In excess of that, a replaceable part will shear. Key from outside and/or inside lever will still operate lockset.

4) Independent spring mechanism for each lever.

i) Contain lever springs in the main lock hub.

5) Outside Lever Sleeve: Seamless one-piece construction.

6) Keyed Levers: Removable only after core is removed by authorized control key.

C. Finishes: See Door Hardware Schedule.

1. Core Faces: Match finish of lockset.

D. Grades: Comply with BHMA A156.2, Grade 1, Series 4000, Operational Grade 1, Extra Heavy Duty.

1. Durability: Passing 50 Million cycle tests verified by third party testing agency.

E. Material: Manufacturer's standard for specified lock.

1. Critical Latch and Chassis Components: Brass or corrosion-resistance treated steel.

2. Outside Lever Sleeve: Hardened steel alloy.

F. Products: Cylindrical locks, including mechanical and electrified types.

1. 9K (Grade 1).

2.6 LADDER PULLS

A. Manufacturers:

1. Trimco

B. Properties:

1. Proper number of support fixings to accommodate length of pull as recommended by the manufacturer.

2. Flat tops at pulls projecting past support fittings.

C. Types:

1. Offset.

D. Installation:

1. Pull Handles Mounting Style: Use single-sided - SNG or back-to-back - B2B mounting methods, as appropriate for item specified and in coordination with door type and other hardware items.

E. Products:

1. AP436

2.7 CLOSERS

A. Manufacturers:

1. Dorma; dormakaba USA, Inc.

2. LCN and Sargent.

B. Properties:

1. Surface Mounted Closers: Manufacturer's standard.

a. Construction: R14 high silicon aluminum alloy.

b. Mechanism: Separate tamper-resistant adjusting valves for closing and latching speeds.

c. Hydraulic Fluid: All-weather type.

d. Arm Assembly: Standard for product specified.

1) Include hold-open, integral stop, or spring-loaded stop feature, as specified in Door Hardware Schedule.

2) Parallel arm to be a heavy-duty rigid arm.

3) Where “IS” or “S-IS” arms are specified in hardware sets, if manufacturer does not offer this arm provide a regular arm mount closer in conjunction with a heavy-duty overhead stop equal to a dormakaba 900 Series.

e. Covers:

1) Type: Standard for product selected.

2) Full.

3) Slim.

4) Material: Plastic.

5) Finish: Painted.

C. Grades:

1. Closers: Comply with BHMA A156.4, Grade 1.

a. Underwriters Laboratories Compliance:

1) Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.

i) UL 228 - Door Closers-Holders, With or Without Integral Smoke Detectors.

D. Code Compliance: As required by authorities having jurisdiction in the State in which the Project is located.

1. Devices listed with California Department of Forestry and Fire Protection, Office of the State Fire Marshal.

E. Types:

1. Rack-and-pinion, surface-mounted. 1-1/2 inches (38 mm) minimum bore.

F. Options:

1. Delayed action, adjustable with an independent valve.

G. Installation:

H. Mounting: Includes surface mounted installations.

1. Mount closers on non-public side of door and stair side of stair doors unless otherwise noted in hardware sets.

2. At out swinging exterior doors, mount closer on interior side of door.

3. Provide adapter plates, shim spacers, and blade stop spacers as required by frame and door conditions.

4. Where an overlapping astragal is included on pairs of swinging doors, provide coordinator to ensure door leaves close in proper order.

I. Products:

1. Surface Mounted:

a. 8900.
b. 8600.

2.8 OVERHEAD STOPS AND HOLDERS

A. Manufacturers:

1. dormakaba; dormakaba Group: www.dormakaba.com/us-en/#sle.

2. Architectural Builders Hardware Mfg (ABH): www.abhmfg.com/#sle.

3. Rixson.

B. Properties:

1. Stop Settings: At 90 degrees opening.

a. Adjustable friction tension.

2. Hold-Open Settings: At 90 degrees opening.

a. Selective on/off.

b. Provide nylon composites for proven friction resistance and durability.

c. Provide built-in cushion stop.

C. Sizes: Manufacturer’s standard for the application.

D. Finishes:

1. Arms and Brackets: Zinc-plated.

E. Grades: As applicable to item specified.

1. Comply with BHMA A156.8, Grade 1.

F. Underwriters Laboratories Compliance:

1. Product Listing: UL (DIR) and ULC for use on fire-resistance-rated doors.

G. Material: Base metal as indicated for each item by BHMA material and finish designation.

1. Track Channel: Extruded aluminum alloy.

2. Slide Block: Machined from solid brass alloy.

H. Types:

1. Surface-applied.

I. Products:

1. Surface Overhead Stops and Holders:

a. 900 Heavy Duty.

2.9 PROTECTION PLATES

A. Manufacturers:

1. Trimco: www.trimcohardware.com/#sle.

2. Hager.

3. Ives.

B. Properties:

1. Plates:

a. Armor Plates: Provide on bottom half of push side of doors that require protection from objects moving through openings that may damage door surface.

2. Edges: Beveled, on four (4) unless otherwise indicated.

C. Grades: Comply with BHMA A156.6.

1. Material: As indicated for each item by BHMA material and finish designation.

2. Metal Properties: Stainless steel.

D. Installation:

1. Fasteners: Countersunk screw fasteners

E. Products:

2.10 STOPS AND HOLDERS

A. Manufacturers:

1. Trimco: www.trimcohardware.com/#sle.

2. Hager.

3. Ives

B. General: Provide overhead stop/holder when wall or floor stop is not feasible.

C. Properties:

1. Wall Bumpers: 1270CX/CV.

2. Floor Stops: 1211.

D. Grades:

1. Wall Bumpers and Floor Stops: Comply with BHMA A156.16 and Resilient Material Retention Test as described in this standard.

E. Material: Base metal as indicated for each item by BHMA material and finish designation.

F. Types:

1. Wall Bumpers: Bumper, concave, wall stop.

2. Floor Stops: Provide with bumper floor stop.

G. Installation:

1. Non-Masonry Walls: Confirm adequate wall reinforcement has been installed to allow lasting installation of wall bumpers.

H. Products:

1. Wall Bumpers.

2. Floor Stops.

2.11 THRESHOLDS

A. Manufacturers:

1. National Guard Products, Inc: www.ngpinc.com/#sle.

2. Reese.

3. Zero.

B. Properties:

1. Threshold Surface: Fluted horizontal grooves across full width.

C. Grades: Thresholds: Comply with BHMA A156.21.

D. Types: As applicable to project conditions. Provide barrier-free type at every location where specified. (ADA Thresholds)

1. Saddle Thresholds: Without thermal break. Maximum ½" Height

2. Bumper Seal Thresholds with Gasket: Use silicone gaskets. Maximum ¼" Ramp Height with a total Maximum ½" including the Bumper.

E. Products: 513 Saddle

2.12 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:

1. National Guard Products, Inc: www.ngpinc.com/#sle.

2. Reese.

3. Zero.

B. Properties:

1. Weatherstripping Air Leakage Performance: Not exceeding 0.3 cfm/sq ft of door opening at 0.3 inches of water pressure differential for single doors, and 0.5 cfm/sq ft of door area at 0.3 inches of water pressure differential for double doors for gasketing other than smoke control, as tested according to ASTM E283/E283M; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

C. Grades: Comply with BHMA A156.22.

D. Products:

1. Weatherstripping: See Door Hardware Schedule.

2. Smoke Seals: See Door Hardware Schedule.

3. Sound Seals: See Door Hardware Schedule.

4. Meeting Stile Seals: See Door Hardware Schedule.

5. Door Bottom Seals:

a. Door Sweeps: See Door Hardware Schedule.

2.13 MISCELLANEOUS ITEMS

A. Manufacturers:

1. Trimco: www.trimcohardware.com/#sle.

B. Properties:

1. Coat Hooks: Provide on room side of door, screw fastened.

a. Material: Brass.

2. Latch Protectors: Provide on door to protect latch from being tampered with while in locked position.

    a. Type: Standard latch protector.

    b. Material: Stainless steel.

3. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.

    a. Single Door: Provide three on strike jamb of frame.

    b. Pair of Doors: Provide two on head of frame, one for each door at latch side.

    c. Material: Rubber, gray color.

C. Products:

1. Coat Hooks.

    a. 3072.

2. Latch Protectors.

    a. 5000 Series.

3. Silencers.

2.14 KEYS AND CORES

A. Manufacturers:

1. BEST Premium, dormakaba Group: www.bestaccess.com/#sle.

2. Substitutions: Not permitted.

B. Properties: Complying with guidelines of BHMA A156.28.

1. Provide small format interchangeable core.

2. Provide Patented CORMAX keys and cores.

3. Provide keying information in compliance with DHI (KSN) standards.

4. Keying Schedule: Arrange for a keying meeting, with Architect, Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying complies with project requirements.

5. Keying: Master keyed.

6. Include construction keying and control keying with removable core cylinders.

7. Key to existing keying system.

8. Supply keys in following quantities:

    a. Grand Master Keys: 1 each.

    b. Master Keys: 4 each.

    c. Construction Master Keys: 5 each.

    d. Construction Keys: 15 each.

    e. Construction Control Keys: 2 each.

    f. Control Keys if New System: 2 each.

    g. Change Keys: 3 each for each keyed core.

9. Provide key collection envelopes, receipt cards, and index cards in quantity suitable to manage number of keys.

10. Deliver keys with identifying tags to Owner by security shipment direct from manufacturer.

11. Permanent Keys and Cores: Stamped with applicable key marking for identification. Do not include actual key cuts within visual key control marks or codes. Stamp permanent keys "Do Not Duplicate."

12. Include installation of permanent cores and return construction cores to hardware supplier. Construction cores and keys to remain property of hardware supplier.

C. Products:

1. Premium: CORMAX.

2.15 FINISHES

A. Finishes: Identified in Hardware Sets.

B. Finishes: Provide door hardware of same finish, unless otherwise indicated.

1. Finish: 630; satin stainless steel, with stainless steel 3000 series base material (former US equivalent 32D), 652; satin chromium plated over nickel, with steel base material (former US equivalent 26D), and 689; aluminum painted, with any base material (former US equivalent US28); BHMA A156.18.

C. Exceptions:

1. Where base material metal is specified to be different, provide finish that is an equivalent appearance in accordance with BHMA A156.18.

2. Hinges for Fire-Rated Doors: Steel base material with painted finish, in compliance with NFPA 80.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Correct all defects prior to proceeding with installation.

C. Verify that electric power is available to power operated devices and of correct characteristics.

3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Install hardware using the manufacturer’s fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

C. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

D. Install hardware for smoke and draft control doors in accordance with NFPA 105.

E. Use templates provided by hardware item manufacturer.

F. Do not install surface mounted items until application of finishes to substrate are fully completed.

G. Wash down masonry walls and complete painting or staining of doors and frames.

H. Complete finish flooring prior to installation of thresholds.

1. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

2. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.

3. For Steel Doors and Frames: See Section 6549.

4. For Steel Door Frames: See Section 08 12 13.

5. Mounting heights in compliance with ADA Standards:

a. Locksets: 40-5/16 inch (1024 mm).

b. Push Plates/Pull Bars: 42 inch (1067 mm).

c. Deadlocks (Deadbolts): 48 inch (1219 mm).

d. Exit Devices: 40-5/16 inch (1024 mm).

e. Door Viewer: 43 inch (1092 mm); standard height 60 inch (1524 mm).

I. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

1. See Section 07 92 00 for additional requirements.

J. Include in installation for existing doors and frames any necessary field modification and field preparation of doors and frames for new hardware. Provide necessary fillers, reinforcements, and fasteners for mounting new hardware and to cover existing door and frame preparations.

3.3 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation activities.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.4 PROTECTION

A. Protect finished Work under provisions of Section 01 70 00 - Execution and Closeout Requirements.

B. Do not permit adjacent work to damage hardware or finish.

3.5 SECTION INCLUDES

A. Procedure for administration of Allowances.

3.6 RELATED REQUIREMENTS

A. Section 01 12 19: Contract Considerations

B. Section 01 40 00 – Quality Control

C. Section 01 45 29 – Testing Laboratory Services

Hardware Sets

Manufacturer List

Code	Name
BE	Best Access Systems
DM	Dorma Door Controls
NA	National Guard
PR	BEST Precision Exit Devices
RCIN	Rutherford Controls Int'l Corp
SDCI	Security Door Controls, Inc.
ST	BEST Hinges and Sliding
TR	Trimco
UNIQ	Unique Mfg

Option List

Code	Description
10-24 SSMS/LA	STAINLESS MACHINE SCREWS/LEAD ANCHOR
1-3/4"	1-3/4" Thick Doors
36"	36" Door Width
3RO	Prefix option for 2000 Apex Series
B4E-HEAVY-KP	BEVELED 4 EDGES - KICK PLATES
CD	CYLINDER DOGGING
CSK	COUNTER SINKING OF KICK and MOP PLATES
FC	Full Plastic Cover
M	Case Drilled for Clevis Only
M5	GALVANIZED STEEL CHAIN
S300	STD. STRIKE - RIM AND TOP OF SVR DEVICES
SMK994	SHIM KIT (APEX WIDE STILE)
SMS-TEKS 6 X 3/4"	SELF DRILLING SCREWS 6 X 3/4"
SMS-TEKS 8 X 3/4"	SELF DRILLING SMS 8 X 3/4"
SN1	SET (4) SEX NUTS - 1 3/4" DOORS (Std)

Finish List

Code	Description
15	Satin Nickel Plate
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
AL	Aluminum
WHITE	White

Hardware Sets

Set #01 - Exterior Belt Filter Press HMD/F SO

1	Continuous Hinge	662HD UL 95"	AL	ST
1	Exit Device	3RO 2103 X 4903D 1-3/4" 36" CD S300 SMK994	630	PR
1	Rim Cylinder	12E-72 L/C	626	BE
1	Mortise Cylinder	1E-74 L/C	626	BE
2	Core	1CM-7MJ12	626	BE
1	Closer	8916 SPA FC SN1	689	DM
1	Overhead Stop	912 S	689	DM
1	Kick Plate	KO050 10" x 1" LDW B4E CSK	630	TR
1	Door Position Switch	9540	WHITE	RCIN
1	Drip Cap	16 A 4"ODW		NA
1	Smoke Seal	5075 CL @ Head & Jambs		NA
1	Gasketing	133 NA 1 x 36" 2 x 84" SMS-TEKS 8 X 3/4"		NA
1	Door Sweep	101 VA 36" SMS-TEKS 6 X 3/4"		NA
1	Threshold	896HD N 36" 10-24 SSMS/LA	AL	NA

Set #02 - OH Garage Doors

1	Mortise Cylinder	1E-74 L/C	626	BE
3	Core	1CM-7MJ12	626	BE
2	Padlock	11B-782L L/C M M5	626	BE
1	Balance of Hardware UNIQ	BALANCE OF HARDWARE BY DOOR MANUFACTURER		15
2	Door Position Switch	9530		RCIN

Opening List

Opening	Hdw Set	Opening Label	Door Type	Frame Type
201A	01		F	HMF
201B	01		F	HMF
201C	02		OH	
201D	02		OH	

END OF SECTION

SECTION 09 80 00 – SPECIAL COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Field applied high performance coatings. All exposed surfaces of equipment, piping, supports, and other materials shall be shop primed and field finished, unless specifically stated otherwise. Under all circumstances, stainless steel piping shall not be painted.

B. The painting of the roof trusses and associated appurtenances is covered in Section 09900.

1.2 REFERENCES

A. National Sanitation Foundation (NSF):

1. 61 - Drinking Water System Components - Health Effects.

B. American National Standards Institute (ANSI):

1. A159.1 - Surface Preparation Specifications.

2. Z54.1 - Safety Color Code for Marking Physical Hazards.

C. American Society for Testing and Materials (ASTM):

1. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

D. National Fire Protection Association (NFPA):

1. 101 - Life Safety Code.

E. Steel Structures Painting Council (SSPC):

1. SP-1 - Solvent Cleaning

2. SP-2 - Hand Tool Cleaning

3. SP-3 - Power Tool Cleaning

4. SP-5 - White Metal Blast

5. SP-6 - Commercial Blast Cleaning

6. SP-7 - Brush-Off Blast Cleaning

7. SP-10 - Near White Blast Cleaning

8. SP-11 - Power Tool Cleaning to Near White Metal

9. SSPC 13 - Preparation of Concrete

10. Steel Structures Painting Manual, Volumes 1 and 2

11. Pictorial Standards for Surface Preparation - SSPC-VIS 1.

12. Measurement of Dry Paint Thickness with Magnetic Gages - SSPC SP A2.

1.3 DEFINITIONS

A. Submerged Metal: Steel or iron surfaces below tops of channel or structure walls which will contain water even when above expected water level.

B. Submerged Concrete Surfaces: Surfaces which are or will be:

1. Underwater.

2. In structures which normally contain water.

3. Below tops of walls or water containing structures.

C. Dry Film Thickness: Thickness of fully cured coating, measured in mils.

1.4 PERFORMANCE REQUIREMENTS

A. Coating materials for concrete and metal surfaces shall be especially adapted for use in water treatment plants.

B. Coating materials that come into contact with potable water shall be certified to NSF 61.

1.5 SUBMITTALS

A. Product Data: Submit in accordance with Sections 01340 and 09900.

B. Certificates: Submit in accordance with requirements for Product Data.

C. Manufacturer’s Instructions: Submit in accordance with requirements for Product Data and Section 09900.

1.6 QUALITY ASSURANCE

A. Qualifications of Applicator:

1. Experienced with at least 3-years’ experience applying type or types of coatings under conditions similar to those of the Work.

2. Manufacturer approved applicator when manufacturer has approved applicator program.

3. Approved and licensed by polymorphic polyester resin manufacturer to apply polymorphic polyester resin coating system

B. Regulatory Requirements: Include requirements concerning the following:

1. Volatile organic compound limitations.

2. Coatings containing lead compounds.

3. Abrasives and abrasive blast cleaning techniques, and disposal.

4. NSF certification of coatings for use in potable water supply systems.

C. Certification: Certify that applicable pigments meet the specifications.

D. Compatibility of Coatings: Use products by same manufacturer for prime coats, intermediate coats, and finish coats on same surface, unless specified otherwise.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: In accordance with Section 09900.

1.8 MAINTENANCE

A. Extra Materials: Provide in accordance with Section 09900.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Products specified are manufactured by Themec.

B. Except for System 2, Epoxy (EPA/NSF), subject to compliance with the Contract Documents, the following manufacturers are acceptable:

1. Ameron Protective Coatings Division

2. Carboline Protective Coatings.

3. Porter Coatings.

4. Sherwin Williams.

5. Tnemec.

2.2 MATERIALS

A. All materials used must not contain more than 3.5 LBS/GAL VOC as applied (in thinned state) unless noted otherwise.

B. For unspecified materials such as turpentine or linseed oil, provide manufacturer's recommended products.

C. Paint Systems – General

1. P=prime coat. I=intermediate coat. F1, F2,. . . Fn = first finish coat, second finish coat . . . nth finish coat, color as selected by OWNER.

2. If two finish coats of same material are required, CONTRACTOR may, at his option and by written approval from paint manufacturer and ENGINEER, apply one coat equal to mil thickness of two coats specified.

3. Paint thickness specified are minimum dry mil thickness.

D. Paint Systems

1. System No. 1 - Polyamide Epoxy - For ferrous metals and metals located at and above a line 6 inches above the high liquid level and other non-submerged areas (except galvanized steel and pre-primed steel).

a. Items include but are not limited to steel and ductile iron piping, tank and equipment platforms, pumps, equipment and pipe supports, filter vessels, bolted steel tank, and process mechanical equipment.

1) Tnemec

i) P1=Series 66-1211 VOC=3.42 LBS/GAL thinned 1 coat, 3-5 mils DFT (Dry Film Thickness)

ii) F1=Series 66

iii) 1 coat, 4-6 mils DFT

iv) F2=Series 66

v) 1 coat, 4-6- mils DFT F2E=73 Series

vi) 1 coat, 2.5-3.5 mils DFT VOC=3.5 LBS/GAL thinned

b. Filter vessel exterior shall have a factory applied primer coat consisting of Tnemec Series N69 Hi-Build Epoxyline II or approved equal.

2. System 2 - Epoxy (EPA/NSF): For ferrous metals and piping submerged to a line 6 inches above the high liquid level (interior of filter vessels), any non-SS components of plate settler, and interior of backwash tank.

a. Epoxy paint for System 2 shall conform to the requirements of AWWA D102-78 inside paint system No. 1 for potable water. Subject to compliance with the Contract Documents, the following manufacturer's paint systems are acceptable:

1) Tnemec Series 20 Pota-Pox

i) First Coat: 20-1255 (beige) 1 coat, 4-6 mils DFT

ii) Top Coat: 20-15 BL (tank white) 1 coat, 4-6 mils DFT

3. System No. 3 - Polyamide Epoxy - For all assembled galvanized steel items; and all plastic including PVC, FRP, and CPVC surfaces. Exposed PVC and CPVC piping shall be painted.

a. Items may include PVC, FRP and CPVC piping.

1) Tnemec

i) P1=Series 66 VOC=3.42 LBS/GAL thinned 1 coat, 3-5 mils DFT

ii) *F1=Series 66

iii) 1 coat, 4-6 mils DFT

iv) F1E=73 Series VOC=3.5 LBS/GAL thinned 1 coat, 2.5-3.5 mils DFT

v) * Replace F1 with F1E at exterior

4. System No. 4 - Polyamide Epoxy - For field cut edge of galvanized steel where top coat is required.

a. Tnemec

1) P1=Series 66 VOC=3.42 LBS/GAL thinned 1 coat, 3-5 mils DFT

2) *F1=Series 66 VOC=3.42 LBS/GAL thinned 1 coat, 4-6 mils DFT

3) F1E=73 Series VOC=3.50 LBS/GAL thinned 1 coat, 2.5-3.5mils DFT

4) * Replace F1 with F1E at exterior

5. System No. 5 - Polyamide Epoxy - For bituminous coated pipe and materials.

a. Tnemec

1) P1=Series 66 VOC=3.42 LBS/GAL thinned 1 coat, 3-5 mils DFT

2) F1=Series 66

3) 1 coat, 4-6 mils DFT

4) *F2=Series 73 VOC=3.50 LBS/GAL thinned 1 coat, 2 .5-3.5 mils DFT

5) * Add F2 at exterior

E. Sandblast Abrasive

1. Sandblast media shall be clean copper slag of the proper particle size to produce the specified profile. Media shall not contain any extraneous matter.

2. Use proper equipment and abrasives when blast cleaning to produce the mil profile, within the range of 2.0 to 3.5 or as recommended by the coating manufacturer. Do not reuse sand or flat abrasives.

PART 3 - EXECUTION

3.1 GENERAL PREPARATION

A. Prepare surfaces in accordance with coating manufacturer's instructions, unless more stringent requirements follow.

B. Protect following surfaces from abrasive blasting in accordance with Section 09900, by masking, or other means:

1. Threaded portions of valve and gate stems.

2. Machined surfaces for sliding contact.

3. Surfaces to be assembled against gaskets.

4. Surfaces of shafting on which sprockets are to fit.

5. Surfaces of shafting on which bearings are to fit.

6. Machined surfaces of bronze trim, including those slide gates.

7. Cadmium-plated items except cadmium-plated, zinc-plated, or sherardized fasteners used in assembly of equipment requiring abrasive blasting.

8. Galvanized items, unless scheduled to be coated.

C. Protect installed equipment, mechanical drives, and adjacent coated equipment from abrasive blasting to prevent damage caused by entering sand or dust.

D. Concrete: Clean concrete surfaces of dust, mortar, fins, loose concrete particles, form release materials, oil, and grease. Fill voids so that surface is smooth. Etch or brush off-blast clean (SSPC SP-7) as recommended by coating manufacturer.

E. Ferrous Metal Surfaces:

1. Remove grease and oil in accordance with SSPC SP-1.

2. Remove rust, scale, and welding slag and spatter, and prepare surfaces in accordance with SSPC SP-10.

3. Abrasive blast surfaces within 12 hours of coating.

4. When abrasive blasted surfaces rust or discolor before coating, abrasive blast surfaces again to remove rust and discoloration.

5. Do not coat surfaces before abrasive blasting.

6. When metal surfaces are exposed because of coating damage, abrasive blast surfaces before touching-up.

F. Ferrous Metal Surfaces not to be Submerged: Abrasive blast in accordance with SSPC SP-10, unless blasting may damage adjacent surfaces, prohibited or specified otherwise. Where not possible to abrasive blast, power tool clean surfaces in accordance with SSPC SP-11.

G. Ferrous Metal Surfaces to be Submerged: Unless specified otherwise, abrasive blast in accordance with SSPC SP-10 or better to clean and provide roughened surface profile of not less than 2 mils and not more than 4 mils in depth when measured with Elcometer 123, or as recommended by the coating manufacturer.

H. Sherardized, Aluminum, Copper, and Bronze Surfaces: Prepare in accordance with paint manufacturer’s instructions.

I. Galvanized Surface:

1. Degrease or solvent clean to remove oily residue.

2. Power tool or hand tool clean or whip abrasive blast.

3. Apply metal pretreatment within 24 hours before coating galvanized surfaces that cannot be thoroughly abraded physically, such as bolts, nuts, or preformed channels.

J. Shop Primed Metal

1. Correct abrades, scratched or otherwise damaged areas of shop prime coat by sanding or abrasive blasting in accordance with SSPC SP-6 for metal surfaces not to be submerged and SSPC SP-10 for metal surfaces to be submerged.

2. When entire shop priming fails or has weathered excessively, or when recommended by paint manufacturer, abrasive blast shop prime coat to remove entire coat and prepare surface in accordance with SSPC SP-10.

3. When incorrect prime coat is applied, remove incorrect prime coat by abrasive blasting in accordance with SSPC SP-10.

K. Non-metallic surfaces: Prepare surface per manufacturer's recommendation.

L. Abrasive blast cadmium-plated, zinc plated, or sherardized fasteners in same manner as unprotected metal when used in assembly of equipment designated for abrasive blasting.

M. Abrasive blast components to be attached to surfaces which cannot be abrasive blasted before components are attached.

N. Grind sharp edges to approximately 1/8 inch radius.

3.2 GENERAL PROTECTION

A. Protect adjacent surfaces not to be coated from spatter and droppings with drop cloths and other coverings.

1. Mask off surfaces of items not to be coated or remove items from area.

3.3 GENERAL APPLICATION REQUIREMENTS

A. Apply coatings in accordance with manufacturer's instructions.

B. Paint metal unless specified otherwise.

C. Verify metal surface preparation immediately before applying coating in accordance with SSPC Pictorial Surface Preparation Standard.

D. Allow surfaces to dry, except where coating manufacturer requires surface wetting before coating.

E. Wash coat and prime sherardized, aluminum, copper, and bronze surfaces, or prime with manufacturer's recommended special primer.

F. Prime shop primed metal surfaces. Spot prime exposed metal of shop primes surfaces before applying primer over entire surface.

G. Apply minimum number of specified coats.

H. Apply coats to thicknesses specified, especially at edges and corners.

I. Apply additional coats when necessary to achieve specified thicknesses.

J. Coat surfaces without drops, ridges, waves, holiday, laps, or brush marks.

K. Remove spatter and droppings after completion of coating.

L. When multiple coats of same material are specified, tint prime coat and intermediate coats with suitable pigment to distinguish each coat.

M. Dust coatings between coats. Lightly sand and dust surfaces to receive high gloss finishes, unless instructed otherwise by coating manufacturer.

N. Application of the coating to the tank interior surfaces, including structural, shall be spray application only. No coating shall be applied to submerged metal by roller application. Application of the coating to the exterior tank surfaces shall be applied according to the manufacturer's recommendations.

O. Spray Application:

1. When using spray application, apply coating to thickness not greater than that suggested in coating manufacturer's instructions for brush coat application.

2. Use airless spray method, unless air spray method is required by coating manufacturer's instruction or these Specifications.

3. Conduct spray coating under controlled conditions. Protect adjacent construction and property from coating mist or spray.

P. Drying and Recoating:

1. Limit drying time to that required by these Specifications or coating manufacturer's instructions.

2. Do not allow excessive drying time or exposure which may impair bond between coats.

3. Recoat epoxies within time limits recommended by epoxy manufacturer.

4. When time limits are exceeded, abrasive blast coat prior to applying another coat.

5. When limitations on time between abrasive blasting and coating cannot be met before attachment of components to surfaces which cannot be abrasive blasted, coat components before attachment.

6. Ensure primer and intermediate coats of coating are unscarred and completely integral at time of application of each succeeding coat.

7. Touch up suction spots between coats and apply additional coats where required to produce finished surface of solid, even color, free of defects.

8. Leave no holidays.

9. Sand and recoat scratched, contaminated, or otherwise damaged coating surfaces so damages are invisible to naked eye.

Q. Dry film thickness (DFT) readings of the coating are to be taken to provide reasonable assurance that the specified minimum DFT has been achieved. A minimum of five (5) separate spot measurements shall be made over every 100 square feet in area. Each spot measurement shall consist of an average of three (3) gage readings next to each other no further than six (6) inches apart. Each spot measurement must be within the specified minimum thickness. The single gage readings, however, making up the spot measurement, are permitted to be no less than 80 percent of the specified minimum thickness.

3.4 EPOXY AND POLYURETHANE COATING SYSTEM

A. Preparation:

1. Prepare surfaces in accordance with general preparation requirements, unless more stringent requirements follow.

2. Prepare concrete surfaces per general preparation requirements unless more stringent requirements are required by the manufacturer.

3. Touch up shop primed steel and miscellaneous iron.

4. Coating shall be applied to ferrous metal surfaces that have been abrasive blasted at job site within twelve (12) hours of abrasive blasting. When cleaned surfaces rust or discolor, surfaces shall be re-blasted in accordance with Section 3.01.

5. Degrease or solvent clean, whip abrasive blast, power tool, or hand tool clean galvanized metal surfaces.

6. Lightly abrasive blast or sand fiberglass and plastic to be coated to roughen surfaces just prior to painting.

B. Application:

1. Apply coatings in accordance with general application requirements, unless more stringent requirements follow.

2. Apply 3 coat system consisting of:

a. Primer: 4 to 5 mil thick high build polyamide epoxy primer,

b. Intermediate Coat: 4 to 5 mil thick high build polyamide epoxy intermediate coat, and

c. Top Coat: 1.5 to 2.5 mil thick aliphatic or aliphatic-acrylic polyurethane topcoat.

3. Recoat or apply succeeding epoxy coats within 30 days or within time limits recommended by manufacturer, whichever is shorter. Prepare surfaces for recoating in accordance with manufacturer's instructions.

3.5 HIGH SOLIDS POLYAMINE EPOXY SYSTEM

A. Preparation:

1. Prepare surfaces in accordance with general preparation requirements, unless more stringent requirements follow.

2. Abrasive blast ferrous metal surfaces to be submerged at jobsite in accordance with SSPC SP-10 within 12 hours of coating. When cleaned surfaces rust or discolor, abrasive blast surfaces in accordance with SSPC SP- 10.

3. Coating shall be applied to ferrous metal surfaces that have been abrasive blasted at job site within twelve (12) hours of abrasive blasting. When cleaned surfaces rust or discolor, surfaces shall be re-blasted in accordance with Section 3.01.

B. Application:

1. Apply coatings in accordance with general application requirements, unless more stringent requirements follow.

2. Apply at least 2 coats with total dry mil thickness of 10 mils.

3. Recoat or apply succeeding epoxy coats within time limits recommended by manufacturer. Prepare surfaces for recoating in accordance with manufacturer's instructions.

4. Coat metal to be submerged before installation when necessary, to obtain acceptable finish and to prevent damage to other surfaces.

5. Paint entire surface of support brackets, stem guides, pipe clips, fasteners, and other metal devices bolted to concrete.

6. Paint surface of items to be exposed and adjacent 1 inch to be concealed when embedded in concrete or masonry.

3.6 EPOXY, POLYURETHANE AND CLEAR COAT SYSTEM

A. Preparation:

1. Prepare surfaces in accordance with general preparation.

2. Aluminum surfaces must have a surface profile which can be created by either brush-off blast cleaning or chemical etching. Manufacturer's representative shall determine acceptability of surface preparation prior to primer application.

3. All surfaces to be clean, dry and free of contaminants prior to coating application.

B. Application:

1. Apply coatings in accordance with general application requirements, unless more stringent requirements follow.

2. Apply 3-coat system consisting of:

a. Primer: 3 to 4 mil thick high build epoxy primer.

b. Finish Coat: 3 to 5 mils thick aliphatic or aliphatic-acrylic polyurethane.

c. Clear Coat: 1 to 2 mils thick clear top coat.

3.7 FIELD QUALITY CONTROL

A. Inspection will be performed prior to and following the abrasive blasting and following each coat. Strip and remove defective coats, prepare surfaces and recoat. When approved, apply next coat.

B. Control and check dry film thicknesses and integrity of coatings.

C. Measure dry film thickness with calibrated thickness gauge.

D. Dry film thicknesses may be checked with Elcometer or Positector 2000.

E. Verify coat integrity with low-voltage holiday detector. Allow OWNER to use detector for additional checking.

F. Check wet film thickness before coal tar epoxy coating cures on concrete or non-ferrous metal substrates.

3.8 SCHEDULES OF ITEMS NOT REQUIRING COATING

A. Items that have received final coat at factory and not listed to receive coating in the field.

B. Brass, bronze, copper, plastic, rubber, stainless steel, chrome, everdur or lead.

C. Buried or encased piping or conduit.

D. Galvanized pipe trays and cable trays.

E. Grease fittings.

F. Steel to be encased in concrete or masonry.

G. Nameplates.

H. Serial number tags.

I. Control Panels.

J. Instruments.

3.9 SURFACES TO BE COATED IN THE FIELD

A. In general, coat steel and iron surfaces unless specified or otherwise indicated on the Drawings or listed above in Section 3.8. Coat concrete surfaces and anodized aluminum only when specified or indicated on the Drawings.

END OF SECTION

SECTION 09 90 00 – PAINTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. See Schedule - Surfaces to be Finished, at end of Section.

1.2 RELATED SECTIONS

A. Section 09800 - Special Coatings: Process piping and process equipment.

1.3 REFERENCES

A. ASTM D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2003 or most current standard.

B. ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 1992 (Reapproved 2003 or most current standard).

1.4 DEFINITIONS

A. In addition to the following definitions, conform to ASTM D 16 for interpretation of terms used in this section:

1. Buried - Covered with earth.

2. Exposed or Exposed Surfaces - Areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.

1.5 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Product Data: Provide data on all finishing products.

1. Paint System Identification: Identify products according to the identification numbers for each interior and exterior paint system, as indicated in Part 2 of this Section.

C. Paint Samples: Submit two paper chip samples, 3 x 3 inches in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

E. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

F. Qualification Data: For firms and persons specified in the Quality Assurance Article to demonstrate their capabilities and experience. Include lists of completed projects, with project names and addresses, names and addresses of architects or engineers and owners, and other specified information.

G. Manufacturer's Certification: Submit in accordance with Part 3, Field Quality Control Article at the completion of the work.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum 10 years documented experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to applicable code for flame and smoke rating and VOC requirements for products and finishes.

B. Lead, Heavy Metals, Cadmium, and Chromates: Lead, Heavy Metals, Cadmium, and Chromate content of painting materials shall not exceed amount permitted by federal, state, and local authorities.

C. Coatings for surfaces in contact with potable water or water being treated for potable use shall not impart any taste or odor to the water or result in any organic or inorganic content in excess of the maximum contaminant level established by applicable laws or regulations.

D. Comply with governing code requirements for air quality and material disposal regulations.

1.8 MOCK-UP

A. Provide mock-ups, for each of the following substrates, illustrating painting and coating colors and finishes.

1. Concrete: Provide panels, 4 feet long by 8 inches wide for each color, and finish.

2. Plywood Wainscot: Provide panels, 4 feet long by 8 feet high for each color and finish.

3. Gypsum Wallboard: Provide panels, 4 feet long by 4 feet wide for each color, and finish.

4. Metal: Provide panel equal to 4 square feet in size for each color and finish.

5. Provide door and frame assembly for each paint coating color, and finish.

B. Locate where directed by Engineer.

C. Mock-up(s) may remain as part of the Work.

D. Work advanced without approved job mock-ups shall be completely removed and re- installed without additional compensation to Owner.

1.9 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.

D. Provide fire extinguishers and post caution signs warning against smoking and open flame when working with flammable materials.

E. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Engineer. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers - Provide paint and coating products by one of the following:

1. Ameron International: www.ameroncoatings.com
2. Carboline Company: www.carboline.com
3. ICI Devoe Coatings: www.devoecoatings.com
4. ICI Paints North America (ICI): www.icidecorativepaints.com
5. Benjamin Moore & Co. (Moore): www.benjaminmoore.com.
6. Kwal-Howells, Inc. (KH): www.kwalhowells.com
7. Sherwin- Williams Company (SW): www.sherwinwilliams.com
8. Okon, Inc. (OKON): www.okoninc.com
9. Coronado Paint Company (Coronado): www.coronadopaint.com
10. Tnemec Company Inc (Tnemec): www.tnemec.com

2.2 PAINTS AND COATINGS – GENERAL

A. Paint exposed surfaces, except where the Paint Schedule indicates that a surface or material is not to be painted or is to remain natural. If the Paint Schedules does not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not the Schedules indicates color(s). If the Schedule does not indicate color(s) or finishes, the Engineer will select from standard colors and finishes available.

B. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

C. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:

1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
2. For good flow and brushing properties.
3. Capable of drying or curing free of streaks or sags.

D. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

1. Review other Sections of these Specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Contractor shall be responsible for the compatibility of all shop primed and field painted items.

2. Furnish information on the characteristics of the finish materials proposed to use, to ensure that compatible prime coats are used. Provide Tie coats over incompatible primers or remove and reprime as required. Notify Engineer, in writing, of anticipated problems using the coating systems as specified with substrates primed by others.

E. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

F. Pipe Painting Colors:

1. Potable Water – Blue

2. Reuse (Wash Water) – Purple

3. Waste Activated Sludge - Brown

2.3 PAINT SYSTEMS – EXTERIOR

A. Paint WE-OP-3A-1 - Wood, Opaque, Alkyd, 3 Coat:

1. Primer: Moore; Moorwhite Primer 100; 1 coat, 2.1-2.3 dry mils.

2. Gloss Finish: Moore; Impervo Alkyd High Gloss Metal and Wood Enamel 133; 2 coats, 1-2 dry mils per coat.

B. Paint CE-OP-3E-1 - Concrete, Opaque, Polyamide Epoxy, 3 Coats over prepared surfaces:

1. First Coat: Polyamide Epoxy; Moore CM36/CM37 Clear; reduced 25% with Moore Epoxy Thinner 95.

2. Second Coat: Polyamide Epoxy; Moore CM36-90/CM37 White; 2.0 dry mils.

3. Third Coat: Polyamide Epoxy; Moor CM36-90/CM37 White; 2.0 dry mils.

C. Paint CE-OP-2AC-3 - Concrete, Opaque, 2 Coats:

1. First Coat: OKON S-20 Penetrating Stain and Sealer System (opaque).

2. Second Coat: OKON S-20 Penetrating Stain and Sealer System (opaque).

D. Paint ME-OP-3E-4 - Ferrous and Galvanized Metals, Primed or Unprimed, Opaque, 3 Coats:

1. Touch-up: Moore; Alkyd Metal Primer M06.

2. Primer: Moore; Alkyd Metal Primer M06; One coat, 1.3-1.5 dry mils.

3. Gloss Finish: Moore; Urethane Alkyd Gloss Enamel M22; Two coats, 2.0-2.2 dry mils.

2.4 PAINT SYSTEMS – INTERIOR

A. Paint GI-OP-3LA - Gypsum Board/Plaster, Latex-Acrylic, 3 Coats:

1. One coat of primer-sealer: Moore; Moorcraft Super Hide Interior Latex Primer/Undercoater 284; One coat, 0.8 - 1.0 dry mils

2. Semi-gloss: Two coats of latex enamel; Moore; Regal Aquaglo #333; 1.3 dry mils per coat.

B. Paint CE-OP-3E-1 - Concrete, Opaque, Polyamide Epoxy, 3 Coats over prepared surfaces:

1. First Coat: Polyamide Epoxy; Moore CM36/CM37 Clear; reduced 25% with Moore Epoxy Thinner 95.

2. Second Coat: Polyamide Epoxy; Moore CM36-90/CM37 White; 2.0 dry mils.

3. Third Coat: Polyamide Epoxy; Moor CM36-90/CM37 White; 2.0 dry mils.

C. Paint ME-OP-3E-4 - Ferrous and Galvanized Metals, Primed or Unprimed, Opaque, 3 Coats:

1. Touch-up: Moore; Alkyd Metal Primer M06.

2. Primer: Moore; Alkyd Metal Primer M06; One coat, 1.3-1.5 dry mils.

3. Gloss Finish: Moore; Urethane Alkyd Gloss Enamel M22; Two coats, 2.0-2.2 dry mils.

2.5 ACCESSORY MATERIALS

A. Patching Material: Latex filler.

PART 3 - EXECUTION

3.1 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.

D. Test previously painted surfaces for compatibility with subsequent cover materials.

E. 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 Wallboard: 12 percent.

2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.

3. Interior Wood: 15 percent, measured in accordance with ASTM D 4442.

4. Concrete Floors: 8 percent.

3.2 PREPARATION

A. Perform all preparation and cleaning procedures as specified herein and in strict accordance with the paint manufacturer's instructions for each particular substrate and atmospheric condition.

B. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces which affect work of this section.

E. Marks: Seal marks which may bleed through surface finishes with tie coat compatible with paint.

F. Impervious Surfaces: Remove mildew in accordance with paint manufacturer's recommendations.

G. Concrete and Unit Masonry Surfaces to be Painted: Allow new concrete and masonry to cure 28 days. Remove stains, oil, grease, dirt, loose mortar, scale, salt or alkali powder, and other foreign matter in accordance with paint manufacturer's recommendations. Do not use wire brushes for preparation or cleaning.

1. Do not paint over surfaces where the moisture content exceeds 8 percent, unless otherwise permitted in the manufacturer's printed instructions.

H. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

I. Concrete Floors to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.

J. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent.

K. 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.

L. Factory Finished Surfaces to be Field Painted: Lightly sand to create a dull surface and as required by paint manufacturer. Provide tie coat over entire factory-finished surfaces as required by paint manufacturer.

M. Shop-Primed and Non-Shop-Primed Ferrous Surfaces to be Finish Painted: Clean and prepare in accordance with manufacturer's recommendations. Feather edges to make touch-up patches inconspicuous. Prime bare steel surfaces.

N. Interior Wood Items to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's instructions.

1. Any spot measurement found below the required minimum dry film thickness shall be repainted by the Contractor in accordance with the manufacturer's instructions, at no additional cost to the Owner.

B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.4 FIELD QUALITY CONTROL

A. The Engineer reserves the right to test surfaces, film thickness, and paint products at any time and as often as the Engineer deems necessary during the period when paint is being applied.

B. Any spot measurement found below the required minimum dry film thickness shall be repainted by the Contractor in accordance with the manufacturer's instructions, at no additional cost to the Owner.

C. Do not paint unsatisfactory surfaces until they have been corrected and are in accordance with paint manufacturer's recommendations.

3.5 CLEANING

A. Collect waste material which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 SCHEDULE - SURFACES TO BE FINISHED

A. Do Not Paint or Finish the Following Items:

1. Items fully factory-finished unless specified herein or specifically noted.

2. Fire rating labels, equipment serial number and capacity labels.

3. Stainless steel, or chromium plated items.

4. Bronze and brass items.

5. Anodized aluminum items.

a. Paint concealed aluminum surfaces in contact with concrete, masonry, and dissimilar materials as described below under Schedule - Paint Systems.

B. Paint the surfaces described below under Schedule - Paint Systems.

C. Process Piping: Paint in accordance with Section 09800.

D. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.

1. Paint exposed exterior conduit and electrical panels, including factory-finished components, unless indicated otherwise.

2. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.

3.7 SCHEDULE - PAINT SYSTEMS

A. Galvanized Metals for Which No Other Paint System is Indicated: ME-OP-3E-4.

B. Ferrous Metals for Which No Other Paint System is Indicated: ME-OP-3E-4.

C. Cast-In-Place Concrete: Finish all surfaces exposed to view, except concrete slabs.

1. Exterior Exposed Walls Below Concrete Masonry: CE-OP-2AC-3.

2. Interior Slabs, Curbs, and Walls Below Concrete Masonry: CE-OP-3E-1.

D. Gypsum Board: Finish all surfaces exposed to view: GI-OP-3LA.

E. Wood: Finish all surfaces exposed to view: WE-OP-3A-1.

F. Plywood Wainscot: WE-OP-3A-1.

G. Exposed interior roof joists, rood deck, and roof framing components: No painting required.

H. Exposed exterior ductwork: ME-OP-3E-4.

I. Exposed interior ductwork: No painting required.

J. Doors and Frames: Finish all surfaces exposed to view, ME-OP-3E-4.

3.8 SCHEDULE – COLORS

A. Colors: Except as noted below provide colors as selected by Engineer from manufacturer's standards.

1. Exposed exterior concrete walls below concrete masonry: Match exterior concrete masonry color.

2. Bollards: Match exterior hollow metal door and frame color.

3. Interior floor slabs and curbs: Moore, “White.”

4. Exposed surfaces of interior concrete walls below concrete masonry: Moore, “White.”

5. Exposed interior surfaces of plywood wainscot: Moore, “White.”

6. Exposed interior surfaces of gypsum board: Moore, “White.”

END OF SECTION

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall provide building signage and appurtenant WORK, complete and in place, in accordance with the Contract Documents.

1.2 REFERENCES

A. Where reference is made to any of the below, the revision in effect at the time of bid opening shall apply.

B. Americans with Disabilities Act (ADA): ADA Accessibility Guidelines (ADAAG).

C. Building Code: Refer to the Drawings to determine which Building Code applies. The applicable Building Code, defined by the Drawings, is referred to herein as "the CODE."

D. National Fire Protection Association (NFPA): NFPA 704 Identification of the Hazards of Materials for Emergency Response

E. Occupational Safety and Health Administration (OSHA).

1.3 QUALITY ASSURANCE

A. Single Source Responsibility: Building signage shall be provided by a single Manufacturer, unless otherwise indicated.

B. Manufacturer Qualifications:

1. Building signage Manufacturer shall have a minimum of 10 years of building signage manufacturing experience.

2. Building signage Manufacturers shall have the ability to print signs in other languages.

3. Manufacturers without these qualifications will not be accepted.

1.4 SPECIAL WARRANTY PROVISIONS

A. Furnish Manufacturer's 15-year written warranty to cover defects in materials, products, and manufacturing workmanship.

1. Warranty shall include coverage against chipping, fading, rusting, shattering, or peeling.

B. Warranties shall be non-prorated for the entire warranty period.

C. The term of the warranties shall begin on the date of Substantial Completion.

1.5 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – CONTRACTOR Submittals.

B. Literature: Manufacturer's specifications, technical data, installation methods, and maintenance instructions, and the following:

1. Manufacturer's full range color charts, indicating custom color availability for color selection by the ENGINEER

C. Warranty: Submit a copy of the warranty.

D. Certifications:

1. Certification by the building signage Manufacturer that the building signage provided is suitable for, and compatible with, the required installation.

2. Certification by the building signage Manufacturer that the building signage provided is suitable for, and compatible with, the substrates and surfaces indicated.

3. Certification of Manufacturer qualifications demonstrating compliance with the qualifications requirements indicated.

4. When requested by the ENGINEER, furnish other certifications as may be required to demonstrate compliance with the Contract Documents.

E. Shop Drawings

1. Shop Drawings shall be drawn to sufficient scale and shall include dimensions, show elevations and details of construction of each building signage type, schedule of building signage, mounting details, location and installation requirements, thickness of materials, joints, provisions for expansion and contraction, connections, accessories, and trim.

2. A typical of repetitive sign layout may be submitted.

3. Depict the most restrictive conditions.

F. Samples

1. Submit full-size sample of each typical building signage type, including materials and colors proposed for the WORK, clearly marked to show the manufacturer's name and product identification.

2. Upon approval, the samples shall become the standard for acceptance for the project with regard to color, finish, and quality of each item. Approval of samples shall not relieve the CONTRACTOR from compliance with the Contract Documents.

G. Submit the manufacturer's technical data and application instructions.

PART 2 - PRODUCTS

2.1 GENERAL

A. Provide identification devices where directed by the ENGINEER.

B. Provide wording as indicated and verified before fabrication.

C. All signage shall be suitable for exterior and interior application.

D. Colors and letter style shall be as selected by the ENGINEER.

E. Signs shall have permanent room or area name or personnel/use insert.

2.2 ROOM/AREA IDENTIFICATION SIGNS

A. BASIS-OF-DESIGN PRODUCT: Subject to compliance with requirements, provide Mohawk 1000 ADA System manufactured by Mohawk Sign Systems, or comparable product by one of the following:

1. APCO Graphics, Inc.

2. ASI Sign Systems, Inc.

3. Vomar Products, Inc.

B. ADA Accessible areas: Uses Mohawk Sign Systems Series 200A Sand-Carved process

C. Process area: Uses Mohawk Sign Systems Series 100 Engraved process.

D. Room/Area Sign Schedule

1. Provide the following signs in the indicated locations:

Location	**Sign Text**
Doors	Electrical Room
Doors	Sludge Handling Room
Doors	Equipment Room

2.3 HAZARD IDENTIFICATION SYSTEM

A. System shall conform to NFPA 704.

B. System shall use a diamond-shaped symbol divided into four smaller diamonds.

1. Health hazard diamond (left): blue background with a rating number in contrasting color.

2. Flammability hazard diamond (top): red background with a rating number in contrasting color.

3. Reactivity hazard diamond (right): yellow background with a rating number in contrasting color.

4. Special hazard diamond (bottom): white background with a rating number in contrasting color.

C. Colors used for the diamonds shall provide an adequate contrast so that the rating numbers are easily identified.

D. Signs shall be SetonUltraTuff by Seton, Branford, Connecticut, or approved equal, constructed of a printed polyester film permanently bonded to a rigid fiberglass panel and over-laminated with Tedlar by Seton, or approved equal, and a total thickness of 0.11 -inch (2.8 mm) minimum.

E. Signs shall be wall and door surface mounted per Manufacturer standard. Signs shall be mounted as scheduled, as recommended in writing by the Manufacturer, and as approved by the ENGINEER.

F. Unless otherwise noted, exterior signs shall be a minimum of 15-inches (381 mm) by 15-inches (381 mm) and interior signs shall be a minimum of 10-inches (254 mm) by 10-inches (254 mm).

G. Hazard Identification Sign Schedule

1. Provide the following signs in the indicated locations:

NFPA				**Location**
Health	**Flam**	**React**	**Special**	North and South mandoors.
3			COR TOX	

2.4 RESTRICTIVE/CAUTION SIGNS

A. General

1. Signs shall be Seton Ultra Tuff by Seton, Branford, Connecticut, or approved equal, constructed of a printed polyester film permanently bonded to a rigid fiberglass panel and over-laminated with Tedlar by Seton, or approved equal, and a total thickness of 0.11 -inch (2.8 mm) minimum.

2. Signs shall be 14-inches (356 mm) wide by 10-inches (254 mm) tall in rounded corners. All aspects of the Restrictive/Caution Signs shall be in accordance with OSHA standards. If OSHA standards do not apply, the color shall be red with white letters, 1-inch (25 mm) high. Signs shall conform to OSHA standards and directions.

3. Signs shall be wall and door surface mounted per Manufacturer standard using stainless steel fasteners. Signs shall be mounted as scheduled, as recommended in writing by the Manufacturer, and as approved by the ENGINEER.

4. Sign sizes shall be adjusted to suit the number of letters in each sign with a 1-inch (25 mm) minimum border all around. Text shall be center justified.

B. Restrictive/Caution Sign Schedule

1. Provide the following signs in the indicated locations:

Sign Text	Location
CAUTION NON-POTABLE WATER. DO NOT DRINK.	Hose bibs where water is non-potable
WARNING THIS MACHINE STARTS AUTOMATICALLY	Attach to equipment and pumps that can be started either automatically or remotely

2.5 EQUIPMENT NAMETAGS

A. Small Equipment (as defined in Section 46 01 00 – Equipment General Provisions)

1. Material shall be 1/16-inch thick acrylic with a matte finish, with the color selected by the ENGINEER.

2. Provide white letters, 1/2-inch tall, embossed and fused by heat and pressure into the material.

3. Lettering shall be the equipment number in the Contract Documents or as directed by the ENGINEER.

B. Large Equipment (as defined in Section 46 01 00 – Equipment General Provisions)

1. Material shall be 1/16-inch thick stainless steel plate, at least 4-inch by 6-inch

2. Provide lettering embossed into the plate, at least one inch tall.

3. Furnish the proposed wording to the ENGINEER for approval prior to application.

C. The ENGINEER will determine the location for equipment nametags and the methods of attachment.

2.6 BUILDING SIGNS

A. Building signs shall be individual dimensional letters of cast aluminum with a baked Kynar finish. Color and font as selected by the ENGINEER.

B. Letters shall be 1-inch thick by 8-inch height minimum or as shown in the schedule or on the drawings.

C. Signs shall be wall mounted with concealed studs per Manufacturer standard. Signs shall be mounted as scheduled, as recommended in writing by the Manufacturer, and as approved by the ENGINEER.

D. Building Sign Schedule

1. Provide the following signs in the indicated locations:

Sign Text	Location
SLUDGE BUILDING	As directed by Engineer

2.1 BRONZE PLAQUE

A. Provide a bronze plaque, 24 inches wide by 16 inches tall, as directed by the ENGINEER.

B. Provide the plaque with a satin finish, a plain double-line border, a leatherette background, and inscribed as directed by the ENGINEER.

C. Letters shall be raised and satin-finished, with each letter sharp and clearly defined, and of a style as selected by the ENGINEER.

D. Mounting the plaque using concealed fasteners with rosette covers in accordance with the plaque manufacturer's recommendations.

E. Submit artist sketches as Shop Drawings for review before final casting.

PART 3 -- EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in Manufacturer’s original, unopened packages, containers, or bundles with labels intact, which clearly identify contents.

B. Store materials carefully in accordance with the Manufacturer’s written instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products.

C. Handle materials in strict accordance with Manufacturer’s written instructions.

3.2 LOCATIONS

A. Signage shall be installed at the locations indicated or as otherwise required by the CODE, ADAAG, NFPA 704, and OSHA. Where a conflict occurs between the requirements of this Section and the references herein, the more stringent shall apply, as directed by the ENGINEER.

B. Where not indicated, signs shall be installed as directed by the ENGINEER.

C. Signs shall be mounted 60-inches (1520-millimeters) above the floor, unless otherwise indicated.

3.3 PROJECT CONDITIONS

A. Comply with Manufacturer’s written instructions for environmental conditions before, during, and after installation.

B. Protect surrounding WORK from damage that may result from operations under this Section.

3.5 INSPECTION

A. The CONTRACTOR shall be totally responsible for the proper performance and completion of the WORK under this Section.

B. Systems and components shall be inspected before installation.

1. Damaged or defective items shall be rejected and marked as such and shall be removed from the Site.

2. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discoloration, or other surface imperfections on the finished units shall be rejected.

C. The CONTRACTOR shall verify dimensions, tolerances, and method of attachment with adjacent WORK.

1. Examine substrates, areas, and conditions where building signage will be installed for compliance with the requirements for installation, taking into account tolerances, and other conditions affecting performance of installed building signage.

a. Provide inserts, backing, blocking, anchoring devices, and reinforcements that must be built into other WORK for the installation of building signage and appurtenances. Coordinate delivery with other WORK to avoid delay.

2. Notify the ENGINEER in writing of conditions detrimental to the proper and timely completion of the WORK. Do not proceed with the WORK until unsatisfactory conditions have been corrected in an acceptable manner.

3. Commencement of the installation by the CONTRACTOR shall indicate CONTRACTOR'S acceptance of the substrate, areas, and conditions.

3.6 PREPARATION

A. Sequence installation properly with the installation and protection of other WORK, so that neither will be damaged by the installation of the other.

3.7 INSTALLATION

A. Installation shall comply with the requirements of the Contract Documents, with applicable references, with the requirements of the CODE, NFPA 704, OSHA, and with Manufacturer's written instructions. Where a conflict occurs among these requirements, the more stringent shall apply, as directed by the ENGINEER.

B. The CONTRACTOR shall provide corrosion resistant fasteners, anchors, and shims required for a complete installation, and shall be secure, plumb, level, straight, and true to line, allowing for required movement, including expansion and contraction.

C. The CONTRACTOR shall provide separation of dissimilar materials to ensure no galvanic action occurs.

D. Horizontal lines shall be level, and vertical lines shall be plumb.

E. The CONTRACTOR shall block and reinforce walls as required to support building signage, and appurtenances.

3.8 CLEANING, FINISHING, AND PROTECTION

A. Adhesive papers used for masking which become firmly bonded when exposed to heat and/or light shall not be used.

1. Remove masking film and temporary labels as soon as possible after installation. Films and labels left in place after installation shall be the responsibility of the CONTRACTOR.

2. Residue shall not be left on any surfaces.

B. Upon completion of the installation, building signage and appurtenances shall be cleaned of dirt and other foreign matter to the satisfaction of the ENGINEER.

1. Cleaning shall be performed again immediately prior to acceptance of the WORK, when directed by the ENGINEER.

2. Cleaning shall be performed in accordance with the Manufacturer's written instructions.

C. Building signage shall be protected from damage from subsequent construction operations.

D. The CONTRACTOR shall make adjustments required until accepted.

E. The CONTRACTOR shall remove scratches and blemishes to the satisfaction of the ENGINEER.

F. Damaged or defective items shall be removed and replaced at the direction of the ENGINEER.

G. When building signage WORK is completed, remove unused materials, containers, and equipment, and clean the Site of building signage debris.

END OF SECTION

SECTION 10 44 00 - FIRE EXTINGUISHERS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall provide fire extinguishers and appurtenant WORK, complete, in place, and operational in accordance with the Contract Documents.

1.2 REFERENCES

A. Where reference is made to any of the below, the revision in effect at the time of bid opening shall apply.

B. Building Code: Refer to the Drawings to determine which building code applies. The applicable building code, defined by the Drawings, is referenced herein as “the CODE”.

C. National Fire Protection Association publications (NFPA):

NFPA 10 Standard for Portable Fire Extinguishers

D. Underwriter’s Laboratories (UL)

1.3 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01 33 00 – CONTRACTOR Submittals.

1. Literature: Manufacturer’s specifications, technical data, installation methods, and maintenance instructions.

2. Certifications:

a. UL certification for each fire extinguisher unit provided.

b. Certification of Manufacturer qualifications demonstrating compliance with the qualifications requirements indicated.

3. When requested by the ENGINEER, furnish other certifications as may be required to show compliance with the Contract Documents.

4. Shop Drawings: Complete Shop Drawings showing location and detail of installation. Shop Drawings shall include mounting and bracket details.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Fire extinguishers shall be provided by a single Manufacturer.

B. Manufacturer Qualifications:

1. Fire extinguisher Manufacturer shall have a minimum of 20 years of fire extinguisher manufacturing experience.

2. Manufacturers without these qualifications will not be accepted.

PART 2 -- PRODUCTS

2.1 GENERAL

A. Fire extinguishers, accessories, and installation shall comply with the CODE, NFPA 10, and with the Manufacturer's published recommendations and specifications.

2.2 FIRE EXTINGUISHERS:

A. Manufacturer, or Equal:

1. Subject to the requirements indicated, provide products from one of the Manufacturers listed below, or Equal.

a. J.L Industries, Inc.

b. Larsen’s Manufacturing Co.

c. General Fire Extinguisher Co.

B. Description:

1. Fire extinguishers in every location, except in rooms or spaces containing electrical switchgear, motor control centers, variable frequency drives, generator rooms, etc., shall be 20 lb minimum capacity, 10A:120B:C (ABC), minimum UL-rated, chemical multipurpose type.

2. Fire extinguishers in rooms or spaces containing electrical switchgear, motor control centers, variable frequency drives, generator rooms, etc., shall be 10 lb, minimum capacity, 10B:C, minimum UL-rated, Halotron type.

3. Fire extinguishers shall be provided with severe duty corrosion resistant finish, red enamel steel cylinders.

4. Fire extinguishers shall be provided with mounting brackets, which support the bottom and sides of extinguishers, and are specially designed for the extinguisher, as recommended in writing by the Manufacturer.

PART 3 -- EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Site in Manufacturer's original, unopened packages, containers, or bundles with labels intact, which clearly identify contents.

B. Store materials carefully in accordance with the Manufacturer's written instructions, in an area that is protected from deleterious elements, and in a manner that will prevent damage to the products.

C. Handle materials in strict accordance with Manufacturer's written instructions.

3.2 LOCATIONS

A. The CONTRACTOR shall verify the fire extinguisher locations and mounting heights on the Contract Drawings with the Fire Marshall before installation. If locations on the Drawings are not accepted by the Fire Marshal, install fire extinguishers where directed by the ENGINEER.

3.3 PROJECT CONDITIONS

A. Comply with Manufacturer's written instructions for environmental conditions before, during, and after installation.

B. Protect surrounding WORK from damage that may result from operations under this Section.

3.4 INSPECTION

A. The CONTRACTOR shall be totally responsible for the proper performance and completion of the WORK under this Section.

B. Systems and components shall be inspected before installation.

1. Damaged or defective items shall be rejected and marked as such and shall be removed from the Site.

2. Exposed surfaces that exhibit pitting, seam marks, roller marks, stains, discoloration, or other surface imperfections on the finished units shall be rejected.

C. The CONTRACTOR shall verify dimensions, tolerances, and method of attachment with adjacent WORK.

1. Examine substrates, areas, and conditions where fire extinguishers and appurtenances will be installed for compliance with the requirements for installation, taking into account tolerances, and other conditions affecting performance of installed fire extinguishers and appurtenances.

    a. Provide inserts, backing, blocking, anchoring devices, and reinforcements that must be built into other WORK for the installation of fire extinguishers and appurtenances. Coordinate delivery with other WORK to avoid delay.

2. Notify the ENGINEER in writing of conditions detrimental to the proper and timely completion of the WORK. Do not proceed with the WORK until unsatisfactory conditions have been corrected in an acceptable manner.

3. Commencement of the installation by the CONTRACTOR shall indicate CONTRACTOR's acceptance of the substrate, areas, and conditions.

3.5 PREPARATION

A. Sequence installation properly with the installation and protection of other WORK, so that neither will be damaged by the installation of the other.

3.6 INSTALLATION

A. Installation shall comply with the requirements of the Contract Documents, with applicable references, the requirements of the CODE, with NFPA 10, and with Manufacturer's written instructions. Where a conflict occurs among these requirements, the more stringent shall apply, as directed by the ENGINEER.

B. The CONTRACTOR shall block and reinforce walls as required to support the fire extinguishers and appurtenances.

C. The CONTRACTOR shall provide corrosion resistant fasteners, anchors, and shims required for a complete installation, and shall be secure, plumb, level, straight, and true to line, allowing for required movement, including expansion and contraction.

D. The CONTRACTOR shall provide separation of dissimilar materials to ensure no galvanic action occurs.

E. Horizontal lines shall be level, and vertical lines shall be plumb.

F. Secure mounting brackets and fire extinguishers to structure, square and plumb.

3.7 CLEANING, FINISHING, AND PROTECTION

A. Adhesive papers used for masking which become firmly bonded when exposed to heat and/or light shall not be used.

1. Remove masking film and temporary labels as soon as possible after installation. Films and labels left in place after installation shall be the responsibility of the CONTRACTOR.

2. Residue shall not be left on any surfaces.

B. Upon completion of the installation, fire extinguishers and appurtenances shall be cleaned of dirt and other foreign matter to the satisfaction of the ENGINEER.

1. Cleaning shall be performed again immediately prior to acceptance of the WORK, when directed by the ENGINEER.

2. Cleaning shall be performed in accordance with the Manufacturer's written instructions.

C. Fire extinguishers shall be protected from damage from subsequent construction operations.

D. The CONTRACTOR shall make adjustments required until accepted.

E. The CONTRACTOR shall remove scratches and blemishes to the satisfaction of the ENGINEER.

F. Damaged or defective items shall be removed and replaced at the direction of the ENGINEER.

G. When fire extinguishers WORK is completed, remove unused materials, containers, and equipment, and clean the Site of fire extinguishers debris.

H. Fire extinguishers shall be inspected and certified within 30 days of Substantial Completion.

END OF SECTION

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. Metal soffit panels.
5. Thermal insulation.
6. Personnel doors and frames.
7. Translucent panels.
8. Accessories.

B. Related Requirements:

1. Section 083323 "Overhead Coiling Doors" for coiling vehicular doors in metal building systems.

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 standards referenced by this Section.

1.4 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

B. 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.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation 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 and impact on construction schedule.

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.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Metal roof panels.

b. Metal wall panels.

c. Metal soffit panels.

d. Thermal insulation and vapor-retarder facings.

e. Personnel doors and frames.

f. Translucent wall panels.

g. Louvers.

B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:

1. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods 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 roof curbs and pipe racks.

3. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, 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 personnel doors, vehicular doors, windows, louvers, and lighting fixtures.

    c. Show translucent panels.

4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:8):

    a. Flashing and trim.

    b. Gutters.

    c. Downspouts.

    d. Service walkways.

C. Samples for Verification: For the following products:

1. Panels: Nominal 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other exposed panel accessories.

2. Flashing and Trim: Nominal 12 inches (300 mm) long. Include fasteners and other exposed accessories.

3. Vapor-Retarder Facings: Nominal 6-inch- (150-mm-) square Samples.

4. Accessories: Nominal 12-inch- (300-mm-) long Samples for each type of accessory.

D. Door Schedule: For doors and frames. Use same designations indicated on Drawings. Include details of reinforcement.

1. Door Hardware Schedule: Include details of fabrication and assembly of door hardware. Organize schedule into door hardware sets indicating complete designations of every item required for each door or opening.

2. Keying Schedule: Detail Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

E. Delegated-Design Submittal: For metal building systems.

1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For erector and manufacturer.

B. Welding certificates.

C. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.

2. Order number.

3. Name of manufacturer.

4. Name of Contractor.

5. Building dimensions including width, length, height, and roof slope.

6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.

7. Governing building code and year of edition.

8. 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).

9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.

10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

D. Erector Certificates: For qualified erector, from manufacturer.

E. Material Test Reports: For each of the following products:

1. Structural steel including chemical and physical properties.

2. Tension-control, high-strength, bolt-nut-washer assemblies.

3. Shop primers.

F. Source quality-control reports.

G. Sample Warranties: For special warranties.

1.8 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes and door hardware to include in maintenance manuals.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

B. 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.

C. 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."

1.10 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.

D. Protect foam-plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.

3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.12 WARRANTY

A. Special Warranty on Metal Panel Finishes: 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 D2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufactures

1. Nucor Building Systems.

2. Mueller Inc.

3. Butler Manufacturing.

4. American Buildings.

5. Or approved equal.

B. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

A. Provide a complete, integrated set of 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.

B. Primary-Frame Type:

1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.

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 exterior-framed (bypass) girts.

E. Eave Height: Manufacturer's standard height, as indicated by nominal height on Drawings.

F. Bay Spacing: As indicated on Drawings.

G. Roof Slope: Manufacturer's standard for frame type required.

H. Roof System: Manufacturer's standard standing-seam, vertical-rib, metal roof panels.

I. Exterior Wall System: Manufacturer's standard exposed-fastener, tapered-rib, metal wall panels.

2.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal building system.

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 and Drift Limits: Design metal building system assemblies to withstand serviceability design loads without exceeding deflections and drift limits recommended in AISC Steel Design Guide No. 3 "Serviceability Design Considerations for Steel Buildings."

C. Seismic Performance: Metal building system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Structural Performance for Metal Roof and Wall Panels: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.

F. Air Infiltration for Metal Roof Panels: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E1680 or ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

G. Air Infiltration for Metal Wall Panels: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

H. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E1646 or ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).

I. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 2.86 lbf/sq. ft. (137 Pa).

J. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

K. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A- 90.

2. Hail Resistance: MH.

L. Energy Performance: Provide roof panels according to one of the following when tested according to CRRC-1:

1. Three-year, aged, solar reflectance of not less than 0.55 and emissivity of not less than 0.75.

M. Thermal Performance for Opaque Elements: Provide the following maximum U-factors and minimum R-values when tested according to ASTM C1363 or ASTM C518:

1. Roof:

a. R-Value: 19 + 11 LS.

2. Walls:

a. R-Value: 13 + 6.5 c.i.

2.4 STRUCTURAL-STEEL FRAMING

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. 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.

D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, 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.

4. Exterior Column: Uniform depth.

5. Rafter: Tapered.

E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.

F. 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, prepainted 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 2-1/2-inch- (64-mm-) wide flanges.

a. Depth: As needed to comply with system performance requirements; minimum 8”.

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 2-1/2-inch- (64-mm-) wide flanges.

a. Depth: As required to comply with system performance requirements ;8” minimum.

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 (51-by-51-by-3-mm) structural-steel angles or 1-inch- (25-mm-) diameter, cold-formed structural tubing to stiffen primary-frame flanges.

5. Sag Bracing: Minimum 1-by-1-by-1/8-inch (25-by-25-by-3-mm) structural-steel angles.

6. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch (76-by-51-mm), fabricated from zinc-coated (galvanized) 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. 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.

9. 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.

G. 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.

H. Bracing: Provide adjustable wind bracing using any method as follows:

1. Rods: ASTM A36/A36M; ASTM A572/A572M, Grade 50 (345); or ASTM A529/A529M, Grade 50 (345); minimum 1/2-inch- (13-mm-) diameter steel; threaded full length or threaded a minimum of 6 inches (152 mm) at each end.

2. Cable: ASTM A475, minimum 1/4-inch- (6-mm-) diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.

3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.

4. 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.

5. Fixed-Base Columns: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.

6. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.

I. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.

J. Materials:

1. W-Shapes: ASTM A992/A992M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).

2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).

3. Plate and Bar: ASTM A36/A36M; ASTM A572/A572M, Grade 50 or 55 (345 or 380); or ASTM A529/A529M, Grade 50 or 55 (345 or 380).

4. Structural-Steel Sheet: Hot-rolled, ASTM A1011/A1011M, Structural Steel (SS), Grades 30 through 55 (205 through 380), or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70 (310 through 480); or cold-rolled, ASTM A1008/A1008M, Structural Steel (SS), Grades 25 through 80 (170 through 550), or HSLAS, Grades 45 through 70 (310 through 480).

5. Metallic-Coated Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G60 (Z180) coating designation; mill phosphatized.

6. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A755/A755M.

    a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, SS, Grades 33 through 80 (230 through 550), or HSLAS or HSLAS-F, Grades 50 through 80 (340 through 550); with G90 (Z275) coating designation.

7. Non-High-Strength Bolts, Nuts, and Washers: ASTM A307, Grade A, carbon-steel, hex-head bolts; ASTM A563 (ASTM A563M) carbon-steel hex nuts; and ASTM F844 plain (flat) steel washers.

    a. Finish: Hot-dip zinc coating, ASTM F2329, Class C.

8. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325 (Grade A325M), Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

    a. Finish: Hot-dip zinc coating, ASTM F2329, Class C.

9. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490 (Grade A490M), Type 1, heavy-hex steel structural bolts or Grade F2280 tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

10. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, (ASTM A563M, Class 10S) heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1 hardened carbon-steel washers.

    a. Finish: Mechanically deposited zinc coating, ASTM B695, Class 50.

11. Unheaded Anchor Rods: ASTM F1554, Grade 36.

    a. Configuration: Straight.

    b. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.

    c. Plate Washers: ASTM A36/A36M carbon steel.

    d. Washers: ASTM F436 (ASTM F436M) hardened carbon steel.

    e. Finish: Hot-dip zinc coating, ASTM F2329, Class C.

12. Headed Anchor Rods: ASTM F1554, Grade 36.

    a. Configuration: Straight.

    b. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.

    c. Plate Washers: ASTM A36/A36M carbon steel.

    d. Washers: ASTM F436 (ASTM F436M) hardened carbon steel.

    e. Finish: Hot-dip zinc coating, ASTM F2329, Class C.

13. Threaded Rods: ASTM A193/A193M.

a. Nuts: ASTM A563 (ASTM A563M) heavy-hex carbon steel.

b. Washers: ASTM F436 (ASTM F436M) hardened carbon steel.

c. Finish: Hot-dip zinc coating, ASTM F2329, Class C.

K. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.

1. Clean and prepare in accordance with SSPC-SP2.

2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil (0.025 mm).

a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil (0.013 mm) on each side.

2.5 METAL ROOF PANELS

A. Standing-Seam, Vertical-Rib, Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch (0.61-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

a. Exterior Finish: Two-coat fluoropolymer.

b. Color: As selected by Architect from manufacturer's full range.

2. Clips: One-piece fixed to accommodate thermal movement.

3. Joint Type: Mechanically seamed.

4. Panel Coverage: 16 inches (406 mm).

5. Panel Height: 2 inches (51 mm).

B. 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 (0.013 mm).

2.6 METAL WALL PANELS

A. Exposed-Fastener, Tapered-Rib, Metal Wall Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.024-inch (0.61-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

a. Exterior Finish: Two-coat fluoropolymer.

b. Color: As selected by Architect from manufacturer's full range.

2. Major-Rib Spacing: 6 inches (152 mm) o.c.

3. Panel Coverage: 36 inches (914 mm).

4. Panel Height: 0.75 inch (19 mm).

B. 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 (0.013 mm).

2.7 METAL SOFFIT PANELS

A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically

attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.

B. Concealed-Fastener, Flush-Profile, Metal Soffit Panels: Formed with vertical panel edges and flush surface; with flush joint between panels; with 1-inch- (25-mm-) wide flange for attaching interior finish; designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps.

1. Material: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.030-inch (0.76-mm) nominal uncoated steel thickness. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

a. Exterior Finish: Fluoropolymer.

b. Color: As selected by Architect from manufacturer's full range.

2. Panel Coverage: 12 inches (305 mm).

3. Panel Height: 1 inch (25 mm).

2.8 THERMAL INSULATION

A. Faced Metal Building Insulation: ASTM C991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

B. Unfaced Metal Building Insulation: ASTM C991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. (8-kg/cu. m) density; 2-inch- (51-mm-) wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

C. Mineral-Fiber-Blanket Insulation: ASTM C665, type indicated below; consisting of fibers manufactured from glass, slag wool, or rock wool.

D. Retainer Strips: For securing insulation between supports, 0.025-inch (0.64-mm) nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.

E. Vapor-Retarder Facing: ASTM C1136, with permeance not greater than 0.02 perm (1.15 ng/Pa x s x sq. m) when tested according to ASTM E96/E96M, Desiccant Method.

1. Basis of Design: **Simple Saver Insulation System** (wall and roof), or approved equal.

2. Composition: White polypropylene film facing, fiberglass scrim reinforcement, and metallized-polyester film backing.

3. Composition: White polypropylene film facing and fiberglass-polyester-blend fabric backing.

F. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.9 PERSONNEL DOORS AND FRAMES

A. Materials:

1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

2. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, CS, Type B; free of scale, pitting, or surface defects; pickled and oiled.

3. Metallic-Coated Steel Sheet: ASTM A653/A653M, CS, Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating designation.

B. Finishes for Personnel Doors and Frames:

1. Prime Finish: Factory-apply manufacturer's standard primer immediately after cleaning and pretreating.

a. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.10 TRANSLUCENT PANELS

G. Uninsulated Translucent Panels: Glass-fiber-reinforced polyester, translucent plastic; complying with ASTM D3841, Type CC1 (limited flammability), Grade 1 (weather resistant); smooth finish on both sides. Match profile of adjacent metal panels.

1. Wall Panel Weight: Not less than 6 oz./sq. ft. (1831 g/sq. m).

2. Light Transmittance: Not less than 55 percent according to ASTM D1494.

3. Metal Edge: Fabricate full length of each side of panel with metal edge for seaming into standing-seam roof panel joint.

4. Color: White.

B. Mastic for Translucent Panels: Nonstaining, saturated vinyl polymer as recommended by translucent panel manufacturer for sealing laps.

C. Performance:

1. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

a. Flame-Spread Index: 25 or less.

b. Smoke-Developed Index: 450 or less.

2.11 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 stainless-steel sheet, designed to withstand negative-load requirements.

3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from stainless-steel sheet or nylon-coated aluminum 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-(25-mm-) thick, flexible closure strips; cut or premolded 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 (25-mm) 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- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted 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: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted 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- (2438-mm-) 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: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch (0.46-mm) nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- (3-m-) long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Louvers: Size and design indicated; self-framing and self-flashing. Fabricate welded frames from zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.048-inch (1.21-mm) nominal uncoated steel thickness; finished to match metal wall panels. Form blades from zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.036-inch (0.91-mm) nominal uncoated steel thickness; folded or beaded at edges, set at an angle that excludes driving rains, and secured to frames by riveting or welding. Fabricate louvers with equal blade spacing to produce uniform appearance.

1. Blades: Fixed.

2. Free Area: Not less than 7.0 sq. ft. (0.65 sq. m) for 48-inch- (1220-mm-) wide by 48-inch- (1220-mm-) high louver.

3. Bird Screening: Galvanized steel, 1/2-inch- (13-mm-) square mesh, 0.041-inch (1.04-mm) wire; with rewirable frames, removable and secured with clips; fabricated of same kind and form of metal and with same finish as louvers.

    a. Mounting: Interior face of louvers.

4. Vertical Mullions: Provide mullions at spacings recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.

H. Roof Curbs: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.048-inch (1.21-mm) nominal uncoated steel thickness prepainted with coil coating; finished to match metal roof panels; with welded top box and bottom skirt, and integral full-length cricket; capable of withstanding loads of size and height indicated.

1. Curb Subframing: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.060-inch (1.52-mm) nominal uncoated steel thickness, angle-, C-, or Z-shaped metallic-coated steel sheet.

2. Insulation: 1-inch- (25-mm-) thick, rigid type.

I. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

J. 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 Roof Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.

c. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM sealing washers bearing on weather side of metal panels.

d. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.

e. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

4. Metal Panel Sealants:

a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.

b. Joint Sealant: ASTM C920; 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.

2.12 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 if applicable, or punch for bolts.

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 instructions and 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 High-Strength Bolts" for bolt type and joint type specified.

a. Joint Type: Snug tightened or pretensioned as required by manufacturer.

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. 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. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. 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.

D. 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 structural supports with end laps in alignment.

6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

E. 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.

F. 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.

G. 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.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

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 and hip 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. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint, at location and spacing and with fasteners recommended by manufacturer.

1. Install clips to supports with self-drilling or self-tapping fasteners.

2. Install pressure plates at locations indicated in manufacturer's written installation instructions.

3. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.

4. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.

5. Provide metal closures at peaks rake edges rake walls and each side of ridge caps.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines and within 1/8-inch (3-mm) 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 (102 mm) 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 for thermal expansion and contraction. Predrill panels.

6. Flash and seal metal wall panels with weather closures at eaves and 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 on Drawings; 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 (6 mm in 6 m), noncumulative; level, plumb, and on location lines; and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 TRANSLUCENT PANEL INSTALLATION

A. Translucent Panels: Attach translucent panels to structural framing with fasteners according to manufacturer's written instructions. Install panels perpendicular to supports unless otherwise indicated. Anchor translucent panels securely in place, with provisions for thermal and structural movement.

1. Provide end laps of not less than 6 inches (152 mm) and side laps of not less than 1-1/2-inch (38-mm) corrugations for metal roof panels.

2. Provide end laps of not less than 4 inches (102 mm) and side laps of not less than 1-1/2-inch (38-mm) corrugations for metal wall panels.

3. Align horizontal laps with adjacent metal panels.

4. Seal intermediate end laps and side laps of translucent panels with translucent mastic.

3.8 METAL SOFFIT PANEL INSTALLATION

A. Provide metal soffit panels the full width of soffits. Install panels perpendicular to support framing.

B. Flash and seal metal soffit panels with weather closures where panels meet walls and at perimeter of all openings.

3.9 THERMAL INSULATION INSTALLATION

A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.

2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.

3. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.

B. Blanket Roof Insulation: Comply with the following installation method:

1. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.

a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

C. Blanket Wall Insulation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing. Hold in place by metal wall panels fastened to secondary framing.

1. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.10 DOOR AND FRAME INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.

B. Personnel Doors and Frames: Install doors and frames according to NAAMM-HMMA 840. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

1. Between Doors and Frames at Jambs and Head: 1/8 inch (3 mm).

2. Between Edges of Pairs of Doors: 1/8 inch (3 mm).

3. At Door Sills with Threshold: 3/8 inch (9.5 mm).

4. At Door Sills without Threshold: 3/4 inch (19.1 mm).

5. At fire-rated openings, install frames according to, and doors with clearances specified in, NFPA 80.

C. oor Hardware:

1. Install surface-mounted items after finishes have been completed at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

4. Set thresholds for exterior doors in full bed of sealant complying with requirements for concealed mastics specified in Section 079200 "Joint Sealants."

3.11 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. 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 (3 m) with no joints allowed within 24 inches (600 mm) 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 (25 mm) 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 (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1524 mm) 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. Louvers: Locate and place louver units level, plumb, and at indicated alignment with adjacent work.

1. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

2. Provide perimeter reveals and openings of uniform width for sealants and joint fillers.

3. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of corrosion-resistant paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

4. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

F. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.

G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.12 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.

B. Product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.13 ADJUSTING

A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.

B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.14 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, 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.

D. Touchup Painting: Cleaning and touchup painting are specified in Section 09 90 00 " Painting".

E. 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.

F. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.

1. Immediately before final inspection, remove protective wrappings from doors and frames.

G. Windows: Clean metal surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances. Clean factory-glazed glass immediately after installing windows.

H. Louvers: Clean exposed surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

1. Restore louvers damaged during installation and construction period so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

a. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

SECTION 23 01 00 - GENERAL PROVISIONS FOR PLUMBING AND HVAC

PART 1 - GENERAL

1.1 PROVISIONS:

A. The Mechanical Specifications are subject to all the requirements of the General Conditions of the Contract and Specifications and shall be used in conjunction therewith. The Contractor shall refer to other divisions of the Drawings and Specifications for work which must be carried on in conjunction with the Mechanical work so that the construction operations can proceed without harm to the Owner for interference, delay or absence of coordination.

1.2 DRAWINGS AND SPECIFICATION COORDINATION:

A. Drawings and specification indicate the extent and general arrangement of the Equipment and systems, and intend to provide the Owner with complete, functioning systems under this Contract.

B. Should conditions necessitate a rearrangement of piping, ductwork, equipment, controls, etc., such departures and the reasons, therefore shall be submitted to the Architect by the Contractor for approval, in the form of detailed drawings showing the proposed changes. No such changes shall be made without the prior written approval of the Engineer. Equipment and piping arrangements shall provide adequate and acceptable clearance for entry, servicing and maintenance.

C. Drawings and Specifications shall be considered as cooperative, and work or materials called for by one and not mentioned in the other shall be done and furnished as though treated by both.

D. In the case of insufficient information and discrepancies in figures, dimensions, details, Drawings, Specifications, or construction notes, the Architect shall be notified immediately and his decision shall determine the necessary adjustment. Without such decision, said discrepancies shall not be adjusted by the Contractor. In case of any settlement or any complication arising from such adjustment to the Contractor, he shall bear all extra expense involved. There shall be no additional expense to the Owner, Architect or Engineer.

E. Should it appear that the work intended to be done, or any of the matters relative thereto, are not sufficiently detailed or explained on the drawings or specifications, the Contractor shall apply to the Architect for such further drawings or explanations as may be necessary, allowing a reasonable time for the Architect to supply same, and the Contractor shall conform to same as part of the Contract. Should any doubt or question arise in respect to the true meaning of the Drawings or Specifications, reference shall be made to the Architect whose decision shall be final and conclusive.

F. All piping and all ducts in the finished areas of the building shall be run concealed in chases, furrings, suspended ceilings, etc., unless noted or directed otherwise. Should any condition arise which would cause any piping or duct to be exposed in finished areas, it shall immediately be called to the Architect's attention and this Contractor shall bear any and all expense in connection with rearranging his work as directed to facilitate its concealment. In unfinished spaces such as ceiling spaces and equipment rooms, all pipe lines shall be run to a continuous grade and square to the building.

G. Contractor shall thoroughly acquaint himself with the details of the Drawings and Specifications before submitting his bid as no allowance will be made because of unfamiliarity with these details. Place all inserts required for concrete construction in place in the forms before concrete is poured and in masonry walls while they are under construction. All concealed piping and ducts shall be installed prior to the time the chases and furrings are fabricated.

H. The Drawings do not give exact details as to elevations of piping, exact locations, etc., and do not show all offsets, control lines, pilot lines and their installation details. The Contractor shall carefully lay out his work at the site to conform to the structural conditions, provide proper grading of lines, to avoid all obstructions, to conform to details of installation supplied by the manufacturers of the equipment to be installed, and thereby to provide an integrated, satisfactory operation installation.

I. Should the particular equipment which any Contractor proposes to install, require other space conditions than those indicated on the drawings, the Contractor shall arrange for such space with the Architect before submitting his bid. Should changes become necessary on account of failure to comply with these details, the Contractor shall make such necessary changes at his (the Contractor's) own expense.

J. Contractor shall submit working scale drawings of all his apparatus and equipment which in any way varies from these specifications and plans which shall be checked by the Architect and approved before the work is started. Interference with the structural conditions shall be corrected before work proceeds.

K. All equipment shall be installed in accordance with the manufacturer's recommendations. Provide all accessories and components for optimum operation as recommended by the manufacturer

1.3 FIELD MEASUREMENTS:

A. Prior to the start of fabrication and/or installation the Contractor shall verify all dimensions, clearances and field conditions governing the mechanical work.

B. No extra compensation shall be claimed or allowed on account of difference between actual dimensions and those indicated on the drawings.

C. The Contractor shall examine adjoining work on which plumbing, heating ventilating and air conditioning is dependent for perfect efficiency and shall report any work that must be corrected.

D. No waiver of responsibility for defective work shall be claimed or allowed due to failure to report unfavorable conditions affecting the mechanical work.

1.4 SHOP DRAWINGS:

A. The review of Shop Drawings or catalog data by the Architect shall not relieve the Contractor from responsibility for deviations from the Drawings and Specifications unless he has, in writing, specifically called attention to such deviations at the time of submission and has obtained the permission of the Architect thereon; nor shall it relieve him from the responsibility for error of any kind in shop drawings. When the Contractor does call such deviations to the attention of the Architect, he shall state in his letter whether or not such deviations involve any extra cost. If this is not mentioned, it will be assumed that no extra cost is involved for making the change.

B. Shop drawings will be returned unchecked unless the following information is included: reference to all pertinent data in the Specifications or on the drawings, symbol designation of equipment as indicated on drawing, size and characteristics of the equipment, name of the project and a space large enough to accept an approval stamp. The data submitted shall reflect the actual equipment performance under the specified conditions and shall not be a copy of the scheduled data on

the drawings.

C. Additional fees will be charged for reviewing second submittal and shop drawings on equipment, fixtures and system, etc. that had been approved on the first submittal review. The fees will be on a time-and-material basis at current hourly rates. The additional fees will be at the Contractor expense with no expense to the owner.

1.5 CODES AND STANDARDS:

A. All work shall be performed in strict accordance with the applicable provisions of the Uniform Plumbing Code and Gas Ordinance of the State of New Mexico, the Uniform Mechanical Code, the International Building Code, the Life Safety Code, and any other applicable codes and ordinances.

B. Where the Contract Documents indicate materials or construction in excess of Code requirements, the Drawings of Specifications shall govern.

C. The Owner and the Architect shall be held free and harmless from liability of any kind or nature arising from his failure to comply with codes and ordinances.

D. The Contractor shall include in his bid to apply for and pay for all permits and certificates of inspection including connections, meter setup fees or extension/expansion of all utility lines.

E. Appropriate standards, such as ASA or ASTM or other established standards, shall become part of the Contract Documents to the extent they are referred to herein.

1.6 ELECTRICAL SERVICES:

A. Motor starters, control equipment and wirings indicated on the electrical drawings, except items otherwise specifically noted, will be furnished and installed by the Contractor.

B. All equipment and controls shall be coordinated with Division 16, Electrical, to ensure that all required components are furnished and properly installed. No additional expense will be allowed due to lack of coordination.

C. The Contractor must refer to the electrical control equipment and wiring shown on the Electrical Drawings. Any changes or additions required by specified equipment furnished shall be the complete responsibility of the Contractor furnishing the equipment.

D. All electrical equipment characteristics (voltage, etc.) must be verified by the Architect prior to ordering.

E. All motors shall be built in accordance with the current applicable IEEE, ASA, and NEMA standards. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion proof when location is in hazardous atmospheres. Type II weather protected motors may be used in lieu of TEFC motors on cooling towers, roof fan units, and similar equipment. Motors mounted in direct sun shall be provided with a shield to prevent direct radiation from the sun when the sun is 45 degrees or greater above the horizon. All motors shall have copper windings. All motors to have minimum power factor of 85% or have switched correction to 90%. Starters shall meet all requirements furnished by the Contractor.

F. Unless indicated otherwise, motors shall be NEMA Design B with a service factor of 1.15 with 40 degrees centigrade rise and total temperature rise of 65 degrees centigrade ambient and when powered from the system voltage feeding the motor. TEFC motors shall have a service factor of 1.00 with total temperature rise of 65 degrees centigrade in the above conditions. Motors located in areas exceeding 40 degrees centigrade ambient shall be factory-rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Type N split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 HP or less may be shaded pole induction motors.

G. If the contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Architect of the change and shall then coordinate the change with the Contractor and shall pay all additional charges in connection with the change.

H. Altitude Ratings: Unless otherwise noted, all specified equipment capacities, air quantities, etc., are for site elevation above sea level, and adjustments to the manufacturer's ratings must be made accordingly.

1.7 FLUSHING AND DRAINING:

A. Properly drain and flush all ducts and pipes before use of acceptance to ensure that all debris is completely removed. Damage caused by such debris remaining in the ducts or pipes shall be repaired by the Contractor at his expense. This Contractor shall demonstrate to the Architect's representative that all piping is clean.

B. Cleaning: Remove from the building construction site all rubbish and dirt as it accumulates. At completion, all areas shall be broom cleaned and all obstructions, surplus materials, etc., removed. All disposable filters in air handling units shall be replaced and all permanent filters shall be cleaned.

1.8 UTILITIES:

A. The location, size, and elevation of existing sewer lines and the location, size and pressure of existing water and gas lines are shown in accordance with data given this office by others. As Engineers, we cannot and do not guarantee the accuracy of this data. Each bidder shall check and verify this data. The points of connection to utility lines are approximate only and shall be verified by each bidder prior to submitting his bid.

1.9 SITE VISIT:

A. Visit the site prior to bidding and verify the conditions under which the mechanical systems are to be installed. No subsequent allowance shall be made in his behalf for failure to make such a visit.

PART 2 - MATERIALS

2.1 QUALITY:

A. The materials and equipment shall be new and shall be the standard products of the manufacturers regularly engaged in the production of Plumbing, Heating, Cooling, Ventilating and Fire Protection Equipment, and shall be the manufacturer's latest standard design. Where two or more units of the same class of equipment are required, these units shall be the products of the same manufacturer. However, the component parts of the systems need not be the products of the same manufacturer. Specific equipment specified hereinafter is to be considered a standard of quality and operation. Should this Contractor desire and install equipment and materials other than that specifically mentioned, he shall submit complete information and engineering data on same to the Architect. This Contractor shall obtain written approval before purchasing proposed substitute equipment. In general, all capacities of equipment, and motor and starter characteristics are shown in schedules on the drawings. Reference shall be made to the schedules for each information. The capacities shown are minimum capacities. Variations in the characteristics will be permitted only on written approval of the Architect. All equipment shall be shipped to the job with not less than a prime coat of paint or as specified hereinafter. Insofar as it is possible, all items of the same type (i.e., pumps, fans, etc.) shall be by the same manufacturer. Where installation instructions are not included in these specifications or on the plans, the manufacturer's instructions shall be followed. All equipment affected by altitude shall be rated to operate at the altitude where it is to be installed.

B. Protection of Materials and Equipment:

1. Materials and equipment shall be protected at all times.

2. The Contractor shall make good all damage caused directly or indirectly by his workmen.

3. Pipe and duct openings shall be closed with caps or plugs during installation. Prior to startup, check to see that all temporary covers have been removed.

4. Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury.

5. At the completion of all work, the equipment shall be thoroughly cleaned and delivered in a condition satisfactory to the Owner.

PART 3 - EXECUTION

3.1 EXCAVATING AND BACKFILLING:

A. All excavating and backfilling shall be done by this Contractor except as noted on plans. Trenching shall be done as shown on the Drawings and according to the Plumbing Code.

B. Curb cuts, asphalt, and concrete patching, etc., shall be part of this Contractor's responsibility. No extra payment will be made for rock excavation. Trenches for all underground piping shall be excavated to the required depths. The bottoms of trenches shall be tamped hard and graded to secure maximum fall. Bell holes shall be excavated to assure the pipe is resting for its entire length on solid ground. Should rock be encountered, it shall be excavated to a depth of 6" below the bottom of the pipe, and before laying the pipe, the space between the bottom of the pipe, and the rock surface shall be filled with gravel, thoroughly. Pipe laid in trenches dug in fill, shall be supported down to load bearing undisturbed soil. After the pipes have been tested and inspected, the trenches shall be filled. No roots, rocks or foreign materials of any description shall be used in backfilling the trenches. All surplus materials shall be hauled from the project by the Contractor at his expense.

C. Backfilling shall be done in 6" layers to 18" above piping, tamping each layer to protect piping from damage.

D. Backfilling shall be completed to 95% compaction under building and within 5 feet of the building line and 90% elsewhere.

E. Street cuts shall be replaced in kind.

3.2 CUTTING AND REPAIRING:

A. Responsibility of the Contractor whose work is involved is to coordinate with others to prevent unnecessary cutting and repairing. Lay out and locate equipment, openings, and chases. Install sleeves, inserts, and supports. Arrange with those whose work is involved to do cutting and replacing caused by negligence or error with costs reimbursed by the Contractor at fault. Cutting and replacing of the existing work shall be the responsibility of the Contractor whose work is being installed. Removal or terminating connections of existing work which is abandoned or replaced shall also be done hereunder to provide correct and finished work.

3.3 LUBRICATION:

A. Provide all oil for the operation of all equipment until acceptance and provide a chart listing the type of oil to be used for each piece of equipment.

B. Properly lubricate all bearings and shafts during the installation. This contractor shall be held responsible for all damage to bearings while the equipment is being operated by him up to the date of acceptance of the equipment.

C. All motors and other equipment shall be provided with covers as requiredfor protection during construction.

3.4 OPERATING AND MAINTENANCE INSTRUCTIONS:

A. Operations and Maintenance Manuals shall be submitted as required by Division One and these Specifications.

1. All Operating Manuals shall be given to the Architect.

3.5 GUARANTEE:

A. All equipment, materials and workmanship to be furnished and performed under this Contract shall be guaranteed for a period of one (1) year, commencing from the written notice of substantial completion approved by the Architect.

B. The Contractor shall, upon notification by the Owner, during that period correct any such defects without cost to the Owner.

3.6 HVAC TEST AND BALANCE:

A. All air and/or water systems, as appropriate, shall be tested and balanced to achieve flow at all outlets and inlets within 10% of the value shown on the drawings.

B. Any deviations from such shall be brought to the attention of the Engineer previous to report submittal.

C. Pulleys, motors, dampers, control devices, etc. shall be adjusted, if necessary, to provide proper flow.

D. Grilles, registers and diffusers shall be adjusted for proper throw, drop, and spread to maintain draft less, comfortable conditions.

E. All equipment shall be tested and proved free from defects and in good operating condition.

F. System shall be tested for every mode of operation, summer through winter cycles.

G. All tools, measuring devices and specialty equipment necessary shall be provided by Contractor.

H. Two (2) weeks prior to the final inspection, Contractor shall submit to Architect four typewritten or hand lettered, bound copies of system performance report. Report shall include: building name; date performed; instruments used in testing; duct and/or pipe layouts, as appropriate, with all test points identified; air quantities and temperatures shown; rated and actual motor amperages; and a discussion of any deficiencies or deviations from the system specified, along with recommendations for correction.

I. Contractor shall certify all information contained in this report as complete and correct as of the date of job completion.

3.7 FOUNDATION:

A. All equipment shall be provided with suitable foundations and supports. It shall be the responsibility of this Contractor to provide for the proper locations of these foundations and supports. This applies to all rooftop equipment also. All concrete foundations required by equipment furnished by the Contractor shall be constructed by them (except where otherwise noted) in conformance with the recommendations of the manufacturer of the respective equipment, and with the approval of the Architect. All corners of the foundations shall be neatly chamfered. Foundation bolts shall be placed in the forms when the concrete is poured. Allow 1" below the equipment base for alignment, leveling and grouting with non-shrinking grout. Grouting shall be done after the equipment is leveled in place. After the grout has hardened, the foundation bolts shall be pulled up tight and the equipment shimmed, if necessary. After removal of the forms, the surface of the foundation shall be rubbed. Unless otherwise noted, foundations shall be a minimum of 6" high. All concrete work performed by these contractors shall conform entirely to the requirements of the Concrete Specifications which describe this class of work.

3.8 FLASHING:

The Contractor shall be responsible for providing and installing all counterflashing. All openings in the roof shall be flashed and counter flashed. Use 4-pound per square foot lead flashing materials for all vent lines and welded flashing in steel lines passing through roof.

3.9 ACCESS PANELS:

A. Similar to Milcor, size as required for concealed expansion joints, valves, traps, balancing dampers, equipment, and similar items requiring accessibility. Notify the General Contractor of each access panel location and the required size. Panels shall be proper type for ceiling or wall in which they are installed. The panels shall be furnished under this section of the Specifications but shall be coordinated to be compatible with walls and ceilings furnished under other sections.

END OF SECTION

SECTION 33 05 00 – BASIC PIPING MATERIALS AND METHODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Basic piping materials and methods.

1.2 REFERENCES

A. American Society of Testing and Materials (ASTM):

1. A 106 - Specification for Seamless Carbon Steel Pipe for High Temperature Service.

2. D 2240 - Test Method for Rubber Property - Durometer Hardness.

3. A-536 - Specification for Ductile Iron Casting.

B. National Sanitation Foundation (NSF) 61

C. AWWA C-111 - Standard for Rubber Gasketed Joints for Ductile Iron Pressure Pipe and Fittings.

D. Refer to Section 09 80 00 and 09 90 00 for coating requirements for exterior/interior of piping.

1.3 DEFINITIONS

A. Exposed Piping: Piping within buildings, vaults, tunnels, or other structures without regard to elevation of piping, or exposed piping outside buildings and structures.

B. Buried Piping: Piping actually buried in soil or cast in concrete.

C. Wet Wall: Wall with water on at least one side.

1.4 INTENT OF DRAWINGS AND SPECIFICATIONS

A. Except in details, piping is indicated diagrammatically. Sizes and locations are indicated on the Drawings. Not every offset and fitting, or structural difficulty that may be encountered has been indicated on the Drawings.

B. Perform minor modifications to piping alignment where necessary to avoid structural, mechanical, or other type of obstructions that cannot be removed or changed.

1. Modifications are intended to be of minor scope, not involving a change to the design concept or a change to the Contract Price or Contract Time.

1.5 SYSTEM DESCRIPTION

A. Performance Requirements:

1. Venting Piping Under Pressure:

a. Lay piping under pressure flat or at a continuous slope without air traps, unless otherwise indicated on the Drawings.

b. Install plug valves as air bleeder cocks at high points in piping. Provide one inch plug valves for water lines, and 2 inch plug valves for sludge lines, unless otherwise indicated on the Drawings.

c. Provide additional pipe taps with plug cocks and riser pipes along piping as required for venting during initial fillings, disinfecting, and sampling.

d. Before piping is placed into service, close plug valves and install plugs. Protect plugs and plug valves from corrosion in accordance with Section 09 80 00 and 09 90 00.

2. Restraining Piping:

a. Restrain piping as follows:

1) When piping is underground, use mechanical restraints throughout. All buried piping shall be restrained.

2) When piping is aboveground or underwater, use mechanical or structural restraints.

b. Provide restraints with ample size to withstand thrust forces resulting from test pressures.

3. Connections to Existing Piping:

a. Expose existing piping to which connections are to be made with sufficient time to permit, where necessary, field adjustments in line, grade, or fittings.

1) Protect domestic water supplies from contamination.

i) Make connections between domestic water supply and other water systems in accordance with requirements of public health authorities.

ii) Provide devices approved by owner of domestic water supply system to prevent flow from other sources into the domestic supply system.

b. Make connections to existing piping and valves after sections of new piping to be connected have been tested and found satisfactory.

c. Provide sleeves, flanges, nipples, couplings, adapters, and other fittings needed to install or attach new fittings to existing piping and to make connections to existing piping.

4. Connections to In-Service Piping:

a. Shutdown in-service piping in accordance with Section 01 60 00.

1) Establish procedures and timing in a conference attended by CONTRACTOR, ENGINEER, and OWNER of the in-service piping.

5. Connections of Dissimilar Metals:

a. Connect ferrous and nonferrous metal piping, tubing, and fittings with dielectric couplings especially designed for the prevention of chemical reactions between dissimilar metals.

b. Nonferrous metals include aluminum, copper, and copper alloys.

c. For flanged piping with dissimilar metals use an insulated coupling or insulating gasket.

6. All pipe tapping saddles are to be of bronze construction.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. Manufacturers: One of the following or equal:

1. Dearborn Brass Company, Model Number 5358.

2. Keeney Manufacturing Company, Model Number 102 or Number 105.

3. Beaton and Corbin, Model Number 1 or Number 13.

B. Material: Chrome plated steel plate.

2.2 LINK SEAL

A. Manufacturers: One of the following or equal:

1. Calpico, Inc.

2. Thunderline Corporation

B. Characteristics:

1. Modular mechanical type, consisting of interlocking neoprene or synthetic rubber links shapes to continuously fill the annular space between the pipe and wall opening.

2. Assemble links solely with stainless steel bolts and nuts to form a continuous rubber belt around the pipe.

3. Provide a stainless steel pressure plate under each bolt head and nut. Isolate pressure plate from contact with wall sleeve.

2.3 COUPLINGS

A. Ductile Iron Couplings

1. Provide ductile iron couplings for use in connection of smooth end joints of ductile iron, steel or other types of pipe.

2. General Requirements

a. Sleeve or center ring shall be of nominal O.D. size, range and length specified. Sleeve shall be of Ductile Iron ASTM A536. Ends shall have a smooth inside taper to provide uniform gasket seal. Sleeve shall be given a shop coat of oil-modified urethane, corrosion- resistant paint.

b. Follower flanges or end rings shall be of the thickness determined by the coupling size, and shall be of ductile iron, ASTM-536. Flanges shall be identified by a color coded shop coat finish as described in Item 2a.

c. Gaskets shall be compression-type, formed with Virgin Styrene Butadiene Rubber (SBR), compounded with ingredients to produce permanence and resistance to set after installation. O.D. range shall be imprinted on the gasket in permanent ink (minimum).

d. Bolts and nuts shall be of high-strength, low-alloy steel, with nominal coarse thread, and hex nuts with black finish. Dimensions and minimum stress values shall be in accordance with AWWA/ANSI C111/A21.11.

e. Where specification states a cast transition or reducing coupling in place of a straight coupling, the sleeve and follower flange shall be of the same manufacturer and compatible for the specific use intended.

f. Quality control procedures shall be employed to ensure that the sleeve, follower flanges, and gaskets are properly fabricated and free of any visible defects. Each coupling shall have a working-pressure rating not less 175 psi.

B. Expansion Joint (Flexible Bellows Coupling)

1. General Rubber

2. Approved equal.

3. Performance and Design

a. Provide single and double arch expansion joints, as shown on the drawings, complete with restraining rods to prevent over-expansion. Provide flanged spool with single or multiple arches, designed to provide motion capability as specified. Rubber expansion joints shall be rated for 259 °F and have a maximum working pressure of 140 psi.

4. Materials

a. Tube - Provide single, seamless, leakproof tube made of synthetic rubber that extends through the bore to the outside edges of both flanges.

b. Body - Fabric reinforcement shall be used as the flexible and supporting member between the tube and the cover. Fabrics of high strength synthetic fibers shall be used. All fabrics plies shall be impregnated with rubber or synthetic compounds to permit flexibility between the fabric plies to reduce service strain.

c. Cover - The exterior surface of the joint shall be formed from synthetic rubber to protect the body from outside damage. Utilize special polymers to resist sunlight.

d. Integral Flanges - Constructed of resilient rubber, and smooth finish, the full-faced flanges form a tight seal against the pipe flange without the need of gaskets. Provide standard AWWA flanges as specified in Section 33 05 10.

e. Provide restraining rods attached to flanges for thrust protection.

5. Execution

6. Install expansion joint as shown on the Drawings and in accordance with the manufacturer's recommendations.

C. Flanged Coupling Adapter

2.4 INSULATION

A. Provide insulation on all piping 1-inch in diameter or smaller if located outside Treatment Building.

B. Insulation shall be flexible, elastomeric thermal insulation, black in color, supplied as unslit tubing in:

1. Nominal wall thickness of ½", for 3/8" to 1-1/8" inside diameter piping, insulating to a line temperature of 35 degrees Fahrenheit.

C. Insulation shall be resistant to moisture vapor flow.

D. Insulation shall conform to the following standards:

1. ASTM C 534, Type I - Tubular Grade 1.

2. ATSM E 84

3. ASTM D 1056, 2B1

4. UL 723

5. UL 94 5V-A, V-O, File E 55798

E. Insulation shall be coated with a weather protective, ultra-violet resistant coating per manufacturer’s recommendations.

F. Manufacturers:

1. Armacell

2. Or Equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Existing Conditions:

1. Locate and expose existing structures, piping, conduits, and other facilities and obstructions which may affect construction of underground piping before starting excavation for new underground piping and appurtenances.

2. Verify sizes, elevations, locations, and other relevant features of existing facilities and obstructions. Determine conflicts for the construction of the new underground piping and appurtenances.

3. Make piping location and grade adjustments to resolve conflicts between new piping and existing facilities and obstructions.

3.2 WALL AND SLAB PENETRATIONS

A. Provide sleeves for piping penetrations through masonry and concrete walls, floors, ceilings, roofs, pilasters, columns, piers, and beams unless specified or otherwise indicated on the Drawings.

B. For piping 1 inch in nominal diameter and larger, provide sleeves with minimum inside diameters of 1 inch plus outside diameter of piping. For piping smaller than 1 inch in nominal diameter, provide sleeve of minimum twice the outside diameter of piping.

1. Arrange sleeves and adjacent joints so piping can be pulled out of sleeves and

2. replaced without disturbing the structure.

3. Cut ends of sleeves flush with surfaces of concrete, masonry, or plaster.

4. Conceal ends of sleeves with escutcheons where piping runs through floors, walls, or ceilings of finished spaces within buildings.

5. Seal spaces between pipes and sleeves.

C. Cast couplings or wall pieces in walls for penetrations of buried rigid piping including cast iron, ductile iron, reinforced concrete, and vitrified clay through structures.

1. Provide couplings or wall pieces with mechanical push-ons, or similar flexible joints at outside of walls.

2. Provide additional similar joints in piping at transition points between trenches and structure excavations.

3. For steel piping, single joints may be used in lieu of 2 joints. Locate single joints outside within 2 feet from outside faces of walls.

D. Link Seal: Use 2 link seals where seal is used to seal at wet wall sleeves. Mount one seal on the inside face of the wall and the other on the outside face of the wall. Coordinate the inside diameter of the wall sleeve with the size of the seal to provide watertight sealing.

E. Where not indicated on the Drawings, penetrations for conditions other than those specified under the preceding subparagraphs shall be one of the three types specified in such subparagraphs found by OWNER to be the most suitable for the particular conditions.

3.3 EXPOSED PIPING

A. Install exposed piping in straight runs parallel to the axes of structures, unless indicated otherwise.

1. Install piping runs plumb and level, unless otherwise indicated on the Drawings.

B. Install exposed piping after installing equipment and after piping and fitting locations have been determined.

C. Support piping in accordance with Section 15141 and as shown on Drawings.

1. Do not transfer pipe loads and strain to equipment.

D. In addition to the joints indicated on the Drawings, provide unions, flexible couplings, flanged joints, and other types of joints or means which are compatible with and suitable for the piping system, and necessary to allow ready assembly and disassembly of the piping.

1. Assemble piping without distortion or stresses caused by misalignment.

2. Match and properly orient flanges, unions, flexible couplings, and other connections.

3. Do not subject piping to bending or other undue stresses when fitting piping. Do not correct defective orientation or alignment by distorting flanged joints or subjecting flange bolts to bending or other undue stresses.

4. Flange bolts, union halves, flexible connectors, and other connection elements shall slip freely into place.

5. After piping assembly to fit when proper fit is not obtained.

6. Install eccentric reducers or increasers with the top horizontal for pump suction piping.

3.4 BURIED PIPING

A. Bury piping with minimum 4 foot cover without air traps, unless otherwise indicated on the Drawings.

B. Where 2 similar services run parallel to each other, piping for such services may be laid in the same trench. Lay piping with sufficient room for assembly and disassembly of joints, for thrust blocks, for other structures, and to meet separation requirements of public health authorities having jurisdiction.

C. Laying Piping:

1. Lay piping in finished trenches free from water or debris. Begin at the lowest point with bell ends up slope.

2. Place piping with top or bottom markings with markings in proper position.

3. Lay piping on an unyielding foundation with uniform bearing under the full length of barrels.

4. Where joints require external grouting, banding, or pointing, provide space under and immediately in front of the bell end of each section under and immediately in front of the bell end of each section laid with sufficient shape and size for grouting, banding, or pointing of joints.

5. At the end of each day's construction, plug open ends of piping temporarily to prevent entrance of debris or animals.

D. All non-magnetic buried piping must have magnetic tracer tape placed two feet above the crown of the pipe.

3.5 CLEANING

A. Piping Cleaning:

1. Upon completion of installation, clean piping interior of foreign matter and debris. Perform special cleaning when required by the Contract Documents.

2. Maintain pipe in clean condition during installation.

3. Before jointing piping, thoroughly clean and wipe joint contact surfaces and then properly dress and make joint.

4. Immediately prior to pressure testing, clean and remove grease, metal cuttings, dirt, or other foreign materials which may have entered the system.

5. At completion of work and prior to final acceptance, thoroughly clean work installed under these Specifications. Clean equipment, fixtures, pipe, valves, and fittings of grease, metal cuttings, and sludge which may have accumulated by operation of system, from testing, or from other causes. Repair any stoppage or discoloration or other damage to parts of building, its finish, or furnishings, due to failure to properly clean piping system, without cost to Owner.

6. Clean chlorine piping by pulling a cloth saturated with trichloroethylene or other suitable chlorinated solvent through each length of pipe. Disassemble valves and clean with suitable solvent. All surfaces which may come in contact with chlorine shall be thoroughly dry, and free of oil or grease before placing in service.

3.6 Cleaning Potable Water Piping:

A. Flush and disinfect potable water piping in accordance with Section 15495.

3.7 FIELD QUALITY AND CONTROL

A. General:

1. Upon completion of piping, but prior to application of insulation on exposed piping or covering concealed/buried piping, test all piping systems.

2. Test all piping systems at 150 psi for 2 hours, unless otherwise indicated. Pressure shall stabilize within 2% of 150 psi.

3. Isolate equipment which may be damaged by the specified pressure test conditions.

4. Perform pressure test using calibrated pressure gauges and calibrated volumetric measuring equipment to determine leakage rates. Select each gauge so that the specified test pressure falls within the upper half of the gauge's range. Notify the OWNER 24 HRS prior to each test.

5. Unless otherwise specified, completely assemble and test new piping systems prior to connection to existing pipe systems.

6. Acknowledge satisfactory performance of tests and inspections in writing to OWNER prior to final acceptance.

7. Provide all necessary equipment and perform all work required in connection with the tests and inspections.

8. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination.

9. CONTRATOR to dispose of testing water.

B. Pressure Testing Methods and Criteria:

1. Types of pressure testing and inspection to be employed include hydrostatic pressure testing, and hydrostatic infiltration/exfiltration testing.

2. Liquid systems:

a. The following liquid piping systems shall have zero leakages at the specified test pressure throughout the specified duration:

1) Exposed piping.

2) Buried insulated piping and buried or exposed pressure piping.

3. Hydrostatic pressure testing:

a. All joints, including welds, are to be left exposed for examination during the test.

b. Provide temporary restraints for expansion joints for additional pressure load under test. Equipment in piping system with rated pressure lower than pipe test pressure shall be isolated by valves or blind flanges.

c. Do not paint or insulate exposed piping until successful performance of pressure test.

d. Test soil, waste and drain piping at completion of installation of each stack or section of piping by filling system with water to highest point and checking joints and fittings for leaks. Leaks must be eliminated before proceeding with work or concealing piping. Minimum test heights shall be 10 FT.

3.8 PIPING SCHEDULE

A. See Drawings and Specifications 09 80 00 and 09 90 00.

END OF SECTION

SECTION 33 05 01 - IDENTIFICATION, STENCILING, AND TAGGING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. All identification, stenciling, and tagging systems for valves, equipment, etc.

B. Related Sections include but are not necessarily limited to:

1. Division 1

2. Section 09 90 00 – Painting

1.2 QUALITY ASSURANCE

A. Referenced Standards

1. American National Standards Institute (ANSI)

a. A13.1 Scheme for Identification of Piping Systems.

1.3 SUBMITTALS

A. Shop Drawings

1. Product technical data including:

a. Acknowledgment that products submitted meet requirements of standards referenced.

b. Manufacturer's installation instructions.

c. Identification register listing all items to be identified, type of identification system to be used, lettering, location and color.

d. Catalog information for all tagging systems.

e. Manufacturer's illustration of safety and danger signs for selection by OWNER.

f. Updated, complete, identification register with non-conflicting numerical assignments submitted prior to project acceptance.

PART 2 - PRODUCTS

2 .01 ACCEPTABLE MANUFACTURER'S

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:

1. Tagging Systems:

a. W.H. Brady Co.

b. Seton Name Plate Corp.

c. T & B/Westline.

d. Safety Sign Co.

2 .02 MATERIALS

A. Tags:

1. Aluminum

B. Fasteners

1. Stainless Steel Wire

2.03 FABRICATION

A. General

1. Lettering Color: Black.

2. Lettering Style: Helvetica.

B. Round Aluminum Tags (Type 1)

1. 2 inch diameter

2. 1/4/ inch high engraved letters.

3. Brushed aluminum finish.

4. Imprint tags with item designation indicated on Drawings.

C. Rectangular Fiberglass Reinforced Plastic Signs (Type 2):

1. 7 x 10 x 1/16 inch.

2. 1 inch high black lettering.

3. Stainless steel grommets each corner.

4. Imprint signs with item designation indicated on drawings.

D. Painted-On Stenciling System (Type 3):

1. Text as required for item being identified.

a. All text uppercase sized in accordance with ANSI A13.1.

E. Rectangular Fiberglass Reinforced Plastic Signs (Type 4):

1. 10 x 14 x 1/16 inch.

2. Text as required by schedule in Part 3.

a. Text shall be largest practicable size based on number of characters required.

3. Rated indoor/outdoor.

F. Engraved Name Plates (Type 5)

2 .04 MAINTENANCE MATERIALS

A. Tags:

1. Aluminum.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation, inspect and verify condition of substrate. Installation of product constitutes installer's acceptance of substrate condition for product compatibility.

3.02 PREPARATION

A. Correct defects which may interface with or prevent a satisfactory installation

3.03 ERECTION, INSTALLATION, AND APPLICATION

A. Install tagging, stenciling, and identification items at required locations.

B. Provide arrows and markers on piping.

1. At 20 foot maximum centers along continuous lines.

2. At changes in direction (route) or obstructions.

3. At valves, risers, “T” joints, machinery or equipment.

4. Where pipes pass through floor, wall, and like obstruction.

    a. Provide markers on both sides of obstruction.

C. Position markers on both sides of pipe with arrow markers pointing in flow direction. If flow is in both directions use double headed arrow markers.

D. Apply tapes and stenciling in uniform manner parallel to piping.

E. Coat back of Type 1 aluminum tags with dissimilar metals protection when installed on concrete.

3.04 SCHEDULE

A. Identification Schedule

ITEM	ID TYPE	FASTENER
Valves	1	Wire
Pumps, Pump Motors, and other Rotating Equipment, and electrical powered equipment	3 or 5	Wire
Instrumentation Flow (Flow Control Valve, Primary Elements etc.)	5	--
Piping	3	--
Control panels, Motor Control Centers, Lightening Panels not Factory Labeled	5	Wire
Safety Signs - Hazard Warning, Fire Protection	4	--
Safety Signs (Custom Labeled)	2	--
Tanks and Vessels	3	Wire

B. Piping Schedule (Colors based on Tnemec.):

1. Color Schedule:

Above Ground Pipe Labels	Color of Letters
Water - Reuse Water	Purple
Water - Potable Water	Light Blue
Sludge - WAS	Brown

Chemicals	Color
Polymer	Black Letters on Yellow
Exposed Conduits	None

2. Lettering Size Schedule:

OD of Pipe or Covering (inches)	Height of Letters (inches)
3/4 to 1-1/4	1/2
1-1/2 to 2	3/4
2-1/2 to 6	1-1/4
8 to 10	2-1/2
Over 10	3-1/2

3. Unless the line is in such a location that it can be seen only from one direction, such as pipes near a wall, two sets of the code designation shall be applied at each location, placed in the two visible quadrants, with respect to normal viewing positions. In general, pipe identification size, color, and arrangements shall be in accordance with ANSI A 13.1 (latest edition).

C. Safety Signs

1. Provide and install a minimum of 5 custom worded signs Type 4 with text and location to be provided by OWNER at later date. Locations will include, but not be limited to, the chemical feed pump area, the chemical storage tank area, the Backwash Equalization Tank, and the MCC enclosure.

END OF SECTION

SECTION 33 05 10 – DUCTILE IRON PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Ductile iron piping, joints, fitting, cleanouts, and pipe lining and coating.

1.2 REFERENCES

A. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):

1. B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.

B. American Society for Testing and Materials (ASTM):

1. A 47 - Ferritic Malleable Iron Casting.

2. A 183 - Carbon Steel Tank Bolts and Nuts.

3. A 536 - Ductile Iron Castings.

4. A 674 - Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids.

5. D 792 - Test Method for Specific Gravity (Relative Density) and Density of Plastics by Displacement.

6. D 4976 - Polyethylene Plastics Molding and Extrusion Materials.

C. American Water Works Association (AWWA):

1. C 104 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. C 105 - Polyethylene Encasement for Ductile-Iron Pipe Systems.

3. C 110 - Ductile-Iron and Gray-Iron fittings, 3 Inches through 48 Inches, for Water and Other Liquids.

4. C 111 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

5. C 115 - Flanged Ductile-Iron Pipe with Threaded Flanges.

6. C 150 - Thickness Design of Ductile-Iron Pipe.

7. C 151 - Ductile-Iron Pipe, Centrifugally Cast for Water or other Liquids.

8. C 153 - Ductile-Iron Compact Fittings, 3 Inches Through 24 Inches, and 54 Inches through 64 Inches, for Water Service.

9. C 600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.

10. C 606 - Joints Grooved and Shouldered Type.

11. C 900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings.

D. National Sanitation Foundation (NSF) 61

1.3 SUBMITTALS

A. Layout Drawing: Detailed layout drawings showing alignment of pipes, location of valves, fittings, and appurtenances, types of joints, and connections to structures.

B. Product Data: Photographs, drawings, and descriptions of fittings, gaskets, couplings, grooving of pipe and fittings, and pipe lining.

C. Test Reports: Manufacturer's test reports for polyethylene lining certifying successful performance of the wet sponge spark tests.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Block piping material for shipment, prevent damage to castings and linings.

B. Carefully handle piping material during loading, unloading, and installation. Do not drop piping material from trucks. Lower piping material by mechanical means. Do not drop or pound pipe to fit grade.

C. Repair damaged pipe lining to match quality, thickness, and bonding or original lining. When lining cannot be repaired or repairs are defective, replace defective piping with undamaged piping.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Ductile Iron Piping:

1. Type, Typical: AWWA C 150 and AWWA C 151 with minimum Class 51 wall thickness.

2. Type with Screw-On Flanges: AWWA C 115 with minimum Class 53 wall thickness.

B. Joints:

1. Flanges Joints:

a. Flanges: One of the following with diameter, thickness, drilling, and other characteristics in accordance with ANSI B 16.1:

1) Cast integrally with the pipe.

2) Screw-on: Comply with the following:

i) Ductile iron

ii) Long hub, threaded, and specially designed for ductile iron pipe.

iii) After attaching to pipe, machine flange face to make pipe end and flange even and perpendicular to the axis of the pipe.

b. Bolt Holes: Two-holed and aligned at both ends of pipe.

c. Cap Screw or Stud Bolt Holes: Tapped.

d. Bolt and Nuts: ANSI/ASME B 16.1 or when connecting flanges underground, in concrete pipe valve boxes, or underwater, Type 304 or Type 316 stainless steel; cut and finished to project a maximum of 1/4 inch beyond nut when joints are assembled.

e. Gaskets: As specified in accordance with Section 33 05 00

2. Mechanical Joints: AWWA C 111/ANSI A 21.11

3. Restrained Mechanical Joints: Manufacturers: One of the following or equal:

a. Mega-lug restrained joints.

b. American Cast Iron Pipe Company, LOK-Fast or Lugged Fastite.

c. Pacific States Cast Iron Pipe Company, Restrained Tyton or Lock Mechanical.

4. Gaskets for Ductile Iron:

a. Suitable for pressures equal to and less than 150 pounds per square inch gauge, temperatures equal to and less than 100 degrees Fahrenheit.

b. Neoprene with minimum durometer hardness value of 70 when tested in accordance with ASTM D 2240, Type A; minimum 3/32 inch thick for less than 10 inch pipe; minimum 1/8 inch thick for 10 inch and larger pipe. Provide gaskets with inserted 13 ounce nylon fabric cloth for pipes 20 inch or larger.

c. Manufacturers: One of the following or equal:

1) Garlock, Style 8798.

2) John Crane.

3) Or approved equal.

2.2 ACCESSORIES

A. Fittings: AWWA C 110/ANSI A 21.10 or AWWA C 153/ANSI A 21.53 with the same pressure rating and joint configuration as that of the associated piping.

B. Cleanouts: As indicated on the Drawings.

2.3 PIPE LININGS

A. Cement-Mortar Lining and Coating: AWWA C 104/ANSI A 21.4, applied on clean bare metal surfaces; extended to faces of flanges, ends of spigots, and shoulders of hubs; painted with bituminous material.

B. Coating on Cement-Mortar Coating: Bituminous material, or none when specified to receive another coating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Install ductile iron piping in accordance with AWWA C 600, modified as specified in Section 15050.

2. Lay mechanical joint or bell and spigot pipe with 1/8 inch space between the spigot between the spigot and shoulder of the pockets.

3. All buried piping shall be restrained using products listed in Section 2.01.

B. Special Techniques:

1. Polyethylene Encasement: Wrap ductile iron pipe to be buried with polyethylene encasement in accordance with ASTM A 674. Repair tears and make joints with double plastic tape wrap.

a. Polyethylene: AWWA C 105.

b. Plastic Tape Wrap: Manufacturers: One of the following or equal:

1) Polyken Pipeline Coatings, Polyken Number 910.

2) The Tapecoat Company, Tapecoat CT.

3.2 JOINTS

A. Install types of joints as specified in Piping Schedule on Drawings.

3.3 GROOVED JOINTS

A. Install piping with grooved joints where specified or indicated on the Drawings.

B. Assemble grooved joints in accordance with manufacturer's published instructions.

C. Support grooved-end pipe in accordance with manufacturer's published instructions. Install at least 1 support between consecutive couplings.

D. Install flanged or grooved joints where flanged joints are scheduled, except under the following conditions:

1. In underground and underwater installations.

2. In piping subject to test pressure of 150 pounds per square inch gauge or more.

3. In steam and in combustible gas piping systems.

4. In sludge and scum piping designed to be steam cleaned as indicated on the Drawings.

5. When wall thickness of pipe is less than the minimum recommended in published instructions by the manufacturer of the grooved end coupling.

E. Make connections to flanged valves, pumps, and piping appurtenances by either:

1. Flanged-to-grooved joint adapters.

2. Flanged-by-grooved end pipe spool of sufficient length to prevent interference with the operation of adjacent valves, pumps, or other items.

3. Integrally cast flanged-by-grooved end pipe fittings.

3.4 FIELD QUALITY CONTROL

A. Clean and test ductile iron piping as specified in Section 33 05 00.

END OF SECTION

SECTION 33 05 11 – COPPER PIPING

PART 1 - GENERAL

1.1 DESCRIPTIONS

A. This section specifies copper piping, tubing, couplings and fittings.

1.2 REFERENCES

A. This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

1. ANSI B16.22-80: Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

2. ANSI B16.26-3: Cast Copper Alloy Fittings for Flared Copper Tubes

3. ASTM B32-83: Solder Metal

4. ASTM B88-83: Seamless Copper Water Tube

PART 2 – PRODUCTS

2.1 COPPER TUBING

A. Copper tubing shall be seamless copper, conforming to ASTM B88. Unless otherwise specified, copper tubing shall be Type L, drawn.

2.2 COUPLINGS AND FITTINGS FOR COPPER TUBING

A. Unless otherwise specified, couplings and fittings for copper tubing 1/2-inch and smaller nominal diameter shall be compression type, brass or bronze, capable of holding the full bursting strength of the tubing; shall meet the requirements of ANSI B16.26; and shall be Swagelok, Gyrolok, or equal.

B. Couplings and fittings for copper tubing larger than 1/2-inch nominal diameter shall be wrought copper or bronze, solder joint pressure fittings and shall conform to ANSI B16.22.

2.3 SOLDER

A. Solder to be used in copper piping shall be ASTM B32, Alloy Grade 50B.

PART 3 – EXECUTION

3.1 FABRICATION

A. SOLDER JOINTS: All pipe and fittings to be jointed with solder shall be free from all burrs and wire brushed or steel wool cleaned. After cleaning, a paste flux shall be evenly and sparingly applied to the surfaces to be joined. Solder shall then be applied and flame passed toward the center of the fitting until the solder disappears. All excess solder shall be removed while it is still plastic. Absolutely no acid flux or acid wipe shall be used in making solder joints.

B. TAKEDOWN COUPLINGS: Takedown couplings shall be screw union type and shall be provided.

C. DIELECTRIC PROTECTION: Copper tubing or fittings shall not be permitted to come in contact with steel piping, reinforcing steel, or other steel at any location. Electrical checks shall be made to assure no contact is made between copper tubing and steel elements. Wherever electrical contact is demonstrated by such tests, the Contractor shall provide dielectric protection.

3.2 INSTALLATION, CLEANING, DISINFECTION, AND TESTING

A. The installation, cleaning, disinfection, and testing of copper piping shall be in accordance with governing codes and authorities.

END OF SECTION

SECTION 33 05 12 – PLASTIC PIPING AND TUBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Plastic pipe, tubing, and fittings.

1.2 REFERENCES

A. American National Standards Institute (ANSI):

1. B 16.12 - Cast Iron Screwed Drainage Fittings

B. American Society for Testing and Materials (ASTM):

1. D 648 - Test Method for Deflection Temperature of Plastics Under Flexural Load.

2. D 1248 - Specification for Polyethylene Plastics Molding and Extrusion Materials.

3. D 1784 - Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated by Poly (Vinyl Chloride) (CPVC) Compounds.

4. D 1785 - Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

5. D 2661 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.

6. D 2751 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Sewer Pipe and Fittings.

7. D 1869 - Specification for Rubber Rings for Asbestos-Cement Pipe.

8. D 2412 - Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.

9. D 2466 - Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings Schedule 40.

10. D 2467 - Specification for Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings Schedule 80.

11. D 2513 - Specification for Thermoplastic Gas Pressure Pipe Tubing and Fittings.

12. D 2564 - Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

13. D 2665 - Specification for Poly (Vinyl Chloride) (PVC) Plastic, Waste and Vent Pipe Fittings.

14. D 2680 - Specification for Acrylonitrile-Butadiene-Styrene (ABS) and Poly (Vinyl Chloride) (PVC) Composite Sewer Pipe.

15. D 3034 - Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

16. D 3212 - Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.

17. D 3261 - Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

18. D 3350 - Specification for Polyethylene Plastic Pipe and Fittings Material.

19. D 4101 - Specification for Propylene Plastic Injection and Extrusion Materials.

20. F 439 - Specification for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

21. F 441 - Standard Specification for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80.

22. F 477 - Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

23. F 483 - Method for Total Immersion Corrosion Test for Aircraft Chemicals Maintenance.

24. F 493 - Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings.

25. F 645 - Guide for Selection, Design and Installation of Thermoplastic Water Pressure Piping System.

26. F 679 - Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.

27. F 714 - Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

C. American Water Works Association (AWWA):

1. C 900 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings.

2. C-115 - Standard for Flanged Ductile Iron Pipe with Grey Iron Threaded Flanges.

D. Code of Federal Regulations:

1. Title 49.

E. Plastic Pipe Institute (PPI):

1. PE 3408.

F. United States Department of Transportation:

1. Materials Transportation Bureau.

G. National Sanitation Foundation (NSF) 61

1.3 ABBREVIATIONS

A. ABS: Acrylonitrile-Butadiene-Styrene.

B. CPVC: Chlorinated Polyvinyl Chloride.

C. DWV: Drain, waste, and vent.

D. ID: Inside diameter of piping or tubing.

E. NPS: Nominal pipe size followed by the size designation.

F. NS: Nominal size of piping or tubing.

G. PE: Polyethylene.

H. PP: Polypropylene.

I. PVC: Polyvinyl Chloride.

J. SDR: Standard dimension ratio.

1.4 SUBMITTALS

A. Product Data: Describe materials and installation equipment including fusion machine.

B. Manufacturer's Published Installation Instructions.

C. Certificates:

1. Submit manufacturer's certificate attesting that plastic pipe, tubing, and fitting types meet specified requirements.

2. Copies of solvent cement manufacturer's report and certification in accordance with ASTM D 2564 for PVC piping, and ASTM F 493 for CPVC piping.

D. Qualifications of installation crew for PE piping, including qualifications of the fusion machine technician.

1.5 QUALITY ASSURANCE

A. Fusion Machine Technician Qualifications: 1 year experience in the installation of similar PE piping systems from the same manufacturer.

B. Provide pipe and tubing bearing NSF seal, except for drainage piping.

C. Mark plastic pipe with nominal size, type, class, schedule or pressure rating, and manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect piping materials from sunlight, scoring, and distortion.

B. Do not allow surface temperatures on pipe and fittings to exceed 120 degrees Fahrenheit.

C. Store and handle pipe and fittings as recommended by manufacturer in published instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Extruding and Molding Material: Virgin material containing no scrap, regrind, or rework material except where permitted in the referenced standards.

B. Fittings: Same material as the pipe and of equal or greater pressure rating, except the DWV fittings need not be pressure rated.

C. Unions 2-1/2 inches and smaller: Socket end screwed unions. Make unions 3 inches and larger of socket flanges with 1/8 inch full face soft rubber gasket.

2.2 PVC PIPING, SCHEDULE TYPE

A. Materials:

1. PVC schedule type piping: Designation PVC 1120 conforming to ASTM D 1785 and appendices thereto.

a. Pipe and fittings: Extruded from Type I, Grade 1, Class 12454-B material in accordance with ASTM D 1784.

b. PVC Schedule Type Piping: Schedule 80 unless otherwise indicated on the Drawings.

2. Fitting:

a. Supplied by pipe manufacturer.

b. Pressure Fittings: In accordance with ASTM D 2466 or ASTM D 2467.

c. DWV Fittings: In accordance with ASTM D 2665.

3. Solvent Cement: In accordance with ASTM D 2564.

2.3 PVC PIPING, CLASS TYPE

A. Materials:

1. PVC pipe, Class type: ASTM D 2241, except that pipe shall have outside diameters of ductile iron pipe sizes rather than of iron pipe sizes.

a. PVC Class 150 pipe: SDR not more than 17, and Uni-Bell Standard UNI-B-2-72.

b. PVC Pipe, Class Type: AWWA C 900, pressure Class 150 and SDR not more than 18.

c. Bell Section: At least as strong as the pipe barrel.

2. Fittings: Cast or ductile iron fittings as specified under Section 15062, sized for the dimensions of the pipe being used.

a. Fittings for joining pipe 4 inches in diameter and larger: Push-on rubber gasket or mechanical joint type.

3. Gaskets: Meeting the requirements of ASTM D 1869 or ASTM F 477.

2.4 PVC EXPANSION JOINTS

A. Materials:

1. PVC schedule type expansion joints: Designation PVC 1120 conforming to ASTM D 1785 and appendices thereto.

2. Seals: Two (2) Viton, one (1) EPDM.

B. Manufacturers:

1. Plastinetics Inc.

2. Or approved equal.

C. PVC expansion joints shall be provided every 50' for pipe run.

2.5 PE AND HDPE PIPING FOR DRAIN, WATER, AND VENT

A. General:

1. Pipe and fittings: High density polyethylene.

2. Dimensions of pipe and fittings: Based on controlled outside diameter in accordance with ASTM F 714.

a. SDR: Equal to or less than 11.

B. Materials:

1. Manufacturers: One of the following or equal:

a. DuPont, Sclairpipe.

b. Polaris, Duratuff; or equal.

1) Pipe, fittings, and adapters: Furnished by the same manufacturer, and compatible with components in the same system and with components of other systems to which connected.

2. Polyethylene: In accordance with ASTM D 1248, Type III, Class C, Category 5, Grade P34; listed by the Plastic Pipe Institute under the designation PE 3408; and have a minimum cell classification, in accordance with ASTM D 3350, of 345434C.

a. Pipe and fittings: Manufactured from material with the same cell classification.

2.6 CPVC PIPE

A. CPVC pipe shall be Schedule 80, Class 23447-B, conforming to ASTM D 1784 and ASTM F 441.

B. Fittings shall be Schedule 80, solvent welded, socket type, conforming to ASTM F439. Solvent cement shall conform to requirements of ASTM F 493.

C. Provide flanged fittings at all valves and equipment with nitrile gaskets, unless shown otherwise on the Drawings. Provide type 316 stainless steel bolts and nuts.

D. Provide CUPC expansion joints for every 50' of pipe run. Confirm locations with ENGINEER in field.

2.7 SOURCE QUALITY CONTROL

A. PVC Piping, Schedule Type:

1. Mark pipe and fittings in accordance with ASTM D 1785.

B. PVC Piping, Class Type:

1. Test pipe to withstand, without failure, 600 pounds per square inch, gauge, hydrostatic pressure for a minimum of 5 seconds.

2. Test integral bell with the pipe.

C. CPVC Piping:

1. Mark pipe and fittings in accordance with ASTM F 441.

2.8 DETECTABLE TAPE

A. Materials:

1. 3.5 mil thick solid foil core encased in a protective plastic jacket.

2. Resistant to alkalis, acids and other destructive elements commonly found in soil.

3. Lamination shall have sufficient strength that the layers cannot be separated by hand.

4. Total composite thickness hall be 4.3 mils minimum.

5. Foil core to be visible to ensure continuity.

6. Minimum tensile strength of 63 lbs in the machine direction and 68 lbs in the transverse direction per three (3) inch strip.

7. Continuous warning message repeated every 16 to 36 inches shall be imprinted on the tape surface. Tape shall be colored.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Where not otherwise specified, install piping in accordance with ASTM F 645, or manufacturer's published instructions for installation of piping, as applicable to the particular type of piping.

2. Provide molded transition fittings for transitions from plastic to metal or IPS pipe. Do not thread plastic pipe.

3. Locate unions where indicated on the Drawings, and elsewhere where required for adequate access and assembly of the piping system.

4. Provide serrated nipples for transition from plastic pipe to rubber hose.

5. All buried plastic pipe shall have detectable tape applied along the entire length of pipe.

6. PVC expansion joints installed on PVC pipelines as conditions require.

B. Installation of PVC Piping, Schedule Type:

1. Exposed 4- inch and larger connections will be van stone style flanged as shown on the drawings. Spigot van stone style will be used to flange fittings. Socket van stone style will be used for piping flanges exposed less than 4" and smaller connections will be solvent welded.

2. Neoprene gaskets will be used for all water piping.

3. Solvent weld joints in accordance with ASTM D 2855.

4. Install piping in accordance with manufacturer's published instructions.

C. Installation of PVC Piping, Class Type:

1. Install piping in accordance with the Appendix of AWWA C 900 complemented with manufacturer's published instructions.

2. Provide for contraction and expansion at each joint with a rubber ring and integral thickened bell as part of each joint.

3. Direct burial installation tie-ins will be done at the proper buried temperatures.

D. Installation of Polyethylene (PE) Tubing and Fittings:

1. Install small bore PE tubing in accordance with manufacturer's printed instructions, in neat straight lines, supported at close enough intervals to avoid sagging, and in continuous runs wherever possible.

2. Bundle tubing in groups of parallel tubes within protective sheath.

3. Tubes within protective sheath may be color coded, but protect tubing other than black outside the sheath by wrapping with black plastic electrician's tape.

4. Grade tubing connected to meters in 1 direction.

E. Installation of PE Piping for Drain, Waste, and Vent:

1. Install piping as recommended in manufacturer's published instructions.

3.2 FIELD QUALITY CONTROL

A. Clean and test piping per NMAPWA and as specified in Specifications 01 60 00 and 33 05 00.

END OF SECTION

SECTION 33 05 13 – PIPING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

1.2 RELATED SECTIONS

A. Division 15 - HVAC and Plumbing Piping Insulation

B. Section 15145 - Plumbing Piping: Placement of hangers and hanger inserts.

1.3 REFERENCES

A. ASTM C 177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2004.

B. ASTM C 195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2000.

C. ASTM C 533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2004.

D. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2003.

E. ASTM C 547 - Standard Specification for Mineral Fiber Pipe Insulation; 2003.

F. ASTM C 552 - Standard Specification for Cellular Glass Thermal Insulation; 2003.

G. ASTM C 578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2004a.

H. ASTM C 585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System); 1990 (Reapproved 2004).

I. ASTM C 610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation; 1999.

J. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2003.

K. ASTM D 1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2000.

L. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2005.

M. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 2000.

N. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 2003.

1.4 SUBMITTALS

A. See Section 01 33 00 – Technical Submittals, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

2.2 GLASS FIBER

A. Insulation: ASTM C 547 and ASTM C 795; rigid molded, noncombustible.

1. 'K' ('Ksi') value: ASTM C 177, 0.24 at 75 degrees F (0.035 at 24 degrees C).

2. Maximum service temperature: 850 degrees F (454 degrees C).

3. Maximum moisture absorption: 0.2 percent by volume.

B. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

C. Vapor Barrier Lap Adhesive:

D. Insulating Cement/Mastic:

1. ASTM C 195; hydraulic setting on mineral wool.

E. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

2.3 CELLULAR GLASS

A. Insulation: ASTM C 552, Grade 1.

1. 'K' ('Ksi') value: 0.37 at 100 degrees F (0.053 at 38 degrees C).

2. Service Temperature: Up to 900 degrees F (482 degrees C).

3. Water Vapor Permeability: 0.005 perm inch (0.007 ng/Pa s m).

4. Water Absorption: 0.2 percent by volume, maximum.

2.4 EXPANDED POLYSTYRENE

A. Insulation: ASTM C 578; rigid closed cell.

1. 'K' ('Ksi') value: 0.23 at 75 degrees F (0.033 at 24 degrees C).

2. Maximum service temperature: 165 degrees F (74 degrees C).

3. Maximum water vapor permeance: 5.0 perms (287 ng/Pa s sq m)

2.5 JACKETS

A. PVC Plastic.

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.

a. Minimum Service Temperature: 0 degrees F (-18 degrees C).

b. Maximum Service Temperature: 150 degrees F (66 degrees C).

c. Moisture Vapor Permeability: 0.002 perm inch (0.00029 ng/Pa s sq m), maximum, when tested in accordance with ASTM E 96.

d. Thickness: 10 mil (0.25 mm).

e. Connections: Brush on welding adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

3. Glass fiber insulated pipes conveying fluids above ambient temperature:

a. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

b. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

C. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

D. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil (0.025 mm) thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

END OF SECTION

SECTION 33 10 52 – PIPE SUPPORTS

PART 1 – GENERAL

1.1 SUMMARY OF SECTION

A. Section Includes: Supports for pipe, fittings, valves, and appurtenances.

1.2 REFERENCES

A. American National Standard Institute or Manufacturer's Standardization Society (ANSI/MSS):

1. SP 58 - Pipe and Supports, Design and Manufacture.

2. SP 69 - Pipe Supports and Hangers, Selection and Applications.

1.3 SUBMITTALS

A. Shop Drawings: Include schedule, indicating where supports will be installed, and drawings of pipe support system components.

PART 2 - PRODUCTS

2.1 PIPE SUPPORTS

A. Pipe Supports

1. 3-inch and larger: As indicated on the Drawings

2. 2-inch and smaller: Supplied by CONTRACTOR under constraints of these specifications. Locations for these supports are not specifically shown in drawings but are the responsibility of the CONTRACTOR.

2.2 MATERIALS

A. Materials: As indicated on the Drawings.

B. Materials Not Specifically Indicated on the drawings: Hot-dip galvanized steel with stainless fasteners.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Properly support, suspend or anchor exposed pipe, fittings, valves, and appurtenances to prevent sagging, overstressing, or movement of piping and to prevent thrusts or loads on or against connected pumps, valves, meters and other equipment.

B. Carefully determine locations of inserts. Anchor to form work prior to placing concrete.

C. Do not use stud type powder actuated fasteners for securing metallic conduit or steel pipe larger than 1 inch to concrete, masonry, or wood.

D. Suspend pipe hangers from hanger rods. Secured with double nuts.

E. Install continuously threaded hanger rods only where indicated on the Drawings.

F. Use adjustable ring hangers; or adjustable clevis hangers, for 6 inch and smaller diameter pipe.

G. Use adjustable clevis hangers for pipe larger than 6 inches in diameter.

H. Secure pipes with galvanized double nutted U-bolts or suspend pipes from hanger rods and hangers.

I. Support Spacing (unless otherwise specified on drawings):

1. Support 2 inch and smaller piping on horizontal and vertical runs at maximum 5 feet on center, unless otherwise specified.

2. Support larger than 2-inch piping on horizontal and vertical runs at maximum 8 feet on center, unless otherwise specified.

3. Support exposed polyvinyl chloride and other plastic pipes at maximum 5 feet on center, regardless of size.

4. Support tubing, copper pipe and tubing, fiber-reinforced plastic pipe or duct, and rubber hose and tubing at intervals close enough to prevent sagging greater than 1/4 inch between supports.

J. Install Supports at the following Locations (unless otherwise shown on Drawings):

1. Horizontal bends.

2. Both sides of flexible pipe connections.

3. Base of risers.

4. Floor penetrations.

5. Connections to pumps, blowers and other equipment.

6. Valves and appurtenances.

K. Securely anchor plastic pipe, valves, and headers to prevent movement during operation of valves.

L. Anchor plastic pipe between expansion loops and direction changes to prevent axial movement through anchors.

M. Size hanger rods, supports, clamps, anchors, brackets, and guides in accordance with ANSI/MSS SP 58 and SP 69.

N. Do not use chains, plumbers' straps, wire, or similar devices for permanently suspending, supporting, or restraining pipes.

O. Support plumbing drainage and vents in accordance with Uniform Plumbing Code.

P. Supports, clamps, brackets, and portions of support system bearing against copper pipe: Copper plates, copper throughout, or isolated with neoprene or polyvinyl chloride tape.

Q. Where pipe is insulated, install over-sized supports and hangers.

R. Install insulation shield in accordance with ANSI/MSS SP 69, Type 40. Shield shall be galvanized steel unless specified elsewhere.

S. Install riser clamps at floor penetrations and where indicated on the Drawings.

T. Paint or Coat support system components as specified in Specifications 09 80 00 and 09 90 00.

END OF SECTION

SECTION 33 10 53 – STEEL PIPE (ASTM A 53 / A 106, MODIFIED)

PART 1 - GENERAL

1.1 SUMMARY

A. The CONTRACTOR shall provide steel pipe and appurtenances, complete and in place, in accordance with the Contract Documents.

1. The requirements of Section 33 05 00 – Basic Pipe Material and Methods apply to the WORK of this Section.

PART 2 - PRODUCTS

2.1 PIPE MATERIAL

A. Water, Air, Fuel Gas, Oil, Steam, and Waste Service: Unless otherwise indicated, galvanized and black steel pipe shall conform to ASTM A 53 - Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless or ASTM A 106 - Seamless Carbon Steel Pipe for High Temperature Service, Grade B, and shall be Schedule 40 or 80, as indicated in the Piping Schedule. Galvanized steel pipe shall not be cement mortar lined unless so indicated.

B. Chlorine and Sulfur Dioxide Pressure Service: Black steel pipe shall conform to Chlorine Institute Pamphlet 6, ASTM A 106, Grade A or B, and shall be Schedule 80.

2.2 PIPE JOINTS

A. Black steel pipe for general service shall have screwed ends with NPT threads, welded joints, or flanged joints. Screwed joints shall be made up with Teflon tape and welded joints may have butt-weld fittings, socket-weld fittings, or flanges. Where indicated, black steel pipe shall have grooved ends for shouldered couplings or plain ends for sleeve-type couplings.

B. Black steel pipe for chlorine or sulfur dioxide pressure service shall be socket-welded except where required to match mating fittings of vacuum regulator-check units, gas filters, valves, diaphragm units, gauges, and switches.

C. Galvanized steel pipe shall have screwed ends with NPT threads made up with Teflon tape. Where indicated, galvanized steel pipe shall have grooved ends for shouldered couplings or plain ends for sleeve-type couplings.

D. Where pressure conditions permit, black and galvanized steel pipe may have push-on joints for compression type fittings. For high pressure service these joints shall be harnessed.

2.3 FITTINGS

A. Common Use: The following fittings shall be provided for galvanized or black steel pipe, as indicated in the Piping Schedule:

1. Threaded malleable iron fittings conforming to ASME B 16.3 - Malleable-Iron Threaded Fittings, Classes 150 and 300.

2. Threaded cast iron fittings conforming to ASME B 16.4 - Cast Iron Threaded Fittings, Class 125 and 250.

3. Forged steel socket welded fittings conforming to ASME B 16.11 - Forged Fittings, Socket - Welding and Threaded.

4. Butt welding fittings conforming to ASME B 16.9 - Factory-Made Wrought Steel Butt Welding Fittings, Schedule 40 or 80, as indicated.

5. Threaded cast iron drainage fittings conforming to ASME 16.12 - Cast Iron Threaded Drainage Fittings.

6. Flanged cast iron fittings conforming to ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.

7. Flanged steel fittings conforming to ASME B 16.5 - Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.

8. Grooved ductile iron fittings with grooving dimensions conforming to AWWA C606 - Joints, Grooved and Shouldered Type.

9. Compression-type steel fittings with armored Buna S gaskets for plain end pipe.

B. Special Applications

1. Fittings for chlorine and sulfur dioxide under pressure shall be 3,000 lb. forged steel socket welded fittings conforming to ASTM A 105, Grade 2 - Forgings, Carbon Steel, for Piping Components, and 300 lb. forged steel fittings conforming to ASME B 16.11, as indicated in the Piping Schedule.

2. Flanges for chlorine and sulfur dioxide pressure service shall conform to ASTM A 105, ASME B 16.5, Class 300, with 1/16-inch raised face, with 1/16-inch high temperature, compressed, self-centering ring type gaskets to ASME B 16.21 - Nonmetallic Flat Gaskets for Pipe Flanges. Unions shall be 4 bolt tongue and groove, ammonia type, suitable for chlorine and sulfur dioxide service, with female threads and lead gaskets.

3. High tensile alloy steel corrosion-resistant bolts and nuts shall be used with each set of flanged unions. Unions shall be rated for 500 lb. CWP service pressure, reducing-type, straight-type or blind-type, as required for the installation. Blind unions shall be provided as cleanouts where indicated, and straight unions shall be provided adjacent to each threaded valve or piece of equipment. Unions shall be as manufactured by Henry Valve Company, Vogt Valve Co., or equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Pipes shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the Site to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipes shall afford maximum headroom and access to equipment, and where necessary, piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. Installation shall be free from defects.

B. Supports and Anchors: Piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with Section 43 10 52 - Pipe Supports. Where necessary to avoid stress on equipment or structural members, the pipes shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature differences.

C. Valves and Unions: Water, steam, condensate, gas, vacuum, and air supply piping to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Low points in water systems and driplegs in steam, gas, and air systems shall have drainage valves. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection.

D. Branch Connections: Branch connections in horizontal runs of air and gas piping shall be made from the top of the pipe, to avoid drainage of condensate into the equipment.

3.2 PIPE PREPARATION

A. Prior to installation, each pipe length shall be carefully inspected, be flushed clean of any debris or dust, and be straightened if not true. Ends of threaded pipes shall be reamed and filed smooth. Fittings shall be equally cleaned before assemblage.

3.3 PIPE JOINTS

A. Threaded Joints: Pipe threads shall conform to ASME B 1.20.1 - Pipe Threads, General Purpose (inch), and shall be full and cleanly cut with sharp dies. Not more than 3 threads shall remain exposed after installation.

B. Welded Joints: Welded joints shall conform to the specifications and recommendations of ASME B 31.1 - Power Piping. Welding shall be done by skilled and qualified welders per Section 43 10 50 - Piping, General.

C. Grooved Joints: Grooves for grooved couplings and fittings shall be made with specially designed grooving tools to the manufacturer's recommendations and conform to AWWA C 606. Grooves shall be clean and sharp without flaws, and the pipe ends shall be accurately cut at 90 degrees to the pipe axis.

D. Push On Joints: Push on joints and gasket installation shall be in accordance with the manufacturer's recommendations and lubricants. Pipe ends shall be beveled to facilitate assembly. Lubricants shall be suitable for potable water service and shall be kept clean in closed containers.

3.4 INSPECTION AND FIELD TESTING

A. Inspection: Finished installations shall be carefully inspected for proper supports, anchoring, interferences, and damage to pipe, fittings, and coating. Any damage shall be repaired.

B. Field Testing: Prior to enclosure or burying, piping systems shall be pressure tested as required in the Piping Schedule for a period of not less than one hour without exceeding the tolerances listed in the Piping Schedule. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum working pressure. The CONTRACTOR shall furnish test equipment, labor, materials, and devices as part of the WORK. For additional testing requirements, refer to Section 01 74 30 - Pressure Pipe Testing and Disinfection.

1. Leakage may be determined by loss of pressure, soap solution, chemical indicator, or other positive and accurate method. Fixtures, devices, or other accessories which are to be connected to the lines and which would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines plugged or capped as required during the testing procedures.

2. After completion of the pressure tests, chlorine gas piping shall be tested for leakage using chlorine gas under operating pressures. Piping shall be thoroughly clean and dry before admitting chlorine gas into the system. Chlorine shall be slowly admitted to the piping system. Leakage shall be checked with a swab soaked in aqua ammonia solution and waved in the vicinity of each fitting. Ammonia solution shall not be applied to the fittings. Formation of white fumes will be evidence of leaks. Chlorine gas shall be purged from the line before leaks are repaired.

3. Leaks shall be repaired, and the system shall be re-tested until no leaks are found.

END OF SECTION

SECTION 33 10 55 – PIPE EXPANSION COMPENSATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Flexible pipe connectors.

B. Expansion joints and compensators.

C. Pipe loops, offsets, and swing joints.

1.2 RELATED SECTIONS

A. Section 33 05 00 Basic Piping Materials and Methods

1.3 REFERENCES

A. ASTM A 269 - Standard Specification for Seamless and Welded Austenitic Stainless-Steel Tubing for General Service; 2004.

B. EJMA (STDS) - EJMA Standards; Expansion Joint Manufacturers Association; 2003.

1.4 SUBMITTALS

A. See Section 01 33 00 – Technical Submittals, for submittal procedures.

B. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.

2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

PART 2 - PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS - STEEL PIPING

A. Inner Hose: Carbon Steel.

B. Exterior Sleeve: Single braided, stainless steel.

C. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).

2.2 FLEXIBLE PIPE CONNECTORS - COPPER PIPING

A. Inner Hose: Bronze.

B. Exterior Sleeve: Braided bronze.

C. Pressure Rating: 125 psi and 450 degrees F (862 kPa and 232 degrees C).

2.3 EXPANSION JOINTS - STAINLESS STEEL BELLOWS TYPE

A. Pressure Rating: 125 psi and 400 degrees F (862 kPa and 204 degrees C).

B. Maximum Compression: 1-3/4 inches (45 mm).

C. Maximum Extension: 1/4 inch (6 mm).

2.4 EXPANSION JOINTS - EXTERNAL RING CONTROLLED STAINLESS STEEL BELLOWS TYPE

A. Pressure Rating: 125 psi and 400 degrees F (862 kPa and 204 degrees C).

B. Maximum Compression: 15/16 inch (24 mm).

C. Maximum Extension: 5/16 inch (8 mm).

D. Maximum Offset: 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

END OF SECTION

SECTION 33 10 56 - PIPE HANGERS

PART 1 -- GENERAL

1.1 THE SUMMARY

A. Provide pipe supports, hangers, guides, and anchors, complete and in place, as indicated in accordance with the Contract Documents.

B. Where pipe support systems are not indicated on the Drawings, the CONTRACTOR shall design and provide the supports in accordance with this Section.

C. Seismic and Wind Forces

1. Reference 2015 International Building Code and ASCE/SEI 7-10 – Seismic and Wind Design Criteria for pipe support details that have not been designed on the Contract Documents.

2. The CONTRACTOR shall arrange for the services of a Registered Professional Civil Engineer in New Mexico experienced in pipe support design to design such pipe supports.

3. The CONTRACTOR shall provide additional supports as needed to resist such forces in accordance with 2015 International Building Code and ASCE/SEI 7-10 – Seismic and Wind Design Criteria

1.2 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with the requirements of Section 01 33 00 – Contractor Submittals.

B. Shop Drawings

1. Submit Shop Drawings which shall include the following information:

a. Drawings of pipe supports, hangers, guides, and anchors in accordance with 2015 International Building Code and ASCE/SEI 7-10 – Seismic and Wind Design Criteria.

b. Calculations for special supports and anchors that have not been designed on the Contract Documents, shall be stamped and signed by a Registered Professional Engineer.

PART 2 -- PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Code Compliance

1. Piping systems and pipe connections to equipment shall be properly anchored and supported in order to prevent undue deflection, vibration, and dislocation due to seismic events, line pressures, pipe weight, fluid weight, liquid movement, thermal changes, vibration, probable forces applied during construction, and stresses on piping, equipment, and structures.

2. Supports and parts thereof shall conform to the requirements of ASME B31.1 - Power Piping, except as supplemented or modified in this Section.

3. Supports for plumbing piping shall be in accordance with the latest edition of the applicable plumbing code or local administration requirements.

B. Structural Members

1. Wherever possible, pipes shall be supported from structural members.

2. Where it is necessary to frame structural members between existing members, such supplementary members shall be provided by the CONTRACTOR.

3. Supplementary members shall be in accordance with the requirements of the 2012 International Building Code, 2015 International Building Code and ASCE/SEI 7-10 – Seismic and Wind Design Criteria, and shall be as acceptable to the ENGINEER.

C. Pipe Hangers

1. Pipe hangers shall be capable of supporting the pipe in operation, allowing free expansion and contraction of the piping and preventing excessive stress on equipment.

2. Hangers shall have a means of vertical adjustment after erection.

3. Hangers shall be designed to prevent becoming disengaged by any movement of the supported pipe.

4. Hangers subject to shock, seismic disturbances, or thrust imposed by the actuation of safety valves shall include hydraulic shock suppressors.

5. Hanger rods shall be subjected to vertical loading only.

D. Hangers Subject to Horizontal Movements

1. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit such movement.

2. Where horizontal pipe movement is greater than 1/2 inch, or where the hanger rod deflection from the vertical is greater than 4 degrees from the cold-to-hot position of the pipe, the hanger rod and structural attachment shall be offset in such a manner that the rod is vertical in the hot position.

E. Spring-Type Hangers

1. Spring-type pipe hangers shall be provided for piping subject to vibration or vertical expansion and contraction, such as engine exhausts and similar piping.

2. Spring-type hangers shall be sized to the manufacturer's printed recommendations and the loading conditions encountered.

3. Variable spring supports shall be provided with means to limit misalignment, buckling, eccentric loading, or to prevent overstressing of the spring, and with means to indicate the compression of the spring.

4. Supports shall be capable of accommodating at least 4 times the maximum travel due to thermal expansion.

F. Thermal Expansion

1. Wherever expansion and contraction of piping is expected, a sufficient number of expansion loops or expansion joints shall be provided, together with the necessary rolling or sliding supports, anchors, guides, pivots, and restraints permitting the piping to expand and contract freely away from the anchored points.

2. Components shall be structurally suitable to withstand the imposed loads.

G. Heat Transmission

1. Supports, hangers, anchors, and guides shall be designed and insulated such that excessive heat will not be transmitted to the structure or to other equipment.

H. Riser Supports

1. Where practical, risers shall be supported on each floor with riser clamps and lugs, independent of the connected horizontal piping.

I. Freestanding Piping

1. Freestanding pipe connections to equipment such as chemical feeders and pumps shall be firmly attached to steel frames fabricated from angles, channels, or I-beams anchored to the structure.

2. Exterior, freestanding overhead piping shall be supported on fabricated pipe stands consisting of pipe columns anchored to concrete footings, or with horizontal, welded steel angles, and U-bolts or clamps securing the pipes.

J. Materials of Construction

1. Pipe support assemblies, including framing, hardware, and anchors, shall be of steel construction, galvanized after fabrication, unless otherwise indicated.

2. Submerged supports, as well as piping, conduits, and equipment in hydraulic structures within 24 inches of the water level, shall be supported with support assemblies, including framing, hardware, and anchors constructed of Type 316 stainless steel, unless otherwise indicated.

3. Piping in chemical and corrosive areas shall be supported with support assemblies, including framing, hardware, and anchors constructed of Type 316 stainless steel or FRP, unless otherwise indicated.

K. Point Loads

1. Meters, valves, heavy equipment, and other point loads on PVC, FRP, or other plastic pipes, shall be supported on both sides, according to manufacturer's recommendations, in order to avoid undue pipe stresses and failures.

2. In order to avoid point loads, the supports on PVC, FRP, or other plastic piping shall be equipped with extra wide pipe saddles or galvanized steel shields.

L. Concrete Anchors

1. Unless otherwise indicated, concrete anchors for pipe supports shall be according to the following table; consult the ENGINEER for any anchor applications not appearing on the table.

Pipe Support Application	Type of Concrete Anchor
New Concrete	Use embedded concrete insert anchors on a grid pattern. Use Grinnell (Anvil International), Tolco, or equal.
Vibratory Loads and High-Temperature Conditions	Use non-shrink grouted anchors

M. Noise Reduction

1. In order to reduce the transmission of noise in piping systems, copper tubes in buildings and structures shall be wrapped with a 2-inch wide strip of rubber fabric or similar suitable material at each pipe support, bracket, clip, or hanger.

2.2 SUPPORT SPACING

A. Supports for piping with the longitudinal axis in approximately a horizontal position shall be spaced to prevent excessive sag, bending, and shear stresses in the piping, with special consideration given where components such as flanges and valves impose concentrated loads.

B. Pipe support spacing shall not exceed the maximum indicated spans.

C. For temperatures other than ambient temperatures or those listed, and for other piping materials or wall thicknesses, the pipe support spacings shall be modified in accordance with the pipe manufacturer's recommendations.

D. Vertical supports shall be provided to prevent the pipe from being overstressed from the combination of loading effects.

E. Steel Pipe

1. Install supports for steel pipe in accordance with the requirements of AWWA: Manual of Practice MOP-11.

2. For steel pipe sizes not indicated, the support spacing shall be designed such that the stress on the pipe does not exceed 5,000 psi.

3. Where support spacing is not indicated on the Drawings, the CONTRACTOR shall use the spacing indicated in the following schedule, for the indicated support condition:

PRACTICAL SPANS FOR SIMPLY SUPPORTED PIPE IN 120-DEGREE CONTACT SADDLES, FEET[1]										
Nominal Pipe Diameter, inches	**Pipe Wall Thickness, inches**									
	3/16	**1/4**	**5/16**	**3/8**	**7/16**	**1/2**	**5/8**	**3/4**	**7/8**	**1**
6	36	40	44							
8	38	42	45							
10	39	43	46							
12	40	44	47							
14	40	44	47							
16	41	45	48							
18	41	46	49	52						
20	42	46	50	53						
22	42	46	51	54						
24	42	48	52	55	58	60				
26	43	48	52	56	59	61				
28	43	48	53	56	59	62				
30	43	49	53	57	60	63				

[1] Reference: AWWA MOP 11, Table 7-1

F. Ductile Iron Pipe

1. Install supports for ductile iron pipe in accordance with the recommendations of the Ductile Iron Pipe Research Association (DIPRA) Design of Ductile Iron Pipe on Supports.

2. As a minimum, where support spacing is not indicated on the Drawings, the CONTRACTOR shall use the spacing indicated in the following schedule:

Nominal Pipe Diameter, inches	Support Configuration
ALL DIAMETERS	two supports per pipe length, with one of the two supports located at a joint

G. Copper Tube

1. Install supports for copper tube in accordance with the recommendations of ANSI/MSS SP-69 Pipe Hangers and Supports - Selection and Application, as indicated in the following schedule:

Nominal Tube Size, inches	Support Spacing, feet[1]	
	Water Service	Vapor Service
1/4	5	5
3/8	5	6
1/2	5	6
3/4	5	7
1	6	8
1-1/4	7	9
1-1/2	8	10
2	8	11
2-1/2	9	13
3	10	14
3-1/2	11	15
4	12	16
5	13	18
6	14	20
8	16	23
10	18	25
12	19	28

[1] Reference: ANSI/MSS SP-69, Table 3

H. Schedule 80 PVC Pipe

1. Install supports for Schedule 80 PVC pipe as indicated in the following schedule:

Support Spacing for Schedule 80 PVC Pipe[1]					
Nominal Pipe Size, inches	**Maximum Support Spacing, feet, at Various Temperatures**				
	60 deg F	**80 deg F**	**100 deg F**	**120 deg F**	**140 deg F**
1	6	5.5	5	3.5	3
1-1/2	6.5	6	5.5	3.5	3.5
2	7	6.5	6	4	3.5
3	8	7.5	7	4.5	4
4	9	8.5	7.5	5	4.5
6	10	9.5	9	6	5
8	11	10.5	9.5	6.5	5.5
10	12	11	10	7	6
12	13	12	10.5	7.5	6.5
14	13.5	13	11	8	7

[1] Reference: USACE based on Harvel Plastics Product Bulletin 112/401 (rev, 10/1/95), p. 63; spacing values based on test data developed by the manufacturer for the specific product and continuous spans; the piping is insulated and full of liquid with a specific gravity of 1.0

2.3 MANUFACTURED SUPPORTS

A. Stock Parts

1. Where not specifically indicated, designs that are generally accepted as exemplifying good engineering practice and using stock or production parts shall be utilized wherever possible.

2. Such parts shall be locally available, new, of best commercial quality, and designed and rated for the intended purpose.

B. Manufacturers, or Equal

1. Basic Engineers Inc.

2. Bergen-Paterson Pipesupport Corp.

3. Grinnell Corp. (Anvil International)

4. NPS Products, Inc.

5. Power Piping Company

6. Tolco Incorporated

2.4 COATING

A. Galvanizing

1. Unless otherwise indicated, fabricated pipe supports other than stainless steel or non-ferrous supports shall be blast-cleaned after fabrication and hot-dip galvanized in accordance with ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

B. Other Coatings

1. Other than stainless steel or non-ferrous supports, supports shall receive protective coatings suitable for the environment.

PART 3 -- EXECUTION

3.1 INSTALLATION

A. General

1. Pipe supports, hangers, brackets, anchors, guides, and inserts shall be fabricated and installed in accordance with the manufacturer's printed instructions and ASME B31.1 - Power Piping.

2. Concrete inserts for pipe hangers and supports shall be coordinated with the formwork.

B. Appearance

1. Pipe supports and hangers shall be positioned in order to produce an orderly, neat piping system.

2. Hanger rods shall be vertical, without offsets.

3. Hangers shall be adjusted to line up groups of pipes at the proper grade for drainage and venting, as close to ceilings or roofs as possible, and without interference with other WORK.

3.2 FABRICATION

A. Quality Control

1. Pipe hangers and supports shall be fabricated and installed by experienced welders and fitters, using the best welding procedures available.

2. Fabricated supports shall be neat in appearance without sharp corners, burrs, or edges.

END OF SECTION

SECTION 33 10 61 - PVC PRESSURE PIPE (ASTM D 1785, MODIFIED)

PART 1 - GENERAL

1.1 THE SUMMARY

A. The CONTRACTOR shall provide polyvinyl chloride (PVC) pressure pipe, complete and in place, in accordance with the Contract Documents.

B. The requirements of Section 33 05 00 – Basic Piping and Methods apply to the WORK of this Section.

C. This Section includes PVC pressure pipe with solvent-welded, flanged, or screwed joints. PVC pipe with bell and spigot joints per AWWA C900.

PART 2 - PRODUCTS

2.1 PIPE MATERIAL

A. PVC pipe shall be made from new rigid unplasticized polyvinyl chloride and shall be normal impact Type 1, Grade 1, class 12454, Schedule 80, listed as compliant with NSF Standard 61, unless otherwise indicated, in accordance with ASTM D 1785-Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

2.2 PIPE JOINTS

A. Pipe joints shall be solvent-welded type with solvent cement and primer as recommended by the pipe manufacturer for the chemical in the pipe.

B. Screwed joints that are necessary to match up to threaded valves or fittings shall be made up with appropriate thread sealant, either paste or tape.

C. Flanged joints shall be made with solvent-welded PVC flanges, drilled to ASME B 16.5 - Pipe Flanges and Flanged Fittings, Class 150, unless otherwise indicated. Gaskets shall be ANSI 150 lb. full face, 1/8-inch thick Neoprene for water or wastewater service. Gasket material for chemicals shall be suitable for the chemical service.

2.3 FITTINGS

A. Solvent Welded and Threaded Fittings: Solvent-welded and threaded fittings shall be Schedule 80 PVC fittings in accordance with ASTM D 2467 - Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

B. Flanged Fittings: Flanged fittings shall be Schedule 80 fabricated PVC fittings with 150 lb. flanges to ASME B 16.5.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: PVC pipe shall be installed in a neat and workmanlike manner, properly aligned, and cut from measurements taken at the Site to avoid interferences with structural members, architectural features, openings, and equipment. Exposed pipe shall afford maximum headroom and access to equipment, and where necessary, piping shall be installed with sufficient slopes for venting or drainage of liquids and condensate to low points. It is recommended that the CONTRACTOR obtain the assistance of the pipe manufacturer's field representative to instruct the pipefitters in the correct installation and support of PVC piping.

B. Supports and Anchors: Piping shall be firmly supported with fabricated or commercial hangers or supports in accordance with Section 43 10 52 - Pipe Supports. Where necessary to avoid stress on equipment or structural members, the pipe shall be anchored or harnessed. Expansion joints and guides shall compensate for pipe expansion due to temperature changes.

C. Valves and Unions: Unless otherwise indicated, connections to fixtures, groups of fixtures, and equipment shall be provided with a shutoff valve and union, unless the valve has flanged ends. Unions shall be provided at threaded valves, equipment, and other devices requiring occasional removal or disconnection. Valves and flanges attached to PVC pipe shall be provided with adequate supports.

3.2 PIPE PREPARATION

A. Prior to installation, each pipe length shall be carefully inspected, flushed clean of any debris or dust, and be straightened, if not true. Ends of threaded pipes shall be reamed and filed smooth. Pipe fittings shall be equally cleaned before assembly.

3.3 PIPE JOINTS

A. Threaded Joints: Pipe threads shall conform to ASTM F 1498 - Taper Pipe Threads 60 Degrees for Thermoplastic Pipe and Fittings, and shall be full and cleanly cut with sharp dies or molded. Joints shall be made with Teflon tape or thread sealant.

B. Solvent-Welded Joints: Solvent-welded joints shall be made with fresh primer and solvent cement on clean, dry pipe ends. The primer and cement cans shall be kept closed at all times and the joints shall be made up at the recommended ambient temperatures, to the pipe or cement manufacturer's written recommendations. Pipe ends shall be inserted to the full depth of the socket.

C. Flange Joints: Flanged joints shall be made with gaskets and Type 316 stainless steel bolts and nuts. Care shall be taken not to over-torque the bolts, in accordance with the manufacturer's written recommendations.

3.4 INSPECTION AND FIELD TESTING

A. Inspection: Finished installations shall be carefully inspected for proper joints and sufficient supports, anchoring, interferences, and damage to pipe, fittings, and coating. Defective WORK shall be repaired.

B. Field Testing: The CONTRACTOR shall allow adequate time for the solvent cement joints to cure. Curing time shall be per the solvent cement manufacturer's recommendation. Prior to enclosure or burying, piping systems shall be pressure tested as required in the Piping Schedule, for a period of not less than one hour, without exceeding the tolerances listed in the Piping Schedule. Caution - Do not use air or gas for testing PVC pipe. Where no pressures are indicated, the pipes shall be subject to 1-1/2 times the maximum working pressure. The CONTRACTOR shall furnish test equipment, labor, materials, and devices.

C. Leakage shall be determined by loss of pressure. Fixtures, devices, or other accessories that would be damaged if subjected to the test pressure shall be disconnected and ends of the branch lines shall be plugged or capped as appropriate during the testing procedures.

D. Leaks shall be repaired, and the piping shall be re-tested until no leaks are found.

END OF SECTION

SECTION 43 20 00 – VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Basic requirement for valves.

1. Requirements indicated on the Drawings and specified elsewhere in these Specifications take precedence over the requirements specified under this Section.

2. Furnish and install valves required for proper piping and equipment operation and maintenance, in addition to the valves indicated on the Drawings, and specified.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A 167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

2. A126 - Gray Icon Casting for Valves, Flanges, and Pipe Fittings

3. A48 - Specifications for Gray Iron Castings.

4. A536 - Ductile Iron Castings.

B. American Water Works Association (AWWA):

1. C 111 - Rubber-Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings.

2. C504-87 - Rubber Seated Butterfly Valves.

3. C508 - Swing Check Valves for Waterworks Service, 2 through 24 IN NPS.

4. C-110 - Standard for Ductile Iron and Grey Iron Fittings.

5. C-207 - Steel Pipe Flanges for Waterworks Service.

C. Steel Structures Painting Council (SSPC):

1. SP-2 - Hand Tool Cleaning

2. SP-10 - Near-White Blast Cleaning

D. American National Standards Institute (ANSI):

1. B1.20.1, Pipe Threads, General Purpose.

E. National Sanitation Foundation (NSF) 61 - Drinking Water System Components

1.3 DESIGN REQUIREMENTS

A. Pressure Rating:

1. Suitable for service under pressures equal to and less than 150 pounds per square inch gauge unless noted in the Drawings.

2. In addition, design valves to withstand test pressures specified in the Piping Schedule.

B. Valve to Piping Connections:

1. Valves 3-inch nominal size and larger: Flanged ends unless otherwise specified on the plans.

2. Valves less than 3-inch nominal size: Screwed ends.

1.4 SUBMITTALS

A. Product Data: Submit detailed technical information relating to the valve including description of component parts, materials of construction, performance, dimensions, and weights.

B. Manufacturer's Published Instructions:

1. Submit instructions for installation, operation, and maintenance of valves.

2. Furnish bound sets of installation, operation, and maintenance instructions for each type of valve 4-inch nominal size and larger.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Valves: Manufactured by manufacturers whose valves have had successful operational experience in comparable service.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Underground Bolts: Low-alloy steel in accordance with AWWA C 111.

B. Bronze and Brass Alloys: Use bronze and brass alloys with not more than 6 percent zinc and not more than 2 percent aluminum in the manufacture of valve parts.

C. Interior Protective Coating:

1. Epoxy coat interior non-working surfaces, except stainless steel surfaces.

2. Coating Types:

a. Powder Epoxies

1) Manufacturers: One of the following or equal:

i) 3-M Company, ScotchKote 134; certified to NSF 61 for drinking water use.

ii) Michigan Chrome and Chemical Company, Micron 650 or 651.

b. High Solids Polyamine Cured Epoxy

1) Manufacturers: One of the following or equal:

i) Ameron: Amercoat 395

ii) Carboline: Carboguard 891

iii) DevoeL Bar Rust 223H

iv) Tnemec: Series 140N Pota Pox

3. Clean surfaces to meet SSPC-SP-10, near-white metal blast cleaning, with grit of size recommended by epoxy manufacturer.

4. Apply in accordance with manufacturer's published instructions.

a. High Solids Polyamine Cured Epoxy:

1) Not less than 2 coats to the specified thickness.

5. Coating Thickness: 12 mils except that:

a. Coating thickness in grooves for gaskets: 5 mils.

b. Do not coat seat grooves in valves with bonded seat.

6. Quality Control:

a. Coating Thickness: Measured with a nondestructive magnetic type thickness gauge.

b. Verify coating integrity with a holiday detector set at 1,800 volts.

c. Consider tests successful when coating thickness meets specified requirements and when no pin holes are found.

1) Correct defective coating disclosed by unsuccessful tests, and repeat test.

2) Repair pinholes in accordance with manufacturer's published recommendations.

D. Underground Valves:

1. Provide underground valves with flanged, mechanical, or other type of joint required for the type of pipe to which the valve is to be connected.

2. Coating and Wrapping:

a. Paint buried valves with 3 coats of asphalt varnish in accordance with AWWA C 504.

1) Protect coating from damage during handling and installation; repair coating where damaged.

b. After installation, wrap valves in polyethylene as specified for ductile iron piping in Specification 33 05 10.

1) Ascertain that polyethylene wrapping does not affect operation of valve.

E. Valve Boxes:

1. Furnish and install access to operators of buried valves through cast-iron valve boxes, as shown on Drawings.

a. Do not support boxes on valve, valve operator, or pipe.

b. Boxes: Fabricated of cast-iron; provided with cover, asphalt varnished or enameled. Adjust to grade, install centered around the upper portions of the valve and valve operator.

c. Minimum clear inside diameter of 6 inches.

F. Valve Operators:

1. Open counterclockwise.

2. Provide valves located below operating level or deck with extensions for key operation or floor stands and handwheels.

3. Provide manually operated valves and gates located not more than 6 feet above the operating level with levers, tee handles, wrenches, or handwheels, as shown on Drawings.

    a. Make the valve operator more conveniently accessible by rolling valves, located more than 5 feet but less than 6 feet above the operating level, toward the operating side.

    b. Secure tee handles and wrenches to the valve head or stem, except where a handle or wrench so secured constitutes a hazard to personnel; in which case, stow handle or wrench immediately adjacent to the valve on or in a suitable hanger, bracket, or receptacle.

4. Fit valves located more than 6 feet above operating level with chain operated handles or valve wheels.

    a. Chains: Sufficient length to reach approximately 4 feet above the operating level.

    b. Where chains constitute a nuisance or hazard to operating personnel, provide hold-backs or other means for keeping the chains out of the way.

G. Silent Check Valves:

1. General Work included in this Section: All globe style silent check valves.

2. Acceptable Manufacturers:

    a. APCO series 600 Globe Style

    b. Clow

    c. Crispin

    d. Val-matic

    e. Or equal

3. Materials:

    a. 150 psi working pressure

    b. Body and cover: Cast iron (ASM A126 Grade B)

    c. Plug and seat: Bronze (ASTM B584 C83600)

    d. Spring: Stainless Steel (ASTM A276 T316)

4. Installation:

    a. Support valve body and adjacent piping as necessary to avoid stressing valve body.

H. Combination air release and air/vacuum valve:

1. Function: Release air accumulating at high point in water piping under pressure and allow air to enter the system in the event of a vacuum at well discharge indicated on Drawings. Provide with a double acting throttling device. The valves shall have an added duplex body combination with air release and isolation valve. The isolation valve between the air release and the air/vacuum valve shall be a ball valve with fittings as required.

2. Working pressure: 10 - 30 psi.

3. Air/Vacuum Valve Connection sizes:

    a. Inlet: 2"

    b. Outlet: 2"

4. Air/Vacuum Valve Orifice Size: 2"

5. Materials:

    a. Body: Cast iron ASTM A126 Grade B.

    b. Trim: Stainless Steel

    c. Float and guide: Stainless Steel ASTM A240

    d. Throttling device:

        1) Housing: Malleable iron ASTM A47

        2) Adj. Screw and nut: Stainless Steel ASTM A276

        3) Spring: Stainless Steel: ASTM A316

        4) Plug: Teflon AMS 3651

    e. Seat: Provide soft seat to seal at lower pressures.

    f. Baffle: Cast iron ASTM A48 CL30

    g. Water diffuser: Brass ASTM B16

6. Accessories:

    a. Isolating valves: 250 lb ball valve with bronze body and Teflon disc and packing, 250 psi working pressure.

    b. Connecting pipe and union: 2" stainless steel nipple, Schedule 40 threaded-NPT.

7. Manufacturer:

    a. APCO Model 144 (2")

2.2 FABRICATION

A. Valves: per the American Iron and Steel Act (AIS) requirements.

B. End connections:

1. Provide end connections for valves as required in the Piping Schedules presented in the Appendix.

2. Assure end connections meet the following American Iron and Steel Act (AIS) standards and the standards below:

    a. Threaded: ANSI B1.20.1

    b. Flanged: AWWA C207.

PART 3 - EXECUTION

3.1 PREPARATION

A. Required Information Prior To Installation:

1. Install valves after the required submittal in installation has been accepted.

2. Determine, after flanged valves and flanged check valves are selected, the face-to-face dimensions of flanged valves and flanged check valves.

B. Fabricate piping to lengths considering the dimensions of flanged valves and flanged check valves.

3.2 INSTALLATION

A. Prior to installation, valves that will be electrically actuated will have actuators mounted and tested by the valve manufacturer. Actuators will be shipped by the actuator manufacturer to the valve manufacturer for mounting and testing.

B. Provide incidental work and materials necessary for installation of valves including flange gaskets, flange bolts and nuts, valve boxes and covers, concrete bases,

blocking, and protective coating.

C. Where needed, furnish and install additional valves for proper operation and maintenance of equipment and plant facilities under the following circumstances:

1. Where such additional valves are required for operation and maintenance of the particular equipment furnished by CONTRACTOR.

2. Where such additional valves are required as a result of a substitution or change initiated by CONTRACTOR.

3. Install valves with their stems in vertical position above the pipe, except as follows:

a. Butterfly valves, gate valves aboveground, globe valves, and angle valves may be installed with their stems in the horizontal position.

D. Install valves so that handles clear obstructions when the valves are operated from full open to fully closed.

E. Place top of valve boxes flush with finish grade or as otherwise indicated on the Drawings.

3.3 ADJUSTING

A. Make sure all adjustments to valves, operators and appurtenant equipment prior to Project Acceptance. Operate valve, open, close at system pressures.

END OF SECTION

SECTION 43 20 10 – BALL VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Plastic body ball valves and instrument isolation ball valves.

1.2 SYSTEM DESCRIPTION

A. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME):

1. B16.5 – Pipe Flanges and Flanged Fittings

B. American Petroleum Institute (API).

C. American Society for Testing and Materials (ASTM).

1. A 351 – Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts.

D. American Water Works Association (AWWA):

1. C 507 – Standard for Ball Valves 6 Inch Through 48 Inch.

E. National Sanitation Foundation (NSF) 61

1.3 SYSTEM DESCRIPTION

A. General: Unless otherwise indicated on the Drawings use:

1. Plastic body ball valves for plastic pipelines.

PART 2 – PRODUCTS

2.1 BALL VALVE TYPES

A. Full Port DIP Ball Valves

1. Conbraco

B. Plastic Ball Valves

1. Manufacturers: One of the following or equal

a. Asahi America

b. Chemtrol Division, NIBCO, Inc.

C. General:

1. Type: Non-lubricated and capable of sealing in either flow direction.

2. End Connection: True union; solvent or heat welded to piping.

3. Operator Handle: Lever.

4. Valves bodies, requiring actuators, shall have integrally mounted molded stem support and platform to assure proper alignment of the actuator to the valve.

D. Materials:

1. Body: Polyvinyl chloride (PVC).

2. Ball: Polyvinyl chloride (PVC).

3. Seats: FMP (Viton).

4. O-rings: FPM (Viton).

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install each type of valve in accordance with manufacturers' printed instructions.

B. Schedule: All valves 3-inches and smaller are not shown on the Valve Schedule.

END OF SECTION

SECTION 43 20 20 – BUTTERFLY VALVES, OPERATORS AND APPURTENANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Metal body lugged butterfly valve, operators, and appurtenances.

B. Related Sections:

1. Section 09 80 00 - Special Coatings.

2. Section 43 20 00 – Valves

1.2 REFERENCES

A. American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME).

1. ANSI/ASME B16.1 – Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.

2. ANSI/ASME B16.5 – Pipe Flanges and Flanged Fittings.

B. American Society for Testing and Materials (ASTM):

1. A 126 - Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

2. D 429 - Test Methods for Rubber Property - Adhesion to Rigid Substrates.

C. American Water Works Association (AWWA):

1. C 110 – Standard for Ductile-Iron and Gray-Iron Fittings 3 inches through 48 inches for Water and Other Liquids.

2. C 504 – Standard for Rubber-Seated Butterfly Valves.

D. National Sanitation Foundation (NSF) 61

1.3 SYSTEM DESCRIPTION

A. Design Requirements:

1. General Purpose Butterfly Valves:

a. Design Standard: In accordance with AWWA C 504 as modified and complemented herein.

b. Class: AWWA Class 150B, when not otherwise specified or indicated on the Drawings.

2. Design Requirements for General Purpose Butterfly Valves and Resilient Seated Butterfly Valves:

a. Design valves and actuators for maximum operating torque, in accordance with and using safety factors required in AWWA C504 and Appendix A, using the following values:

1) Maximum Water Velocity: 16 feet per second with valve fully open.

2) Maximum pressure differential across the closed valve in accordance with AWWA Class designation, or as indicated on the Butterfly Valve Schedule.

b. System head loss characteristic, exclusive of valve, and proportional to the velocity head.

c. Coefficient for seating and unseating torque, dynamic torque, and bearing friction in accordance with valve manufacturer's published recommendations.

B. Valve Disc: Seat in an angular position of 90 degrees to the pipe axis and rotate an angle of 90 degrees between fully open and closed positions.

1. Do not supply valves with stops or lugs cast with or mechanically secured to the body of the valve for limiting the disc travel.

2. Unacceptable Thrust Bearings: Do not provide valves with thrust bearings exposed to the fluid in the line and consisting of a metal bearing surface in rubbing contact with an opposing metal bearing surface.

C. Performance Requirements:

1. General Purpose butterfly valves:

a. Tight shutoff at the AWWA rated class with flow in either direction.

2. Resilient Seated butterfly valves:

a. Zero-leakage shut-off to 175 psi with the higher pressure on the flat side of the disc.

b. Zero-leakage shut-off to 100 psi with the higher pressure on the curved side of the disc.

3. Suitable for the following service conditions:

a. Throttling.

b. Frequent operation.

c. Operation after long periods of inactivity.

d. Installation in any position and flow in either direction.

1.4 SUBMITTALS

A. Shop Drawings: Include certified drawings and material specifications in accordance with AWWA C504, Sections 1.4 and 1.5.

1. Include description of the method of attachment of the edge to the valve disc.

B. Product Data: Include manufacturer's published recommendations for seating and unseating torque coefficient, dynamic torque, and bearing friction for calculation of maximum operating torque.

C. Test Reports: Records of tests performed in accordance with AWWA C504.

D. Certificates: Affidavit of compliance specified in AWWA C504, Section 1.7.

PART 2 - PRODUCTS

2.1 GENERAL PURPOSE BUTTERFLY VALVES (APPLICABLE TO ALL VALVES SUPPLIED OUTSIDE OF PACKAGED FILTRATION SYSTEM)

A. Manufacturers: One of the following:

1. Dezurik

B. Valve Body:

1. Material: Cast-iron ASTM A 126, Class B.

a. Flanges: 125-pound ANSI/ASME B16.1.

b. Mechanical Joint Ends: In accordance with AWWA C 110.

C. Body Design:

1. Provide short body or long body valves at CONTRACTOR's option, subject to:

a. Location in the piping system so that when the valve is operated, its operation will not interfere with, nor be impaired by, adjacent fittings, valves, equipment or other installations.

D. Disc Materials:

1. For Liquid Service: Stainless steel or nickel-chrome mating edge on a cast-iron or ductile iron disc.

2. For Low Pressure Air Service: Stainless steel.

E. Shaft and Bearings:

1. Shaft: Type 304 or 316 stainless steel.

2. Thrust Bearings: Self-lubricating, sleeve type; Teflon lined with fiberglass backing, or polytetrafluoroethylene (PTFE) with phenolic or stainless-steel backing.

3. Valves in Low Pressure Air Systems and Systems with Operating Temperatures of 250 Degrees Fahrenheit or Higher: Provide valves with Teflon lined bearings with fiberglass backing.

4. Valves in Other Service Applications: Provide valves with polytetrafluoroethylene with phenolic or stainless-steel backing.

F. Disc Pins: Secure valve disc to shaft by means of solid, smooth sided, Type 316 stainless steel or monel, taper or dowel pin.

1. Extend pins through shaft and mechanically secure in place.

G. Seats:

1. For valves less than 24 inches Nominal size, bond or vulcanize seats into the valve body.

2. For valves 24 inches Nominal size and larger, mechanically retain seats in the valve body.

a. Achieve retaining effect by an epoxy injection method that expands the seat into the body, or by segmented clamping tee lock ring with adjusting screws.

b. Provide means to prevent nuts and screws used to retain rubber seats from loosening due to vibration or cavitation.

c. Seat Retainers: Type 316 stainless steel.

3. Resilient Seat:

a. Withstand 75-pound pull when tested in accordance with ASTM D 429, Method B.

b. Resilient Seat Valves (2 to 4-inch nominal size): The resilient seat shall act as the full body liner. The seat shall be held in place by a field replaceable seat cartridge. In lugged body style valves, the seat shall be held in place by metal retaining ring compressed into the seat before assembly.

4. Do not provide valve with seats retained by a snap ring.

5. Seat Materials:

a. Liquid Service: Buna N, Acrylonitrile Butadiene, natural rubber.

b. Low Pressure Air Service: Synthetic rubber suitable for continuous operation at 250 degrees Fahrenheit.

H. Valve Packing:

1. Valves 4 -inches to 48 inches in Nominal Size: Self-adjusting V-type packing or chevron type packing.

2. Valves 54 inches in Nominal Size and Larger: Adjustable V-type packing with bronze packing gland or self-adjusting V-type packing.

2.2 RESILIENT SEATED BUTTERFLY VALVES (APPLICABLE TO ALL VALVES SUPPLIED OUTSIDE OF PACKAGED FILTRATION SYSTEM)

A. Manufacturers:

1. Dezurik

2. Or approved equal.

B. Valve Body: Cast iron, ASTM A126 Class B

C. Disc Material: Type 316 stainless steel.

D. Shaft and Bearings:

1. Shaft: Type 416 stainless steel.

2. Bearings: PTFE coated stainless steel

E. Disc Pins: Secure valve disc to shaft by means of solid, smooth sided, Type 316 stainless steel, ASTM A276.

1. Extend pins through shaft and mechanically secure in placed

F. Seats:

1. Acrylonitrile Butadiene, Ethylene Propylene a Diene Terpolymer

2. Seat Retainers: Cold rolled steel.

2.3 BUTTERFLY VALVE OPERATORS

A. Type of Actuator is shown in the Valve and Flow Controller Schedule in the Schedule.

B. Manual Operators for Valves less than 8 Inch Diameter: Hand lever type with a locking device so that the valve can be locked in any position with a wing nut.

1. Locking Device: Hand wheel with hand crank.

C. Provide underground valves 6 inches in nominal size and larger with a totally enclosed worm gear operator mounted on the valve.

1. Valve Shaft: Extend from the valve to the operator and be as specified for valve shafts.

2. Operator: Gasketed for watertightness.

D. Manual Operators on Aboveground Butterfly Valves Larger than 8 Inches in Nominal Size: Worm geared; valves 10 inches in nominal size and smaller on low pressure air service may be lever operated.

E. Fit exposed butterfly valves not specified to have geared operators with ell or tee wrenches, or speed handles for operation.

2.4 FABRICATION

A. Shop coat interior and exterior ferrous metal surfaces of valves and accessories, except as follows:

1. Finished surfaces.

2. Bearing surfaces.

3. Stainless steel components.

B. Surface Coatings:

1. Unfinished Surfaces:

a. Interior Surfaces:

1) High solids polyamine cured epoxy.

C. Exterior Surfaces:

a. Submerged Valves: High solids polyamine epoxy.

b. Buried Valves, Valves in Manholes and Vaults: Coal tar.

c. Other Valves: Rust-inhibitive primer.

2. Polished and Machined Surfaces: Rust-preventive compound.

3. Actuators and Accessories: Rust-inhibitive primer.

D. Coating Materials:

1. High Solids Polyamine Cured Epoxy:

a. Application: Shop apply to iron and steel surfaces, except stainless steel.

b. Product: As specified in Section 09 80 00.

c. Quality Control: After coating is cured, check coated surface for porosity with a holiday detector set at 1,800 volts.

d. Repair holidays and other irregularities and retest coating.

1) Repeat procedure until holidays and other irregularities are corrected.

2. Additional field coating, other than touchup coating of damaged surfaces, will not be required.

a. Perform touchup coating within the recoat time recommended by the paint manufacturer.

b. When touchup coating is required after expiration of the recoat time, precede coating by blast cleaning or other surface preparation recommended by manufacturer of the coating material for satisfactory adhesion between coats.

3. Rust-Inhibitive Primer:

a. Rust-inhibitive Primers: Compatible with the piping systems coating specified in Specification 09 80 00.

b. Surface Preparation: As specified in Section 09 80 00.

4. Rust-Preventive Compound: One of the following or equal:

a. Houghton, Rust Veto 344.

b. Rust-Oleum, R-9.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install valves with valve shafts horizontal, unless a vertical shaft is required to suit a particular installation, and unless a vertical shaft is indicated on the Drawings.

B. Install pipe spools or valve spacers in locations where butterfly valve disc travel may be impaired by adjacent pipe lining, pipe fittings, valves, or other equipment.

3.2 SCHEDULE

A. See Drawings

END OF SECTION

SECTION 43 20 30 – CHECK VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: swing check valves, silent check valves, and plastic body ball check valves.

B. Related Sections:

1. Section 09 80 00 - Special Coatings.

2. Section 43 20 00 – Valves

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A 48 – Specification for Gray Iron Castings.

2. A 126 – Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

3. A 276 – Specification for Stainless Steel Bars and Shapes.

4. B 582 – Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet and Strip.

5. B 584 – Specification for Copper Alloy Sand Castings for General Applications.

B. American Water Works Association (AWWA):

1. C 508 – Standard for Swing-Check Valves for Waterworks Service 2 Inch Through 24 Inch NPS.

C. American Petroleum Institute (API).

D. National Sanitation Foundation (NSF) 61

1.3 SYSTEM DESCRIPTION

A. Design Requirements:

1. Check Valves: When not otherwise specified as indicated on the Drawings, provide check valves suitable for service as follows:

a. In either horizontal or vertical position.

b. Under pressures equal and less than 150 pounds per square inch gauge.

c. Plastic body ball check valves on plastic pipelines.

PART 2 – PRODUCTS

2.1 SWING CHECK VALVES

A. Valves ¼ Inch through 3 Inches:

1. Manufacturers: One of the following or equal:

a. Crane Valve Company, Number 36.

b. Lunkenheimer Company, Figure 554Y.

2. Valve Design:

a. Threaded joints.

b. Y-pattern body with integral seat.

c. Hinged disc.

d. Access to valve seat for regrinding without disassembly of piping.

3. Materials:

a. Body, Cap, Hinge, and Disc: Bronze.

B. Valves 4 Inches through 24 Inches:

1. Manufacturers: One of the following or equal:

a. Kennedy, Figure 106LW.

b. Mueller Company, Model A-2600.

c. M&H, Model 159

d. Or Approved Equal.

2. Valve Design:

a. Conform to AWWA C 508.

b. Constructed to permit top entry and removal of internal components without removing the valve.

c. Equipped with outside lever and weight.

3. Materials:

a. Body: Cast-iron, ASTM A 126 Class B.

b. Disc:

1) 4-inch valves: Bronze.

2) 6-inch and larger valves: Bronze faced.

c. Hinge Pins: Stainless steel.

2.2 SILENT CHECK VALVES

A. Globe Style Silent Check Valves 4 Inches through 24 Inches:

1. Manufacturers: One of the following or equal:

a. APCO.

b. Valmatic

c. Clow

d. Crispin

e. Or Approved Equal.

2. Valve Design:

a. Globe

b. Valve plug will be spring loaded, normally closed, by means of one or more stainless steel springs.

c. Check valve must be capable of silent operation when installed in the vertical or horizontal position - flow up or down.

d. Spring must be helical or conical. Seat and plug shall be hand replaceable in the field for ease of maintenance.

e. The flow area through the body shall be equal to or greater than the cross-sectional area of the equivalent pipe size.

3. Materials:

a. Body: Cast-iron, ASTM A 126 Class B.

b. Doors: Ductile iron ASTM A536

c. Hinge Pins: Stainless steel.

d. Sealing element: Buna-N

2.3 PLASTIC BODY BALL CHECK VALVE

A. Valves ¼ inch through 2 inches

1. Manufacturers:

a. One of the following or equal:

1) Chemtrol Division, NIBCO, Inc.

2) R.G. Sloane Company, Inc.

3) Spears Manufacturing Company

2. General:

a. End Connection:

1) True union

2) solvent

3) heat welded to piping.

3. Material:

a. Body: Polyvinyl chloride (PVC).

b. Ball: Polyvinyl chloride (PVC).

c. Seats: FPM (Viton)

d. O-rings: FPM (Viton)

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install with proper orientation of flow direction arrow on valve body.

B. Schedule: See Valve Schedule on Drawings. All valves 3-inches and smaller are not shown on the Valve Schedule.

3.2 ADJUSTING

A. Adjust cushioned swing check valves in the field by means of external adjustment devices to minimize pressure surges.

B. Adjust weight on swing check valves to affect proper closing action on equipment shutdown.

END OF SECTION

SECTION 43 20 40 – GATE VALVES AND APPURTENANCES

PART 1 – GENERAL

1.1 SUMMARY

A. Scope:

1. Contractor shall provide all labor, materials, equipment and incidentals required to furnish and install all gate valves and appurtenances complete and operational as shown on the Drawings and as specified.

2. The Work includes, but is not necessarily limited to, all valves required for buried, exposed, submerged and other types of piping, except where otherwise specifically included in other Sections.

B. Coordination:

1. Review installation procedures under other Sections and coordinate with the Work which is related to this Section including buried piping installation, exposed piping installation and site utilities.

C. Related Sections: Contractor shall coordinate the requirements of the Work in this Section along with the requirements of the Sections listed below which includes, but is not necessarily limited to:

1. Section 09 80 00, Special Coatings. (Specifications for surface preparation and shop priming required under Section 43 20 40, Gate Valves and Appurtenances are included under Section 09 80 00, Special Coatings).

2. Section 33 05 00, Basic Piping Materials and Methods.

3. Section 33 05 10, Ductile Iron Piping.

4. Section 33 05 11, Copper Piping.

5. Section 43 20 00, Valves.

6. Section 33 10 52, Mechanical Process Pipe Supports.

1.2 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:

1. Manufacturer shall have a minimum of five years’ experience of producing substantially similar equipment and shall be able to show evidence of at least five installations in satisfactory operation for at least five years.

2. Each gate valve shall be the product of one manufacturer.

B. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. AWWA C-115, Cast Iron Pipe Flanges and Flanged Fittings.

2. AWWA C-110, Cast Iron Fittings.

3. ASTM A 48, Specification for Gray Iron Castings.

4. ASTM A 126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

5. ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

6. ASTM A 354, Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners.

7. ASTM A 436, Specification for Austenitic Gray Iron Castings.

8. ASTM A 536, Specification for Ductile Iron Castings.

9. ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.

10. AWWA C111, Rubber Gasket Joints for Ductile Iron and GrayIron Pressure Pipe and Fittings.

11. AWWA C500, Gate Valves for Water and Sewerage Systems.

12. AWWA C509, Resilient Seated Gate Valves, 3 through 12 NPS, for Water and Sewerage Systems.

13. AGMA Standards.

14. NEMA, National Electrical Manufacturer's Association.

15. NSF 61, Drinking Water System Components-Health Effects.

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:

1. Manufacturer's literature, illustrations, paint certifications, specifications, detailed drawings, data and descriptive literature on all valves and appurtenances.

2. Deviations from Contract Documents.

3. Engineering data including dimensions, materials, size and weight.

4. Fabrication, assembly, installation and wiring diagrams.

5. Control characteristics of modulating valves.

6. Certificates of compliance with AWWA Standards, where applicable.

7. Corrosion resistance information to confirm suitability of the valve materials for the application. Information on chemical resistance of elastomers shall be furnished from the elastomer manufacturers.

8. Power and control wiring diagrams, including terminals numbers for electric actuators.

9. Complete nameplate data of valves and electric actuators.

10. Special tools list.

11. C values and headloss curves.

B. Calculations:

1. Sizing of electric actuators.

2. Sizing of operating mechanism with extension stems.

3. Sizing of gear actuators.

4. Sizing of anchor bolts.

C. Operation and Maintenance Manuals:

1. Submit complete installation, operation and maintenance manuals including test reports, maintenance data and schedules, description of operation, and spare parts information.

2. Furnish Operation and Maintenance Manuals.

D. Shop Tests:

1. Test motor operated valves before shipment to ensure that the mechanisms can close the valves in the specified time limit, and for proper seating.

2. Hydrostatic tests shall be performed, when required by the valve specifications included herein.

E. Certificates: Where specified or otherwise required by ENGINEER, submit test certificates.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay the Work.

B. All boxes, crates and packages shall be inspected by Contractor upon delivery to the site. Contractor shall notify ENGINEER if any loss or damage exists to equipment or components. Replace loss and repair damage to new condition, in accordance with manufacturer's instructions.

C. Store materials to permit easy access for inspection and identification. Keep all material off the ground, using pallets, platforms or other supports. Protect steel members and packaged materials from corrosion and deterioration.

D. Store all mechanical equipment in covered storage off the ground and prevent condensation and in accordance with the manufacturer's recommendations for long term storage.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General:

1. Valves shall have manufacturer's name and working pressure cast in raised letters on valve body.

2. Manual valve operators shall turn clockwise to close, unless otherwise specified. Valves shall indicate the direction of operation.

3. Manually operated valves, with or without extension stems, shall require not more than a 40-pound pull on the manual operator to open or close a valve against the specified criteria. The gear actuator and the valve components shall be able to withstand a minimum pull of 200 pounds on the manual operator and an input torque of 300 foot pounds to an actuator nut. Manual operators include handwheel, chain, crank, lever and a T-handle wrench.

4. Unless otherwise specified, all flanged valves shall have ends conforming to AWWA C-115. The pressure class of the flanges shall be equal to or greater than specified pressure rating of the valves.

5. Buried valves shall have flanged ends with mechanical joint adapters and installed with a flanged adapter or have grooved mechanical couplings. All bolts shall be Type 316 stainless steel.

6. Buried valves shall be provided with adjustable two piece valve boxes and provided with extension stems, operating nuts and covers, unless otherwise shown on the Drawings or specified. Extension stems shall terminate12-inches below finished grade.

7. Unless otherwise specified, bronze gate valves shall be provided with integral seats.

8. Iron body valves shall be provided with screwed-on seat rings. Buried or submerged gate valves shall be of the non-rising stem type. Exposed gate valves shall be rising stem type. Rising stem valves and brass non-rising stem valves shall be provided with O-ring stem seals.

9. All bolts, nuts and studs on or required to connect buried or submerged valves shall be Type 316 stainless steel.

10. All bolts and studs embedded in concrete and studs required for wall pipe shall be of Type 316 stainless steel.

11. For stainless steel bolting, except where Nitronic-60 nuts are required, use anti-seize compound, graphite free, to prevent galling. Strength of the joint shall not be affected by the use of anti-seize compound.

12. All other bolts, nuts and studs shall, unless otherwise approved, conform to ASTM A 307, Grade B; or ASTM A 354.

13. Bolts and nuts shall have hexagon heads and nuts.

14. All materials of construction of the valves shall be suitable for the applications as shown on the Drawings.

15. Protect wetted parts form galvanic corrosion due to contact of two different metals.

16. Buried service valves shall be provided with grease filled actuators with position indicators.

17. Gasket material and installation shall conform to manufacturer's recommendations.

18. Identification: Identify each valve 4-inches and larger with a stainless-steel nameplate stamped with the approved designation. Nameplate shall be permanently fastened to valve body at the factory. Stenciled designations are acceptable for buried valves.

B. Gate Valves:

1. Buried, 3-inch Diameter and Larger:

a. Standard: AWWA C509.

b. Type: Resilient seat, nonrising stem.

c. Construction:

1) Body and Bonnet: Ductile Iron, ASTM A 536, coated inside and out with fusion bonded epoxy.

2) Gate: Ductile Iron, ASTM A 536, symmetrically and fully encapsulated with an elastomer having a minimum 1/8-inch thickness suitable for the service intended.

3) Stem: Stainless Steel.

4) Stem Seal: “O”-Ring.

5) All internal and external bolting and other hardware including pins, set screws, plug, studs, bolts, nuts and washers: Type 316 stainless steel.

6) Provide position indicators for non-rising stem valves.

d. Pressure Rating: Gate valves shall have the following minimum pressure ratings unless otherwise specified in the Valve Schedule.

1) 3-inch through 16-inch diameter valves: 250 pounds per square inch.

2) Greater than 16-inch diameter valves: 150 pounds per square inch.

e. End Connection: Unless otherwise shown on the Drawings or specified valves shall be mechanical joint ends conforming to AWWA C111.

f. Interior Coating:

1) All valves shall be coated inside. The steel, cast-iron and ductile iron surfaces, except machined surfaces, shall be epoxy coated in accordance with AWWA C550.

g. Testing:

1) Test all valves in conformance with AWWA C509.

h. Gear Actuators for Manually Operated Valves:

1) Provide valves with gear actuators conforming AWWA C500.

2) Size gear actuators for the following maximum differential pressures:

i) Maximum Differential Pressure Across Closed Valve: 100 psi.

i. Product and Manufacturer: Provide one of the following:

1) U.S. Pipe and Foundry Company, Metroseal.

2) American Flow Control, American-Darling, Series 2500.

3) Or equal.

2.2 APPURTENANCES FOR BURIED VALVES

A. Wrench Nuts:

1. Provide wrench nuts on all buried valves of nominal 2-inch size conforming to AWWA C500.

2. Arrow indicating direction of opening the valve shall be cast on the nut along with the word “OPEN”.

3. Material: Ductile iron.

4. The nut shall be secured to the stem by mechanical means.

B. Extension Stems for Non-Rising Stem Valves and Quarter Turn Buried Valves:

1. Provide extension stems to bring the operating nut to 6-inches below the valve box cover.

2. Minimum Size and Material: Same as valve stem.

3. Maximum Unsupported Length: Three feet.

4. Provide top nut and bottom coupling of ductile iron with pins and set screws of Type 316 stainless steel.

C. Valve Boxes:

1. Valve boxes shall be as shown on the Drawings and as required.

2. Type: Heavy duty, suitable for highway loading, 2-piece telescopic, and adjustable.

3. Lower section shall enclose operating nut and stuffing box and rest on bonnet.

4. Material: Cast or ductile iron.

5. Coating: Two coats of asphalt varnish conforming to Federal Specification TT-C-494.

6. Marking: As required for service.

2.3 ANCHOR AND MISCELLANEOUS MOUNTING BOLTS

A. All bolts, nuts and washers for connection of the valve appurtenances to concrete structure or other structural members shall be obtained from the valve manufacturer, and shall be of ample size and strength for the purpose intended. Anchor bolts shall be hooked or adhesive type and shall be Type 316 stainless steel.

B. Provide anchor bolts for stem guides of required strength to prevent twisting or sagging of the guides under load.

C. Provide bolts and washers of Type 316 stainless steel and nuts of Nitronic 60. The bolts shall have rolled threads and both bolts and nuts shall be electropolished to remove burrs.

D. Minimum Size of Anchor Bolts: 5/8-inch.

2.4 TOOLS AND SPARE PARTS

A. Provide the following T-Handle Operating Wrenches for Buried Valves:

1. T-handle operating wrench of suitable length and size for each valve that is not readily accessible to direct operation.

2. Quantity: Provide one of each length and size required.

2.5 SURFACE PREPARATION AND PAINTING

A. Valves, appurtenances, etc., shall receive shop primer and shop finish coating conforming to the requirements of Section 09800, Special Coatings. If any damage to the paint system occurs, the equipment shall be repainted as directed by the OWNER.

B. Surface preparation and painting shall conform to the requirements of Section 09800, Special Coatings.

C. All gears, bearing surfaces, machined surfaces and other surfaces which are to remain unpainted shall receive a heavy application of grease or other rust-resistant coating. This coating shall be maintained during storage and until the equipment is placed into operation.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install all valves and appurtenances in accordance with the manufacturer's instructions and recommendations.

B. Conform to appendices of AWWA Standards, where applicable.

C. Install all valves so that operating handwheels or levers can be conveniently turned from operating floor without interfering with access to other valves and equipment, and as approved by the ENGINEER. Orient chain operators out of the way of the walking areas. Mount valves so that indicator arrows are visible from floor level.

D. For motor-operated valves located lower than five feet above the operating floor, orient the motor actuator to permit easy access to the pushbuttons and the handwheel.

E. Install all valves plumb and level. Install all valves to be free from distortion and strain caused by misaligned piping, equipment or other causes.

F. For buried valve installations, set valve boxes plumb and centered, with soil carefully tamped to a lateral distance of four feet on all sides of the box, or to the undisturbed trench face if less than four feet.

3.2 FIELD TESTS AND ADJUSTMENTS

A. Adjust all parts and components as required to provide correct operation of the valves.

B. Conduct a functional field test on each valve in the presence of the ENGINEER to demonstrate that each valve operates correctly.

C. Demonstrate satisfactory opening and closing of valves at the specified criteria requiring not more than 40 pounds effort on the manual actuators.

D. Test ten percent valves of each type by applying 200 pounds effort on the manual operators. There shall be no damage to the gear actuator or the valve.

3.3 MANUFACTURER'S SERVICE

A. A factory trained representative shall be provided for installation supervision, start-up and test services and operation and maintenance personnel training services. The representative shall make a minimum of three visits, eight hours on site for each visit, to the site. The first visit shall be for assistance in the installation of equipment. The second visit shall be for checking the completed installation and start-up of the system. The third visit shall be for the purpose of operator training. Manufacturer's representative shall test operate the system in the presence of the ENGINEER OF RECORD and verify that the valves conform to requirements. Manufacturer's representative shall revisit the job site as often as necessary until all trouble is corrected and the installation is entirely satisfactory.

B. All manufacturer service costs, including travel, lodging, meals and incidentals, shall be considered as included in Contractor's bid price.

END OF SECTION

SECTION 43 20 50 – ECCENTRIC PLUG VALVES, OPERATIONS AND APPURTENCANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Lubricated and non-lubricated plug valves.

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A 126 – Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

B. National Sanitation Foundation (NSF) 61

PART 2 – PRODUCTS

2.1 NON-LUBRICATED PLUG VALVES

A. Manufacturers:

1. DeZurik

2. Or approved equal.

B. Design:

1. Type: Non-lubricated eccentric type.

2. Plug Face: Resilient material which operates satisfactorily at a temperature of 180 degrees Fahrenheit continuous and 215 degrees Fahrenheit intermittent, except for valves in compressed air service.

3. Compression Washer: Provide flat compression washer made of Teflon, or of a material having equal physical characteristics on valve stem between plug and bonnet.

4. Stem Seals: Provide stem seals serviceable without unbolting the valve bonnet assembly.

5. Clearly mark valves to indicate their open and closed positions.

6. Provide valves with ends as required by piping details indicated on the Drawings.

C. Materials:

1. Body and Plug: ASTM A 126, Class B, cast-iron with plug face of neoprene, Buna N, isoprene, or hycar material suitable for the intended service.

2. Body Seats in Valves 3 Inch Size and Larger: Provide with overlay of not less than 90 percent nickel and minimum thickness of 1/8 inch on surfaces contacting the plug face.

3. Stem Bearing and Bottom Bearing: Stainless steel Type 316.

4. Internal Parts, Except the Body and Plug: Type 316 stainless steel, Monel, or nickel.

5. Exposed Nuts, Bolts, and Washers: Zinc plated. Exception: exposed nuts, bolts, and washers for buried service: stainless steel.

6. For valves over 5,' install a chainwheel. Paint chain safety yellow.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install valves so that in the closed position the pressure in the pipeline applies a seating head on the valves.

B. Lubrication: Lubricate plug valves and fill extended lubricant pipes with lubricant suitable for service intended.

3.2 SCHEDULE

A. See Drawings

END OF SECTION

SECTION 43 20 60 – SPECIALITY VALVES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backflow Preventer.

B. Related Sections:

1. Section 43 20 00 – Valves

1.2 REFERENCES

A. American Society for Testing and Materials (ASTM):

1. A 126 – Specification for Gray Iron Casting for Valves, Flanges, and Pipe Fittings.

2. D 2000 – Classification System for Rubber Products in Automotive Applications.

1.3 SUBMITTALS

A. Furnish submittals as specified in Sections 43 20 00 and submitted in accordance with Section 01 33 00.

B. Submittals Prior to Installation:

1. Product Data: Submit detailed technical information relating to each type of valve including description of component parts, materials of construction, performance, dimensions, and weights.

C. Operation and Maintenance Data:

1. In accordance with Section 01 60 50.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufactured by manufacturers whose valves have had successful operational experience in comparable service.

B. Backflow preventers must be tested by an OWNER-approved, certified tester.

1.5 DELIVERY STORAGE AND HANDLING

A. Protect valves from damage during handling and installation.

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTERS

A. Manufacturers: Must be on City of Socorro's approved list for reduced pressure principle backflow prevention assemblies.

1. Acceptable Manufacturer: Watts Model 909 or equal.

B. Backflow prevention assembly shall be reduced pressure type and 1-1/2" in size.

C. The backflow preventer device shall meet requirements of ASSE 1013.

D. Body: Bronze body with bronze internal parts and stainless-steel springs.

E. Provide two independently operating, spring loaded check valves, diaphragm type differential pressure relief valve located between check valves, third check valve that opens under back pressure in case of diaphragm failure and non-threaded outlet.

F. The backflow preventer shall be assembled with two gate valves, strainer, and four test cocks.

G. Furnish for horizontal installation, with vent elbow and air gap, 2-1/2" size.

H. Provide suitable pipe supports for the backflow preventer assembly.

PART 3 - EXECUTION

3.1 Schedule

A. See Drawing

END OF SECTION

SECTION 46 23 02 - HORIZONTAL ANSI END SUCTION PUMPS

PART 1 - GENERAL

1.1 THE SUMMARY

The CONTRACTOR shall provide a complete skid mounted horizontal process end suction pumps and appurtenances including hydropneumatic tank as shown on the plans, complete and operable, in accordance with the Contract Documents.

Pumps shall be in accordance with ASME B73.1 - Specification for Horizontal End Suction Centrifugal Pumps for Chemical Process.

The requirements of Section 46 30 10 – Pumping Equipment shall apply to this Section.

The Supplier shall examine the Site conditions, intended application, and operation of the pump system and recommend the pump that will best satisfy the indicated requirements.

PART 2 - PRODUCTS

2.1 GENERAL DESCRIPTION

Identification**:** See Equipment Datasheets appended to this Specification Section.

Operating Conditions: The WORK of this Section shall be suitable for long term operation under the conditions as indicated on each individual Equipment Datasheet appended to this Specification Section.

Performance Requirements: The WORK of this Section shall meet the performance requirements as indicated on each individual Equipment Datasheet appended to this Specification Section.

Pump Dimensions: Pump dimensions shall be in accordance with the requirements as indicated on each individual Equipment Datasheet appended to this Specification Section.

2.2 PUMP REQUIREMENTS

Construction: Construction of horizontal ANSI end-suction pumps shall conform to the following requirements:

Casing-foot mounted	Ductile Iron ASTM A395 back pullout design with gauge connections
Impeller	Ductile Iron ASTM A395, statically and dynamically balanced, open
Shaft	Steel AISI C1045 or SAE 4140 designed for max 0.002 inch deflection at sealing face at max load

Shaft sleeve	316SS
Casing Wear Rings	316SS
Seal	See Equipment Datasheet appended to this Specification Section
Pump and motor base	Cast iron, Ductile iron or fabricated steel with drain rim or pan
Bearings	Ball bearings with min L-10 life of 50,000 hours at max load, double row thrust bearing outboard, and single row radial bearing inboard
Lubrication	Oil with plexiglass oil reservoir with inlet and drain lubrication fittings
Coupling	Flexible heavy duty spacer shaft coupling with guard
Mounting	Frame mounted

All elastomeric materials such as O-rings and gaskets shall be compatible with the fluid.

Drive: Electric motors shall be furnished as indicated on each individual Equipment Datasheet as shown on the plans. Where an individual Equipment Datasheet indicates a driver requirement for variable speed operation, such pumps shall be furnished with variable frequency drives.

Coating: Interior water passages of cast iron and ductile iron casing and impellers shall be coated with 10- to 12-mils DFT vitreous enamel or 10- to 12-mils DFT fusion bonded epoxy per Section 09 80 00 and 09 90 00- Protective Coatings and Painting. All external surfaces of cast iron and carbon steel materials shall be coated in accordance with Section 09 80 00 – Protective Coatings and Paintings.

2.3 PUMP CONTROLS

Pumps shall be controlled by Variable Frequency Drives (VFD) as shown on the plans.

2.4 SPARE PARTS

Furnish spare parts for each pump as indicated on each individual Equipment Datasheet appended to this Specification Section. Where pumps of identical size and fluid service have more than one datasheet, the spare parts shall be supplied in the quantities shown on the first of such Equipment Datasheets.

2.5 MANUFACTURERS OR EQUAL

Cornell Pumps

Goulds Pumps, Inc.

Peerless Pump Company

Flowserve

Or Approved Equal.

PART 3 - EXECUTION

3.1 SERVICES OF MANUFACTURER

Inspection, Startup, and Field Adjustment: The service representative of the manufacturer shall be present continuously at the Site to furnish the services required by Section 46 30 10 – Pumping Equipment.

Instruction of OWNER's Personnel: The training representative of the manufacturer shall be present at the Site for 5 Days to furnish the services required by Section 46 30 10 – Pumping Equipment.

For the purpose of this paragraph, a Day is defined as an 8 hour period at the Site, excluding travel time.

The ENGINEER may require that the inspection, startup, and field adjustment services above be furnished in 3 separate trips.

END OF SECTION

SECTION 46 30 05 – EQUIPMENT: GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes

1. Requirements of this Section apply to all equipment provided on the Project, including that found in Divisions 33, 43 and 46, even if not specifically referenced as a related section in those Specifications.

B. Related sections include, but are not necessarily limited to:

1. Division 1 - General Requirements.

2. Section 09 80 00 - Special Coatings.

3. Section 33 05 01 - Identification, Stenciling and Tagging Systems.

4. Individual equipment specifications in Divisions 43 and 46.

1.2 QUALITY ASSURANCE

A. Referenced Standards:

1. American Society for Testing and Materials (ASTM):

a. A307, Standard Specification Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

b. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

2. Institute of Electrical and Electronics Engineers (IEEE):

a. 112, Standard Test Procedure for Polyphase Induction Motors and Generators.

3. National Electrical Manufacturers Association (NEMA):

a. 250, Enclosures for Electrical Equipment.

b. ICS 6, Enclosures for Industrial Control and System.

c. MG1, Motors and Generators.

4. NSF International:

5. 61 - Drinking Water System Components

B. Unit Responsibility:

1. Where indicated in these documents, equipment systems made up of two or more components shall be manufactured and assembled as a unit by the responsible manufacturer. The responsible manufacturer shall select all components of the system to assure compatibility, ease of construction and efficient maintenance. The responsible manufacturer shall coordinate selection and design of all system components, such that all equipment furnished under the specification for the equipment system, including equipment specified elsewhere, but referenced in the specification, is compatible and operates properly to achieve the performance requirements specified. Unless otherwise specified, the responsible manufacturer shall be the manufacturer of the driven equipment. This requirement for unit responsibility shall in no way relive CONTRACTOR of his responsibility to the OWNER for performance of all systems.

2. CONTRACTOR shall assure that all equipment systems provided for the Project are products for which unit responsibility has been accepted by the responsible manufacturer. Where the detailed specification requires CONTRACTOR to furnish a certificate from the Unit Responsibility Manufacturer, such certificates shall be provided prior to Shop Drawing review. No other submittal material will be processed until a Certificate of Unit Responsibility has been received and has been found to be satisfactory. Failure to provide acceptable proof that the unit responsibility requirement has been satisfied will result in withholding approval of progress payments for the subject equipment even though the equipment may have been installed in the Work.

1.3 DEFINITIONS

A. Product: Manufactured materials and equipment.

B. Equipment: One or more assemblies capable of performing a complete function. Mechanical, electrical, instrumentation or other devices requiring an electrical, pneumatic, electronic or hydraulic connection. Not limited to items listed under “Equipment” article within Specifications.

1.4 SUBMITTALS

A. Shop Drawings:

1. General for all equipment:

a. See Sections 01 33 00 and 46 30 05.

b. Acknowledgement that products submitted comply with the requirements of the standards referenced.

c. Manufacturer’s delivery, storage, and handling instructions.

d. Equipment identification utilizing tagging system and name utilized in Drawings.

e. Equipment installation details:

1) Location of anchorage.

2) Type, size, and materials of construction of anchorage.

3) Anchorage setting templates.

4) Manufacturer’s installation instructions.

f. Equipment area classification rating.

g. Shipping and operating weight.

h. Equipment physical characteristics:

1) Dimensions (both horizontal and vertical).

2) Materials of construction and construction details.

i. Equipment factory primer and painting and coating data.

j. Manufacturer’s recommended spare parts list.

k. Piping and duct connection size, type and location.

2. Mechanical and Process Equipment

a. Operating characteristics:

1) Technical information including applicable performance curves showing specified equipment capacity, rangeability, and efficiencies.

2) Brake horsepower requirements.

3) Copies of equipment data plates.

b. Piping and duct connection size, type, and location.

c. Equipment bearing life certification.

d. Field noise testing reports if such testing is specified in specific equipment sections.

e. Equipment foundation data:

1) Equipment center of gravity.

2) Criteria for designing vibration, special or unbalanced forces resulting from equipment operation.

3. Electrical and control equipment:

a. Electric motor information:

1) Nameplate data.

2) Service factor on motors ½ HP and above.

3) Motor enclosure type.

4) NEMA frame size, if applicable.

5) NEMA design code, if applicable.

6) Insulation type.

7) Efficiency and power factor at full load, $^{3}/_{4}$ load, ½ load and $^{1}/_{4}$ load.

b. Control panels:

1) Panel construction.

2) Point-to-point wiring diagrams.

3) Scaled panel face and subpanel layout.

4) Technical product data on panel components.

5) Panel and subpanel dimensions and weights.

6) Panel access openings.

7) Nameplate test.

8) Panel anchorage.

c. Motor tests reports.

d. Certification that equipment has been installed properly, has been initially started up, and is ready for operation.

e. Certification prior to Project closeout that electrical panel drawings for manufacturer-supplied control panels truly represent panel wiring including any field-make modifications.

B. Operations and Maintenance Manuals:

1. Section 01 60 50.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with the Contract Documents, the following Manufacturers are acceptable:

1. Motors:

a. U.S. Motors.

b. Baldor.

c. Or approved equal.

2.2 MANUFACTURED UNITS

A. Electric Motors:

1. Provide motors designed and applied in compliance with NEMA, IEEE, and the NEC for specific duty imposed by driven equipment.

2. Where used in conjunction with adjustable speed drives, provide motors fully compatible with the variable speed controllers. These motors shall be inverter duty.

3. Where frequent starting applications are specified, design for frequent starting duty equivalent to duty service required by driven equipment.

4. Rate for continuous duty at 50 Deg C ambient. Design in accordance with NEMA standards for Class F insulation with Class B temperature rise above 50 Deg C ambient on continuous operation or intermittent duty at nameplate horsepower.

5. Design for full or reduced voltage starting, as appropriate.

6. Design bearing life based upon actual operating load conditions imposed by driven equivalent.

7. Size for altitude of Project.

8. Size so that, under maximum continuous load imposed by driven equipment, motor nameplate horsepower for continuous operation is minimum of 15 percent more than driven load.

9. Provide encapsulated windings in wet/corrosive and for outdoor applications.

    a. Provide encapsulation using a silicone or epoxy seal after the windings have been dried to less than 1 percent moisture.

10. Furnish with clamp-type grounding terminals inside motor conduit box.

11. Furnish with oversized external conduit boxes.

12. Furnish with stainless steel nameplates with information to include all data as required by paragraph 430-7 of the National Electric Code, NFPA 70.

13. Totally Enclosed, Fan-Cooled (TEFC) unless specified otherwise.

2.3 ACCESSORIES

A. Guards:

1. Provide each piece of equipment having exposed moving parts with full length, easily removable guards, meeting OSHA requirements.

2. Interior Applications:

    a. Construct from expanded galvanized steel rolled to conform to shaft or coupling surface.

    b. Utilize non-flattened type 16 GA galvanized steel with nominal ½ IN spacing.

    c. Connect to equipment frame with hot-dip galvanized bolts and wing nuts.

3. External Applications:

    a. Construct from 16 GA stainless steel or aluminum.

    b. Construct to preclude entrance of rain, snow, or moisture.

    c. Roll to conform to shaft or coupling surface.

    d. Connect to equipment frame with stainless steel bolts and wing nuts.

B. Anchorage:

1. Cast-in-place anchorage:

a. Provide ASTM F593, Type 316 stainless steel anchorage for exposed equipment.

b. For continuously submerged anchorage, utilize ASTM A307 anchorage. For intermittently submerged applications, use 316 stainless steel.

c. Configuration and number of anchor bolts shall be per manufacturer's recommendations.

d. Provide two nuts for each bolt.

2. Drilled anchorage:

a. Epoxy grout per Section 03600.

b. Threaded rods same as cast-in-place.

C. Data Plate:

1. Attach a stainless-steel data plate to each piece of rotary or reciprocating equipment. Permanently stamp information on data plate including manufacturer's name, equipment operating parameters, serial number and speed.

2.4 FABRICATION

A. Design, fabricate, and assemble equipment in accordance with best modern engineering and shop practices.

B. Manufacture individual parts to standard sizes and gages so that repair parts, furnished at any time, can be installed in field.

C. Furnish like parts of duplicate units to be interchangeable.

D. Assure that equipment has not been in service at any time prior to delivery, except as required by tests.

E. Furnish equipment which require periodic internal inspection or adjustment with access panels which will not require disassembly of guards, dismantling of piping or equipment or similar major efforts. Quick opening but sound, securable access ports or windows shall be provided for inspection of chains, belts, or similar items.

F. Provide common, lipped base plate mounting for equipment and equipment motor where said mounting is a manufacturer's standard option. Provide drain connection for tubing.

G. Machine the mounting feet of rotating equipment.

H. Shop or Factory Finishes shall be in accordance with Section 09800.

PART 3 - EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION

A. Install equipment as shown on Drawings and in accordance with manufacturer's directions.

B. Utilize templates for anchorage placement for slab mounted equipment.

C. For equipment having drainage requirements such as seal water, provide 3/4 IN PVC or clear plastic tubing from equipment base to nearest floor or equipment drain. Route clear of major traffic areas and as approved by OWNER.

D. Extend all non-accessible grease fittings using stainless steel tubing to a location which allows easy access of fittings.

E. Construct subbases, either concrete, steel or cast iron, level in both directions. Particular care shall be taken at hold-down bolt locations so these areas are flat and level.

F. Machine Base:

1. Mount machine bases of rotating equipment on subbases in manner that they are level in both directions according to machined surfaces on base. Use machinist level for this procedure.

2. Level machine bases on subbases and align couplings between driver and driven unit using steel blocks and shims.

a. Size blocks and shims to provide solid support at each anchor bolt location. Area size of blocks and shims shall be approximately 1-1/2 times area support surface at each anchor bolt point.

b. Provide blocks and shims at each anchor bolt. Blocks and shims shall be square shape with "U" cut out to allow blocks and shims to be centered on anchor bolts.

c. After all leveling and alignment has been completed and before grouting, tighten anchor bolts to proper torque value.

d. Do not use nuts below the machine base on anchor bolts for base leveling.

G. Grouting:

1. After machine base has been shimmed, leveled, couplings aligned and anchor bolts tightened to correct torque value, a dam or formwork shall be placed around base to contain grouting. Dam or formwork shall extend at least ½ IN above the top of leveling shims and blocks.

2. Grouting mixture shall be non-shrink grout per Division 3 requirements.

3. When the grout has sufficiently hardened, remove dam or framework and finish the exposed grout surface to fine, smooth surface. Cover exposed grout surfaces with wet burlap and keep covering sufficiently wet to prevent too rapid evaporation of water from the grout. When the grout has fully hardened (after a minimum of 7 days) tighten all anchor bolts and recheck driver-driven unit for proper alignment.

H. Identification of Equipment and Hazard Warning Signs:

1. Identify equipment and install hazard warning signs in accordance with Section 33 05 01.

I. Field coat in accordance with Section 09800.

3.2 WIRING CONNECTIONS AND TERMINATION

A. Clean wires before installing lugs and connectors.

B. Coat connection with oxidation eliminating compound for aluminum wire.

C. Terminate motor circuit conductors with copper lugs bolted to motor leads.

D. Tape uninsulated conductors and connectors with electrical tape, 150 percent of insulation value of conductor.

E. Connections to carry full ampacity of conductors without temperature rise.

F. Terminate spare conductors with electrical tape.

3.3 FIELD QUALITY CONTROL

A. Furnish equipment manufacturer services as specified in the individual equipment specifications.

B. Inspect wire and connections for physical damage and proper connection.

C. Check rotation of motor before connection to driven equipment, before couplings are bolted or belts installed. Before motor is started to check rotation, determine that motor is lubricated.

END OF SECTION

SECTION 46 30 10 – PUMPING EQUIPMENT: GENERAL REQUIREMENTS

PART 1 - GENERAL

A. SUMMARY

1. General work included in this Section:

2. All pumping equipment.

B. Related Sections include, but are not necessarily limited to:

1. Division 1.

2. Division 33 - Piping

3. Section 01 33 00 - Technical Submittals

4. Section 01 60 00 - Demonstration of Systems/Commissioning.

5. Section 01 60 50 - Equipment Operation and Maintenance Instructions.

6. Section 09 80 00 - Special Coatings

7. Section 46 30 05 - Equipment: General Requirements

8. Section 46 30 20 – End Suction Centrifugal Pumps

9. Section 46 30 30 - Submersible Non-Clog

C. Reference Standards:

1. NSF International Standards 60- 61 - Drinking Water System Components

1.2 QUALITY ASSURANCE

A. The pumping equipment shall include furnishing and installing the specific type of pumps as shown, together with all accessories and appurtenances necessary for a complete installation. The work includes furnishing motors, variable frequency drives if required and all electrical and other controls.

1. The pumps including drive units, controls and other accessories and appurtenances, shall be furnished by a single pumping manufacturer for each particular process category of pump types. The pumps shall be arranged as shown and suitable for installation in the space as shown. The equipment shall be designed for the foundation arrangements shown and piping connections shall be located to preclude any appreciable change in the arrangement of the suction and discharge lines shown

2. Fully coordinate all mechanical seal and seal water systems specified to assure pump/seal compatibility

3. For variable speed pumping applications, the pump manufacturer is designated to have single source responsibility for coordination for the pump motor/VFD drive system.

1.3 DEFINITIONS

A. NPSHR - Net Positive Suction Head Required.

B. NPSHA - Net Positive Suction Head Available.

C. VFD - Variable Frequency Drive.

D. Pump Service Category - Pump or pumps having identical names (not tag numbers) used for specific pumping service.

1.4 SUBMITTALS

A. Shop Drawings:

1. Certified pump performance curves.

2. Pump accessories data.

3. Pump bearing supports, brackets, shafting details and lubrication provisions.

4. Solids passage information.

5. Anchor bolt sizes and locations

6. See Section 46 30 05

B. Operation and Maintenance Manuals.

PART 2 - PRODUCTS

2.1 ACCESSORIES

A. See Section 46 30 05.

2.2 SOURCE QUALITY CONTROL

A. If specifically required in the individual pump Sections, provide factory tests.

1. Adjustable speed units:

a. Head (FT) versus flow (gpm) pump curves:

1) Maximum, minimum and two equally spaced intermittent speeds.

2) Efficiencies along each curve.

3) Brake horsepowers along each curve.

4) $NPSH_R$ along each curve.

b. Hydrostatic test at 150 percent of shutoff head for a minimum of 5 minutes.

2. Constant speed units:

a. Head (FT) versus flow (gpm) pump curves:

1) Efficiencies along curve.

2) Brake horsepower along each curve.

3) $NPSH_R$ along each curve.

B. Balance

1. All rotating parts accurately machined and in as near perfect rotational balance as practical.

2. Excessive vibration is sufficient cause for equipment rejection.

3. Unit mass and distribution is such that resonance is avoided.

4. Max. shaft vibration displacement (peak-to-peak) at stuffing box face: 2.0 mils

5. Max. vibration displacement (peak-to-peak) at any point on the machine

Nominal Rotative Speed	**Maximum Displacement**
1,800 rpm	2.0 mils
1,200 rpm	3.0 mils
900 rpm	3.5 mils
720 rpm	4.0 mils
600 rpm & below	5.0 mils

6. Ratio of rotative speed to critical speed of a unit or components thereof less than 0.8 or more than 1.3.

7. Each pump motor will have an electrical disconnect that is not integral to the motor, but located adjacent to the motor, for quick disconnection of electrical power supply.

PART 3 - EXECUTION

3.1 ERECTION/INSTALLATION/APPLICATION

A. See Section 46 30 05

B. Floor/pad mounted units (Non-Submersible):

1. Vertically and horizontally align, level, wedge and plumb units to match piping interface.

2. Assure no unnecessary stresses are transmitted to equipment flanges.

3. Tighten flange bolts at uniform rate and manufacturer's recommenced torque for uniform gasket compression.

4. Support and match flange faces to uniform contact over entire face area prior to bolting pipe flange and equipment.

5. Permit piping connecting to equipment to freely move in directions parallel to longitudinal centerline when and while bolts in connection flange are tightened.

6. Grout equipment into place prior to final bolting of piping but not before initial fitting and alignment.

7. Assemble connecting piping with gaskets in place and minimum of four bolts per joint installed and tightened. Test alignment by loosening flange bolts to see if there is any change in relationship of piping flange with equipment.

8. Coat units as defined in Section 09 80 00.

9. Provide pressure gauge on discharge of all pumps and on suction of all non-submersible units.

3.2 FIELD QUALITY CONTROL

A. Employ and pay for services of equipment manufacturer's field service representative(s) to.

1. Conduct initial startup of equipment and perform operational checks.

2. Provide a written statement that manufacturer's equipment has been installed properly, started up and is ready for operation by OWNER's personnel.

3. Instruct OWNER’s personnel for start-up testing for specified minimum number of hours at jobsite on operation and maintenance of the pumping equipment.

END OF SECTION

SECTION 46 50 00 – FIELD INSTRUMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes:

1. CONTRACTOR shall provide labor, materials, equipment and incidentals according to:

a. Section 46 30 05 - Equipment General Requirements,

b. Section 01 60 50 - Equipment Operation and Maintenance Instructions,

2. The above requirements are necessary to furnish, install, calibrate, test, adjust and place all the field instruments into satisfactory operation as specified in the above-mentioned sections and this Section.

3. The functional and general construction requirements of the field instruments shall be illustrated and specified clearly in the Contract documents. All the necessary components including, components, piping, wiring, accessories and labor required for a complete, workable and integrated system shall be provided by the CONTRACTOR.

4. Provide taps in the process piping systems for installation of flow and pressure sensing instruments.

5. The CONTRACTOR shall coordinate the installation of all items specified herein and shall be required to ensure the complete and proper interfacing of all the instruments.

B. Related Work Specified Elsewhere:

1. Division 1: General Requirements

2. 01 33 00 - Technical Submittals

3. 01 60 50 - Equipment Operation and Maintenance Instructions

4. 46 30 05 - Equipment General Requirements

1.2 REFERENCES

1. National Electrical Manufacturer’s Association (NEMA)

2. ICS 6, Enclosures for Industrial Controls and Systems

1.3 QUALITY ASSURANCE

A. All the field instruments shall be in compliance with the requirements of Section 46 50 00, Equipment General Requirements.

B. Manufacturers' Acceptable:

1. Named manufactures or other manufacturers who supply approved equal equipment shall be the acceptable manufactures to furnish the field instruments.

2. The named manufacturers are those who have been specified to establish the standard of quality and performance of the equipment to be supplied.

3. All the field instruments of a given type shall be obtained from the same manufacturer.

C. Manufacturers' Responsibilities:

1. The design and manufacture of the field instruments shall be in accordance with the applicable general requirements specified in Section 46 30 05 - Equipment General Requirements, and the detailed specifications herein.

2. The manufacturer shall be responsible for conducting field supervision, inspection and start-up operations along with the CONTRACTOR.

D. CONTRACTOR's Responsibilities:

1. CONTRACTOR shall assume the responsibilities specified below:

a. The design and implementation of the field instruments shall be in accordance to the Contract Documents.

b. Supervise, check and approve the installation of all system components and wiring connections prior to placing the instruments into operation.

c. Calibrate the instruments, check the operation functions and test the final control actions.

d. The CONTRACTOR shall furnish the ENGINEER certified calibration reports for field instruments, as soon as calibration is completed.

1) Receipt of any calibration certificate shall in no way imply acceptance of any Work or instrument.

2) The calibration certificate forms shall be prepared and furnished by CONTRACTOR and shall contain the

information shown on the sample calibration certificate included at the end of this Section.

3) Each calibration certificate shall be signed and dated by an authorized representative of CONTRACTOR.

e. CONTRACTOR shall furnish ENGINEER two (2) copies of an installation inspection report certifying that all equipment has been installed correctly and is operating properly. The report shall be signed by an authorized representative of CONTRACTOR.

f. CONTRACTOR to provide O & M manuals for all field instruments.

1.4 EQUIPMENT DELIVERY, STORAGE AND HANDLING

A. All the field equipment shall be delivered and handled according to the requirements of the manufacturer.

B. The field instruments shall not be delivered to the site until all product information and system Shop Drawings for instruments have been approved.

1.5 SUBMITTALS

A. Submittals shall be in accordance to the Section 01 33 00 - Technical Submittals and as specified in this Section.

B. Shop Drawing submittals shall be in accordance with the requirements of the Contract Documents.

C. Three (3) copies of each completed calibration certificate shall be submitted to ENGINEER.

D. Two (2) copies of an installation inspection report shall be submitted to the OWNER.

E. Field Instruments Shop Drawing Submittal Requirements:

1. Product information for all field instruments, include the following:

a. Manufacturer's product name and complete model number.

b. Instrument tag number from Contract Documents.

c. Manufacturer’s data sheets and catalog literature.

d. Description of construction features.

e. Performance and operation data.

f. Installation and mounting details, instructions and recommendations.

g. Service requirements.

h. Dimensions.

i. Range of each device and calibration information.

j. A complete list of all field instruments to be provided shall be part of the submittal. All ranges and setpoints shall be coordinated during the submittal review process. The CONTRACTOR shall provide suggested ranges based on the actual tank sizes, flow and pressure of equipment to be installed. If changes are required due to a change in the installed equipment, the associated change in the instrument shall be provided at no extra cost.

2. Complete fabrication, assembly and installation drawings and operation, maintenance and storage instructions, together with detailed specifications and data covering materials used, parts, devices and other accessories forming a part of the equipment furnished.

3. Descriptions of enclosures and materials of constructions of all parts and a listing of NEMA ratings for all equipment.

4. Detailed mounting and installation instructions for each piece of equipment furnished under this Section.

1.6 IDENTIFICATION TAGS

A. All field instruments shall have an identification tag meeting the following requirements:

1. Refer to Section 33 05 01 - Identification Devices, Stenciling, and Tagging System.

2. The tag numbers shall be in accordance to those listed on the Drawings and Instrument List.

3. The identifying tag number shall be permanently etched or embossed onto a stainless-steel tag which shall be fastened to the device housing with stainless steel rivets or self-tapping screws of appropriate size.

4. Tags shall be attached permanently to the device by a circlet of 1/16-inch diameter stainless steel wire rope in case neither of the above fastenings can be accomplished.

5. All field instruments mounted on or within panels shall have the stainless-steel identification tag installed so that the numbers are easily visible to service personnel.

PART 2 – PRODUCTS

2.1 PRESSURE SWITCHES

A. Type: Bourdan Tube actuating a Snap Action Switch for sensing gage or differential pressure.

B. Bourdan Tube Material: Stainless Steel

C. General Features:

1. Adjustable Operating Range: As per Drawings

2. Fixed Deadband: Depends on the operating range and is factory set

3. Switch: Fixed Deadband, Fully Automatic, Single Adjustment Snap Action Switch.

4. Visible operation with On/Off indication

5. Repeatability: ±1 of full scale

6. Snap Action Switch is SPDT rated 15 amp resistive at 120 VAC

7. Process Connection: 1/4-inch NPT.

D. Control Features

1. Weather-Proof

2. Diaphragm Seal

3. Watertight, Dust-tight NEMA 4X Enclosure

E. Acceptable Manufacturers:

1. Tri-point SA, SB, SC, SD, and SE Series, as manufactured by ASCO.

2. Mercoid

3. Ashcroft

4. Or equal.

2.2 FLOW SWITCH

A. Type: A vane operated flow switch to actuate an electric switch at a predetermined flow rate.

B. Materials:

1. Vane: 316 Stainless Steel

2. Body: 316 Stainless Steel standard

3. Magnet Keeper: 430 SS standard

C. General Features:

1. Leak proof body

2. Weatherproof and designed to meet NEMA 4 standards

3. Pressure Limit: See Equipment Schedule

4. Required Pipe Diameter: As per diameter of pipes in Drawings and vane combinations provided by the manufacturer.

D. Electrical Features:

1. Electrical Connections:

a. UL and CSA models: 16 AWG, 6" long

b. ATEX and SAA unit: Terminal bloc

2. Conduit connection: 3/4" female NPT

3. Process Connection: 1-1/2" male NPT

E. Acceptable Manufacturers:

1. Flotech by Dwyer Instruments Inc.

2. Or equal.

2.3 DIFFERENTIAL PRESSURE SWITCHES

A. Type: A Differential Pressure Switch assembly with Viton diaphragm for sensing differential pressure at the inlet and outlet of the contactors.

B. Materials:

1. Diaphragm: Viton

2. Chamber : 316 SS

C. General Features:

1. Field adjustable set point adjustment screw on top of housing.

2. Weatherproof housing and designed for use according to meet NEMA 4 and 4X standards

3. Pressure Limit: As per Drawings

4. Installation: The standard switches are mounted with diaphragm in vertical position

D. Electrical Features:

1. Voltage: 120 VAC/ 5 Amp

2. Conduit connection: 3/4" female NPT

3. Process Connection: 1/8" female NPT

4. Wiring Connections: Internal Terminal Block

E. Acceptable Manufacturers:

1. Dwyer Instruments, Inc.

2. Or equal.

2.4 LEVEL MONITORS

A. Type: The multi-functional level control system (level system) uses acoustic echo-ranging technology to determine the distance between the transducer and monitor surface as a basis for display, output, and digital communication. The level system consists of a microprocessor based level controller (level controller) and an ultrasonic transducer. The level system and the level controller actuates the control relays whenever the liquid level reaches predetermined values in the sulfuric acid tank, ferric chloride tank, caustic tank and backwash holding tank.

B. General Features:

1. The level system and level controller consist of:

a. Level controller - Model Multiranger 100 (PN 7ML1033-1AA00-1A)

b. Transducer - Model XPS-10, 10 M Transducer

c. One handheld programmer (P/N 7ML 1830-2AK)

C. Required Features:

1. Level Controller

a. Power: AC version, 115 Vac ± 15%, 50/60 Hz, 36 VA (17W)

b. Enclosure: NEMA 4X

c. Ambient Temp: -5 to 122^{O}f

d. Memory: 1MB static RAM with battery backup 512 kB flash EPROM

e. Digital Display Module: 4 x 1.5-inch multi-feedback lit LCD

f. Excitation: Transducer: 315V peak, 44kHz nominal frequency

g. mA O/P: 4-20 mA, directly or inversely proportional, scalable and configurable

h. Load: 750-ohm maximum load, isolated

i. Relays: All relays rated 5A at 250 Vac, non-inductive 3 Rely Version:

1) 2 Form A control relays

2) 1 Form C alarm relay

j. Discrete I/P: 2 discrete inputs configurable to override control functions.

1) Logical 0 = < 0.5 Vdc; Logical 1 = 10 to 50 Vdc

k. Current: 3 mA maximum draw

l. mA I/P: 4-20 mA

m. The level controller shall be mounted remotely adjacent to the chemical unloading area.

2. Transducer

a. Measuring Range: 1 to 33 ft

b. Output:

1) Frequency: 44 kHz

2) Beam angle: 12 degrees

c. Ambient Temperature: -40 to 203^{o}F

d. Pressure: 120 psi

e. Construction: Kynar construction with 1" NPT connection

f. Approvals: CE compliant, CSA and FM, UL Listed

D. Acceptable Manufacturers:

a. Siemens Energy and Automation, c/o Process Dynamics Inc.

b. Miltronics

c. Or approved equal.

2.5 LEVEL SWITCH - CONDUCTANCE TYPE

A. Type: Complete level sensing system utilizing conductance type measuring technique to energize and de-energize independent control relays when the monitored medium reaches the corresponding level electrode elevation.

B. Performance Requirements:

1. Level Setpoints (See Drawings)

C. Required Features:

1. Electrodes:

a. Type: Insulated, 1/4-inch diameter solid rod with bare end tip; cut to required length in the field.

b. Insulation: PVC

c. Rod Material: Type 316 stainless steel

2. Electrode Holders:

a. Type and Material: Flanged, PVC

3. Control Relays:

a. Type: Solid state with low fixed sensitivity resistance of 10K ohms. Sensitivity shall be field changeable to adjust for process fluid conductivity by means of external resistor replacement and relay shall be field convertible for direct or inverse operation.

b. Power Supply: 120 VAC (-20, +10 percent), 60 Hz.

c. Power Consumption: 9 volt-ampere, six watts.

d. Sensing Circuit: Eight VAC and less than 30 ma short circuit.

e. Contacts: Silver cadmium oxide.

f. Load Contact Arrangement: Three separate and isolated sets of Form C (SPDT) contacts; one set wetted for local use, two sets dry for remote monitoring or external load control.

g. Contact Ratings: Ten amps at 120 VAC, 240 VAC and 28 VDC.

h. Temperature Range Limitations: -40 Degree F to 180 Degree F.

i. Enclosure: NEMA 4X for field mounted locations; NEMA 1 for interior panel mounted installations.

j. Quantity: One control relay per control or alarm electrode. Ground common electrode to each relay.

D. Product Manufacturer: Provide one of the following:

1. Drexelbrook

2. Warrick

2.6 ULTRASONIC LEVEL SWITCH

A. Type: The ultrasonic level controller system shall be comprised of a transmitter, an ultrasonic transducer, and cabling. The system shall be of the non-contact type for continuous measurement and control of liquid and solid levels.

B. Performance Requirements:

1. Level Setpoints: (to be determined by the Owner)

2. Electrode Tag Numbers (Not Used)

a.

b.

C. Required Features:

1. The transmitter shall include a front panel mounted, 4-digit LCD indicator, scalable in engineering units. The LCD shall provide messages for loss of echo, and cabling trouble.

2. The transmitter shall provide a 4-20 mA DC analog output signal which is proportional to level.

3. The unit shall also have 5 form 'C' SPDT relays assignable for level control, totalizing, sampling, and alarming.

4. Transmitter Temperature Range: The transmitter shall be designed to operate from -20 degrees C to +50 degrees C.

5. The transducer shall be encapsulated in chemical and corrosion resistant material, such as Kynar, Teflon, or TEFZEL.

6. Transducer Temperature Range: The transducer shall be capable of operating from -40 degrees C to +73 degrees C. The unit shall be ambient temperature compensated.

7. The transducer shall be compatible with the level range as indicated on the Plans and shall operate with up to 1200 feet of separation from the transmitter.

8. Measurements Range: The transducer shall be capable of measuring a span of up to 35 feet. The span and range shall be set in the field. Accuracy shall be +/-0.25 percent of range.

9. Power Requirements: The system shall operate on 120 VAC.

10. Enclosures: NEMA 4X for field mounted locations; NEMA 1 for interior panel mounted installations

D. Product Manufacturer: Provide one of the following:

1. Siemens Energy and Automation, c/o Process Dynamics, Inc.

2. Milltronics HydroRanger

3. Or approved equal.

REFERENCE FOLLOWING CALIBRATION CERTIFICATE

CALIBRATION CERTIFICATE

Tag Number: _____

Loop Description: _____

Instrument Location: _____

Manufacturer: _____

Model Number: _____

Adjustable Range: _____

Calibrated Range: _____

Remarks: _____

Installation Per Manufacturer's Requirements? Yes No Installation Per Contract Documents? Yes No

If "No", explain: _____

Calibration Test:

	Input (Units)	Output (Units)	Accuracy
0%			
10%			
25%			
50%			
75%			
90%			
100%			

Switch Test:

	Setting	Deadband	Switch Point Upscale	Switch Point Downscale
Setpoint 1				
Setpoint 2				
Setpoint 3				
Setpoint 4				

CALIBRATION CERTIFICATE (cont.)

I hereby certify that the above information is correct and accurate, to the best of my knowledge, and that the instrument indicated above has been supplied, installed, calibrated, and testing in accordance with the manufacturer's recommendations and the Contract Documents, unless otherwise noted.

Receipt of this Calibration Certification shall in no way imply acceptance of any Work or instrument supplied as a part of this Contract.

CONTRACTOR's Signature:_____Date: _____

END OF SECTION

SECTION 46 50 10 – TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL (NOT USED)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 QUALITY ASSURANCE

A. Perform total system balance in accordance with AABC MN-1, ASHRAE Std 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.

1. Maintain one copy of each document on site.

B. TAB Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC.

C. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor experienced in performance of this Work and licensed at the Rio Rancho, New Mexico.

3.2 PRE-BALANCING MEETING

A. Convene a meeting one week prior to commencing work of this Section.

3.3 SEQUENCING AND SCHEDULING

A. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

3.4 WARRANTY

A. Furnish AABC National Performance Guaranty for this project.

3.5 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:

D. Company specializing in the testing, adjusting, and balancing of systems specified in this section.

3.6 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.

2. Temperature control systems are installed complete and operable.

3. Final filters are clean and in place. If required, install temporary media in addition to final filters.

4. Fans are rotating correctly.

5. Air coil fins are cleaned and combed.

6. Air outlets are installed and connected.

B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.7 PREPARATION (Not Used)

3.8 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.9 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.10 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Measure air quantities at air inlets and outlets.

C. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

D. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

E. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.

3.11 SCOPE

A. Test, adjust, and balance the following:

1. Packaged Heating/Cooling Units

3.12 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

B. V-Belt Drives:

C. Air Moving Equipment:

a. Location

b. Manufacturer

c. Model number

d. Serial number

e. Air flow, specified and actual

f. Return air flow, specified and actual

g. Outside air flow, specified and actual

h. Total static pressure (total external), specified and actual

i. Discharge pressure

j. Fan RPM

D. Return Air/Outside Air:

1. Identification/location
2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature

E. Exhaust Fans:

1. Location
2. Air flow, specified and actual
3. Total static pressure (total external), specified and actual
4. Inlet pressure
5. Discharge pressure

F. Air Distribution Tests:

1. Air terminal number
2. Design velocity
3. Design air flow
4. Test (final) velocity
5. Test (final) air flow
6. Percent of design air flow

END OF SECTION

SECTION 46 76 21 - BELT FILTER PRESS

PART 1 - GENERAL

1.1 SUMMARY

A. All equipment detailed in this section shall be furnished by the belt press manufacturer to comprise a complete dewatering system. Only units with a minimum actual belt width of 1.2 meters will be considered.

B. Furnish two (2) Belt Filter Press complete with in-line sludge mixing device, control panel as specified, and all spare parts and other appurtenances as required in this specification.

C. The following equipment, as specified herein, shall be supplied by a single belt press manufacturer to insure proper performance and coordination of responsibilities.

1. Two (2) belt filter press complete with belts, belt drive, controls, and automatic belt tracking and tensioning systems with air compressor.

2. Two (2) wash water booster pump.

3. Press controls.

4. All press mounted valves, gauges, controls, piping, wiring and other necessary appurtenances, as specified herein, to insure proper operation of the belt filter press.

5. Pumps (Not Included).

6. Two (2) polymer makedown Systems, including storage totes complete and Two (2) polymer injection pumps with controls.

7. One (1) complete and operational sludge conveyor as shown on the plans.

D. All wiring, and controls shall conform to applicable standards of UL, NEC and any applicable state and/or local codes. Where conflicts exist, the NEC shall prevail.

E. Drive motor shall be inverter duty. Enclosure shall be TEFC, severe duty and conform to current NEMA standards.

F. Materials

Main Frame:	Carbon Steel Channel. Fully welded, blasted to SP-10 near-white specification. Galvanized with 4-6 mils of 99% pure zinc using a thermal spray method, followed by 4-6 mils of a two-component epoxy coating for additional corrosion resistance.
Rollers:	Carbon steel stub shaft construction with fully welded dual end plates. Coated with 0.250 minimum 70 durometer rubber and machined for concentricity.
Bearings:	Double row spherical roller type with triple-tec seals. nylon coated, minimum 1,000,000 hrs L-10 life.
Belt Tracking and Tensioning:	Automatically controlled via pneumatic system.
Belt Wash System:	Stainless pipe with recessed nozzles and manually operated internal cleaning brush.
Fasteners:	Stainless Steel
Belt Support Grid:	304 Stainless Steel
Containment Barriers:	304 Stainless Steel, minimum 14 gauge
Beltwash Enclosures:	304 Stainless Steel, minimum 14 gauge
Filtrate Collection Pans:	304 Stainless Steel, minimum 14 gauge
Doctor Blades:	UHMW Plastic
Plow Blades:	UHMW Plastic
Wiper Blades:	UHMW Plastic

1.2 RELATED WORK **(Not Used)**

1.3 CODES AND STANDARDS

A. Equipment specified herein shall meet or exceed the applicable sections of the following codes and standards authorities.

1. AGMA, American Gear Manufacturers Association.

2. ASME, American Society of Mechanical Engineers.

3. ASTM, American Society of Testing and Materials.

4. ANSI, American National Standards Institute.

5. IEEE, Institute of Electrical and Electronics Engineers.

6. NEC, National Electrical Code.

7. U.L. Underwriters Laboratories.

1.4 SYSTEM DESCRIPTION

A. The belt filter press shall be of the continuous belt design, having three (3) distinct dewatering zones: A gravity drainage zone, a fully adjustable wedge zone, and a pressure/shear zone. Design shall consist of a structural main frame, two (2) dewatering belts, inlet distributor, belt support/wiper assembly, furrowing devices, rollers, bearings, doctor blades, belt drive unit, belt tracking and tensioning systems, belt wash system, and a filtrate / wash water drainage and collection system.

1.5 PERFORMANCE REQUIREMENTS AND TESTING

A. Sludge belt filter press manufacturer and contractor shall collect and test a minimum of Three (3) sludge samples to recommend the appropriate polymer for dewatering.

B. Belt filter press manufacturer shall be responsible for obtaining and testing the existing Waste Activated Sludge (WAS) to optimize the belt filter press performance and to recommend the appropriate polymer.

C. The belt filter press shall be designed to dewater with the following characteristics:

Feed Solids, percent d.w.s.	2.0-4.0 wt%
pH	6.5 – 8

D. Belt filter press shall be capable of meeting the following minimum performance criteria:

Solids capacity, lbs d.w.s / hr	395 – 885
Hydraulic capacity, gpm	75 - 100
Solids capture, percent	95%
Polymer dosage, lb / ton ds	TBD

E. Compliance with the performance section of these specifications shall not relieve the contractor of the responsibility to provide equipment that is mechanically and structurally equal to the equipment specified in this section.

1.6 QUALITY ASSURANCE

A. Only manufacturers having belt filter presses of the type specified herein operating for a period of five years in a minimum of twenty wastewater treatment plants in the United States shall be considered. Manufacturers not meeting the experience requirement shall not be acceptable. All components of the belt filter press equipment shall be of high quality and sized to accommodate, without failure or compromise, all forces encountered during fabrication, installation and operation. Compliance with the performance requirements of the specification shall not relieve the contractor of his responsibility to supply equipment having the specific structural, mechanical, operational and surface corrosion protection features as specified herein.

B. The belt filter press shall be factory assembled and tested prior to shipment to ensure proper operation of all systems.

1.7 SUBMITTALS

A. Drawings

Submit, within 30 days of notice to proceed, drawings that include weights, structural loadings & dimensions of the specified equipment. Submit 3 copies of the following:

1. Full size dimensional drawing of belt filter press, with typical sump arrangement.

2. Field installation requirements and weight of each equipment item.

3. Detailed wiring diagrams, instrumentation and operational description of control system.

4. Descriptive literature, catalog cuts, technical data, performance curves & utility requirements for all auxiliary equipment, i.e. pumps, compressors, etc.

5. Complete description of all interconnecting components, including a list of the following:

    a. Number, type and size of all piping and service connections.

    b. Number type and size of all electrical conductors and connections.

    c. Number type and size of all pneumatic connections.

6. Control panel dimensions, mounting requirements and access restrictions.

B. Operations and Maintenance Manuals

1. Furnish, within 10 working days of shipment, four (4) complete copies of operation and maintenance instructions, including start-up and regular recommended maintenance schedules and complete spare parts list. Information shall include all auxiliary equipment supplied under this specification.

1.8 DELIVERY STORAGE AND HANDLING

A. Deliver equipment to site.

B. Provide manufacturer's recommendations regarding handling, storage and protection.

C. The press shall be shipped fully assembled, with the exception of the dewatering belts and the drive unit, which shall be shipped separately to prevent damage. Ancillary equipment shall be shipped separately.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Acceptable Manufacturers

1. Plans and specifications have been prepared based on PHOENIX Process Equipment Co. Model WX-(1.2) H8W Belt Filter Press. Only manufacturers offering equipment which meets the mechanical, structural, process and performance requirements of these specifications shall be considered acceptable. If proposed alternate equipment requires

differing equipment arrangement, or if details of construction and design differ from the specified equipment, contractor shall prepare and submit for review all necessary architectural, structural, electrical, process and instrumentation drawing revisions. The above data must be submitted to the engineer no later than fourteen (14) days prior to the bid date. A complete listing of all design and construction deviations from specified equipment must be submitted for review.

B. Process Description

1. Flocculation of the sludge shall be accomplished by a thorough mixing with polymer prior to entering the sludge feed box at the inlet of the belt filter press. The sludge shall be evenly distributed across the upper dewatering belt by means of an adjustable underflow weir. Initial dewatering shall be accomplished by gravity drainage as free water is allowed to pass through the moving filter belt in the gravity zone. The thickened sludge shall then enter the wedge zone where the upper and lower belts converge, with the sludge in between, prior to entering the shear pressure zone. The sludge cake shall then pass through a series of decreasing diameter rollers while contained between the two dewatering belts. The pressure and shear forces exerted in this section shall force entrained water from the sludge and through the filter belts. The dewatered sludge cake will then be discharged, aided by UHMW doctor blade assemblies, on both belts, at the discharge roller location. Washwater and filtrate shall be collected in drainage pans and directed for piping to the prepared sump beneath the press.

2.2 EQUIPMENT

A. Sludge Conditioning System

1. System shall consist of an in-line polymer injection ring, which shall be mounted in the sludge line feeding the belt filter press. The injection ring shall be fitted with four equally spaced nozzles for even distribution of polymer in the incoming slurry. Following the injection ring shall be a variable orifice mixing valve with adjustable counterweight to vary mixing energy. Mixer shall have a removable side plate for inspection and cleaning.

B. Frame

1. The belt press frame shall be fabricated of fully welded structural members conforming to ASTM Standard Specifications for Structural Steel, Designation A36-77a, into a rigid structure, adequately braced to withstand intended loads without excessive vibration or deflection. Due to

the potential for misalignment and loosening of members precipitated by loading, shipping, unloading and/or vibration during operation, bolting frames shall not be acceptable. Frame shall withstand a belt tension of 50 pli without exceeding a yield stress safety factor of 6.0. Calculations shall be submitted to confirm compliance with safety factor requirements.

2. After fabrication, the completed frame shall be blasted and prepared to SSPC SP-10 near-white finish, then receive a minimum of 4 mils of 99% pure zinc for corrosion protection. Zinc shall be applied by thermal spray metallizing to insure proper coating thickness and leave a surface that is superior for adhesion of other coatings. Following the application of zinc, 4-6 mils of a two-component, catalyzed epoxy shall be applied for maximum protection.

C. Gravity Zone

1. The gravity drainage zone shall be inclined and fitted with an adjustable underflow weir to provide for the formation of a pool to maximize gravity drainage and assure even distribution of sludge across the entire width of the belt. The distribution area shall be designed to prevent spillage or short circuiting of sludge. Gravity drainage zones subject to flooding shall not be considered acceptable to this specification. A minimum of six (6) rows of adjustable, wedge-shaped, furrowing devices (plows) shall be provided to direct the sludge and enhance drainage of free water entrained in the sludge. The belt shall be supported in the gravity zone by a series of grids mounted perpendicular to belt travel. The grids shall be equipped with replaceable UHMW wiper bars. Wiper bars shall be easily replaceable without machine disassembly. Minimum effective area in the gravity zone shall be (56) square feet.

D. Wedge Zone

1. The wedge zone shall consist of an upper and lower belt. Dewatering grids shall support the belts and aid in drainage by breaking surface tension on both belts while exerting gradually increasing pressure as the belts converge. The wedge zone shall allow drainage through both belts. Minimum effective area in the wedge zone shall be (46) square feet, when measured on the lower belt only.

E. Pressure/Shear Zone

1. The pressure/shear zone shall consist of a minimum of eight (8) rollers arranged in a serpentine pattern to maximize the contact area of the belts with the rollers and to provide for maximum shear of the sludge. The first roller shall be 24" minimum diameter and followed by incremental

reductions in diameter of successive rollers. Minimum effective area in the pressure zone shall be (66) square feet. The effective dewatering area in the pressure zone shall be defined as the area of one belt only in contact with the rollers.

F. Cake Discharge

1. UHMW polyethylene doctor blade shall be provided in the area of the discharge rollers to aid in the removal of sludge cake from the belts. The doctor blades shall be held in place against the belts by means of a counter-weighted assembly. The doctor blade assemblies shall be designed to allow the blades to be held away from the belts, without assistance, for maintenance and belt replacement.

2. Dewatered sludge cake shall be scraped from the discharge rollers by means of counter-weighted adjustable doctor blades. Pressure shall be adjustable by positioning of the counterweight. Doctor blades shall be reversible to maximize service life.

G. Rollers

1. All rollers shall be fully welded, double separated plate and stub end shaft construction. Rollers shall be fabricated of ASTM A-36 Steel. Roller shafts shall be of 1045 carbon steel with a minimum stock diameter of 4.0 inches through the roller end discs. Rollers shall have a maximum deflection of 0.05 inches at a belt tension of 50 pli. All rollers shall be covered with rubber, 70 durometer Shore “A” hardness, and machined to ensure concentricity. Rollers shall be covered to insertion point of bearing.

H. Bearings

1. All bearings shall be double row, spherical or tapered roller bearings. All bearings shall be housed in horizontal, cast-iron pillow block housings. Housings shall have triple labyrinth seals with integral slinger for maximum protection from contamination. Housings shall be coated with 8 mils of electrostatically applied heat set nylon polyester with mounting bolts and grease fittings of stainless steel. Bearings shall be self- aligning and accessible for lubrication without disassembly of press components.

2. All bearings shall have a minimum of 1 million hours L-10 life at 50 pli belt tension and an operating speed of 15 feet per minute. Calculations shall be submitted to substantiate L-10 life.

I. Belt Tracking

1. Each belt shall be independently controlled by an automatic tracking system consisting of a sensor to monitor belt position, a proportional tracking valve, a steering roller and a pneumatic positioning cylinder. Electromechanical, spring-tensioned and non-continuous (snap action) tracking systems shall not be allowed. The tracking system shall continuously monitor belt position and adjust belt path to ensure central tracking. Limit switches shall be provided to detect gross belt misalignment and provide alarm to operator and de-energize the system in the event of belt failure. Pneumatic controls shall be provided integral to the main control panel.

J. Belt Tensioning

1. The press shall be equipped with individually controlled pneumatic tensioning systems for each belt. Tension shall be accomplished by rotation of heavy section monolithic lever arms by frame mounted industrial air bellows. The tensioning system shall not permit belt misalignment. Rack and pinion tensioning systems and hydraulic tensioning systems shall not be allowed.

2. Pneumatic controls shall be located in the press control panel. Separate adjustable pressure controls shall be provided for each belt. Pressure gauges for individual belt pressure shall be mounted in the face of the control panel. Control system shall be capable of adjusting belt tension from 0 to 50 pli. Sensing devices shall be provided for each belt to detect belt break and de-energize the system.

K. Belts

1. Press manufacturer shall provide two dewatering belts of wear-resistant polyester monofilament construction. Actual belt width shall be a minimum of (1.2) meters, with edges sealed and bonded to prevent premature wear and fraying. Belt porosity and tensile properties shall be optimized for intended service. A stainless clipper seam shall be employed to join belt ends and facilitate belt replacement with minimum interruption in operating time.

L. Belt Washing

1. Press shall be furnished with individual belt wash stations for each belt. Each station shall consist of a stainless-steel header fitted with a series of replaceable spray nozzles. The nozzles shall be arranged to provide an overlapping spray pattern to insure complete coverage of belt surface. Spray bar shall be fitted with a stainless-steel cleaning brush which, when actuated by a handwheel, shall remove debris from spray nozzles and automatically back flush spray bar. Spray bar shall feature a stainless-steel containment housing with replaceable seals and collection pan. Collected wash water shall be piped to a common drain connection.

2. A wash water boost pump shall be provided to increase the plant water pressure to insure 100 psi to the belt wash system. Pressure gauges shall be installed at each wash station, and individual in-line ball valves provided for isolation and flow control.

M. Hardware

1. All fasteners shall be made of stainless steel. Bolts used for location of load bearing members shall be a minimum of ½" diameter.

N. Belt Drive

1. Both dewatering belts shall be driven by a single drive roller. The drive roller shall be powered by a shaft mounted gearmotor. Multiple drive rollers or chain-driven rollers shall not be acceptable. All gearing shall be at least AGMA Class 2 and feature heavy duty bearings and synthetic gear lubricant to ensure long service life. Drive motor shall be inverter duty and meet all current NEMA electrical requirements. Motor enclosure shall be TEFC, severe duty. Both motor and gear reducer shall receive a two-part epoxy protective coating. Speed control shall be accomplished by an AC variable frequency speed controller, capable of 5 to 1 speed variation.

O. Controls

1. Electrical Work

a. All electrical work shall meet the current NEC standard for code and practice and shall comply with all applicable state and local codes concerning wiring and service equipment. Where conflicts of the code exist, the national code shall prevail.

b. All components used for this control and all associated equipment shall be UL approved and bear the underwriter’s

stamp and registration number. The entire assembly shall meet minimum requirements for safety as determined by this agency and be built according to its guidelines within the framework of the NEC as listed above.1.3. Electrical assemblies shall meet UL-508 standards and be suitable for wet environments. The controls and equipment located on or near the BFP shall meet UL-4X or IP66 standards for wash down service. Controls and equipment located away from the BFP shall meet UL-4 standards for wet environments.

c. Electric motors shall meet all specifications as outlined in Division 16 and associated sections.

d. All press mounted conduit and wiring shall meet all necessary code requirements as stated in the NEC for wet and/or corrosive environments. All wiring shall be fully enclosed in conduit or sealed flexible armor. No exposed cords or "mine cable" such as SO or SJO cables will be allowed.

2. Variable Frequency Drive Units

a. The manufacturer shall supply drive units installed in the master control that meet the functional requirements associated with each motor involved with process control. Motor and drive unit selection shall be based upon the operating profile of the machine, with particular attention given to the limits of motor performance when operated at less than full speed with a VFD.

b. The drive unit shall operate with a output up to 120% continuous capacity without exceeding the motor specification for:

1) Temperature rise

2) Full load current draw

3) Vibration

4) Noise

5) Phase slip

c. The drive unit shall consist of the following major components:

1) Motor load protection as required by the NEC and in accordance with UL 991

2) Under and over voltage protection that shall shut down the drive and enunciate a buss fault

3) Phase protection shall guard against a phase-to-phase fault and enunciate the error

4) Ground fault protection shall enunciate a phase to ground short

5) Acceleration and deceleration protection with adjustable pre-selected speed set points

6) Operating panel for monitoring and controlling the VFD

7) Remote control capability that will accept 0-10VDC, 4-20mA DC or pulsed DC speed reference signals

d. The drive unit shall be assembled and tested to the latest applicable standards of ANSI, NEC, IEEE, NEMA, be UL listed, registered and be capable of CE certification with no modifications to the drive. The drive shall be industrial grade. Commercial grade or "OEM" grade drives will not be accepted.

3. Electrical Control Panel

a. An electro-pneumatic control panel shall be provided that will allow operation of the Belt Filter Press dewatering system from a central point near or mounted on the press. This control shall be constructed such that it shall have a UL-4 rating. All equipment contained on the panel shall be rated NEMA 4/4X and construction shall be such that this rating is maintained in the finished control.

b. The enclosure shall be configured to allow local connection of the electrical wiring and pneumatic lines to the BFP. The control shall be constructed to conform with UL-4X and/or IP66 ratings. The enclosure is stainless steel.

c. Starting Devices (Starters, VFD's) located in this panel.

1) Press VFD

2) Sludge Pump VFD

3) Air Compressor Starter

4) Booster Pump Starter

5) Polymer Pump Drive

d. Power to the master panel shall be 480VAC/60Hz/60A. Single point wiring shall be used, with all control voltages supplied internally by a copper wound, split bobbin, step down transformer that provide full regulation at duty cycles between 85 to 120% of load. The transformer shall be fully fused on both the primary and secondary windings. One leg of the secondary winding shall be bonded to the panel frame to provide a true neutral buss.

e. A master disconnect, rated for 125% of the possible full load current draw expected in normal service shall be installed in the cabinet. The operating handle is to be interlocked to the door so that the power must be off to gain entry to the cabinet interior. A defeater is to be installed in this mechanism so that qualified technicians can open the door under power with the use of a proper tool.

1) This disconnect shall be front mounted, be lockable, with provisions for three locks. The disconnect must be NEMA rated, suitable for 600-volt service, and be UL approved.

2) The disconnect shall be by Allen Bradley, Square D or approved equal.

f. A mushroom head Emergency Stop palm switch shall be provided in a prominent place on the cabinet face. This switch shall be the maintained position type and require manual reset. Actuation of the switch shall result in a full crash stop of the equipment controlled from this panel. This is accomplished by opening the control voltage line which will shut off power to all equipment.

g. All push buttons and pilot lights shall be Allen Bradley bulletin 800H devices, or approved equals, and be UL-4 rated devices with NEMA A600 self-cleaning contact blocks rated at 10 amps continuous service with a one million cycle design life.

h. All major machine functions shall be enunciated with pilot lights. These pilots shall be Allen Bradley bulletin 800H devices (or approved equal) with integral step-down transformers to provide a low voltage filament supply to incandescent bulbs for extended lamp life in severe service.

i. Other secondary functions shall be labelled push buttons or switches with accompanying banks of pilot lights that will describe the general operation surrounding that function.

j. The control shall have pneumatic equipment as necessary to individually control belt tensions with gauge indication of the actual pressure placed on the tensioning devices.

k. There shall be a primary oil coalescing air filter mounted on the control to pre-clean the air for use in belt tracking and tensioning.

l. Alarm tie points shall be provided for cable safety, belt over travel, and low air pressure. Each of these conditions shall immediately stop the system by breaking the control circuit to the start/run contact for the press drive. This alarm shall start a programmed shut down of the system.

m. All wiring shall be done in a neat and professional manner. Internal wire connections between devices shall be contained in PVC wire duct. Where space limitations prohibit this, all wires shall be laced into neat bundles tied to the enclosure with panel cleats to prevent movement of the harness in service. All wires shall have computer generated self-laminating Tyvek numbers on each end of the conductor. These numbers shall coincide with the diagram supplied with the control. All wiring shall use AWG #16 or heavier stranded copper conductors with 600-volt type MTW insulation. All wires shall terminate at screw and pressure plate connectors. All terminal points shall have indelible marking showing the wire number and corresponding tie point. Twenty percent spare terminals shall be provided for use by the owner.

n. All work shall be in full compliance with the latest version of the National Electric Code and LSC. Additionally, all work will be UL/CUL approved using only listed components.

o. A set of schematic diagrams shall be provided with the panel describing both the wiring and pneumatic layout. All

components associated with the press shall be shown on the drawing and all connections shall be addressed. Standard JIC drafting symbols are to be used to show component wiring and function.

p. All equipment shall be completely checked out and hot tested prior to shipment. This shall include a test of all switches, lights, relays, and other components. All safety devices shall be rechecked completely for operation, function and control prior to final clean up and packaging for shipment.

4. Control Function

a. Control Function shall include as a minimum, automatic one button start and stop with fully interlocked preprogrammed machine sequencing from a fully cold start up through steady state dewatering of process sludge. The shutdown shall also be fully automatic with all necessary timed steps to insure an orderly stop of all equipment. Logic shall be via Allen Bradley CompactLogix PLC.

b. The alternate form of operation is manual mode. This mode is for maintenance use and certain operations which may call for manually operating parts of the system. Interlocking of the system is optional in this mode. Full annunciation and safety protection shall be maintained.

5. Order of Operation

a. The Order of operation in the automatic mode is as follows:

1) Start the air compressor and allow the day tank to build to operating pressure. Pre-tension the filter belts.

2) Select AUTO mode on the master control panel for each device to start automatically.

3) Press the AUTO START push button. The press starts and the PRESS RUNNING pilot illuminates.

4) The wash water pump starts and the press begins a pre-wet cycle. The boost pump pilot shall illuminate when the pump is running.

5) A PREWASH pilot light indicates that the press is performing a preconditioning cycle.

6) At the end of the PREWASH cycle, the sludge pump starts. The operator can adjust the belt speed of the press to get a good cake flow in the dewatering zone.

7) When the sludge pump starts, the polymer system also starts.

8) The press is now in full run mode and the operator can adjust flows and speeds as necessary to achieve the cake consistency desired.

b. The order of operation for shut down is as follows:

1) The operator presses the AUTO STOP push button on the master control panel.

2) The sludge pump and polymer system will stop.

3) The POST WASH pilot light illuminates, and the press will begin a timed step to wash off the belts.

4) The boost pump and press stop at the end of the timed cycle.

5) The machine automatically resets for the next cycle.

6. Alarms

a. Alarms shall be provided for Belt Break, Belt Track, Low Air, Emergency Stop (including cable Safety). Faults shall immediately initiate an orderly shutdown of the system. In as much as practical, the remaining parts of the system that can still run shall continue to do so and the automatic shutdown will allow operating portions of the equipment to clear themselves out and wash off. Downstream interlocked equipment will of course, not be allowed to run. All alarms shall latch on until manually cleared and reset. Individual pilot lights shall be provided for each alarm. Alarms shall remain on until manually reset. The alarm horn shall sound on a fault and remain on until manually silenced. The alarm horn shall reset with the system.

P. Spare Parts

1. Press manufacturer shall supply the following spare parts, as well as any additional parts recommended for one year's operation:

a. 1 set of dewatering belts

b. 1 set of doctor blades

c. 1 set of gravity zone seals

d. 1 bearing of each size

e. 1 each, limit switch

f. 1 each, tracking valve

2. Parts shall be packaged in protective enclosure suitable for storage and shipped separately to minimize possibility of loss or damage.

Q. Air Compressor

1. System air shall be provided by a single stage air compressor. Compressor shall be industrial type with cast iron sleeves within finned aluminum casting. Pump shall be splash-lubricated. Compressor to be driven by industrial duty AC induction motor sized for intended duty with a service factor of at least 1.15. Compressor shall be mounted on a 30-gallon ASME rated receiver with pressure gauge and pressure regulator switch. Compressor shall be sized to supply all air for press operation at peak demand. Compressor shall be Jenny, Compressed Air Systems, Industrial Air, Campbell-Hausfield, Gardner-Denver, Emglo or equal.

R. Booster Pump

1. Plant water pressure shall be increased to 100 psi for proper operation of press belt washing. Booster pump shall be centrifugal design, close coupled, bronze fitted construction, with bronze impeller. Pump shall be driven by an industrial duty, AC induction motor sized for the intended duty with a service factor of at least 1.15. Pump and motor shall be close-coupled or mounted on a common base plate. Pump shall be Xylem, Goulds, Aurora, Grundfoss or equal.

S. Polymer Unit

1. The polymer dilution and feed systems shall be capable of effectively activating and fully blending with water a homogenous polymer solution ranging from 0.1% to 1% concentration of emulsion polymers with active contents up to 75%.

2.3 WARRANTY

A. The system shall be covered by a one (1) year limited warranty against defects in materials and workmanship. The mixing chamber shall be warranted for the life of the system against failure for plugging for any reason. The warranty shall exclude failure due to excessive water pressure or freezing.

2.4 MANUFACTURERS

A. Provide a polymer activation, blending and feed system as manufactured by PHOENIX, Polyblend, VeloDyne, or equal.

2.5 EQUIPMENT

A. Multi-zone Hydro-Dynamic Mixing Chamber:

1. A hydro-dynamic blending device with staged mixing energy shall be provided. The first stage mixing energy shall be in the form of a high energy water jet impinging on the polymer as the polymer is injected into the mixing chamber. Polymer injection shall be through a quill to optimize polymer / water interface. The water jet shall be produced by a pressure drop across a variable orifice. The system shall effectively blend & activate polymers in this non-mechanical stage with differential pressures as low as 30 psid. The second stage shall produce a back-mixing through a hydraulic, cyclonic action. The design of the mixing chamber shall provide plug flow to prevent polymer build up and plugging in the event polymer is introduced without to the mixing chamber without water. Systems shall allow for low velocity areas in the mixing chamber shall not be considered.

2. The mixing chamber body shall be constructed of PVC. The mixing zone shall be clear for viewing purposes. Clear solution piping alone shall not be considered to meet this requirement. A drain connect with a pressure relief valve shall be provided. The chamber shall be rated for up to 150 psi.

3. Provide a neat polymer check valve specifically designed to isolate neat polymer from dilution water. The valve shall be designed with an open and unobstructed path to the valve seat. The valve body shall be constructed of Teflon with Viton seals. The poppet and spring shall be stainless steel and designed to prevent polymer from flowing through the spring, causing buildup and plugging. The valve shall be readily accessible for cleaning and shall not require tools for removal, cleaning or replacement. Conventional check valves, ball checks, and or check valves that are installed inside the mixing chamber, or which require mixing chamber disassembly for servicing will not be accepted.

B. Dilution Water Assembly

1. The dilution water flow rate shall be monitored by a Rotameter type flow meter having a range of (0.5 – 5 GPM). A union shall be provided on the Rotameter to allow easy removal for cleaning.

2. Unit shall have an electric solenoid valve for on/off control of total dilution water flow.

3. Provide a 2-1/2” stainless steel liquid filled pressure gauge to monitor dilution water inlet pressure.

4. Provide a (1/2” or 3/4”) FNPT dilution water inlet assembly.

C. Progressive Cavity Neat Polymer Metering Pump

1. Each unit shall have one (1) neat polymer metering pump(s) integrally mounted on the systems skid. The metering pump(s) shall have a range of (0 – 2 GPH). The pump shall be a positive displacement, progressive cavity type constructed of stainless steel and Viton. The pump seal shall be packing type. Mechanical seals shall not be used. The pump shall have a minimum of three stages to minimize slip. A TENV 90 VDC motor shall drive the pump. The motor shall be controlled by an SCR motor controller located in the main control panel.

2. Provide a calibration column with two full port PVC ball valves having Viton O-rings. The column shall be calibrated for a one-minute draw-down and read in GPH and milliliters.

3. Provide a pressure gauge with diaphragm isolator to monitor polymer line pressure.

4. Provide a pressure switch with diaphragm isolator to alarm on high polymer line pressure.

5. Provide a metering pump priming assembly including vacuum device and valve.

6. Provide a thermal type loss of polymer flow sensor. Loss of flow shall cause polymer pump and sludge pump to stop and initialize an alarm.

D. Solution Discharge Assembly.

1. Provide a 2-1/2” stainless steel liquid filled pressure gauge to monitor system discharge pressure.

2. Provide a (1/2” or 3/4”) FNPT solution discharge assembly.

E. Controls for the polymer system shall be located in the belt filter press control panel.

F. Power:

1. 120 VAC, 1Ph, 60/50 Hz.

G. Equipment Skid

1. The system's frame shall be of rugged 304 stainless steel construction. No mild steel shall be used. All piping shall be rigidly supported.

2. The overall system dimensions shall not exceed 36”W x 24”D X 42”H.

H. Not Used

I. Manufacturer's Services

1. The manufacturer shall furnish a trained technician to provide start-up assistance and train owner's personnel in the operation, maintenance and adjustments of the press. Assistance shall be provided in a minimum of one (1) trip to owner's location and a total of three (3) days on-site.

J. Miscellaneous

1. The press shall be equipped with a safety trip cord along the accessible areas of the press. Trip cord shall actuate a NEMA 4 safety switch that shall immediately de-energize the press. The safety switch must be reset for the press to be re-started. All wiring shall be contained in press mounted PVC conduit. All belt wash water piping shall be schedule 80 PVC. All air lines shall be nylon tubing with brass connections. Drain connections shall be PVC or stainless steel.

2. The press frame shall be coated as described in Section 2.2B. All other surfaces in contact with sludge or filtrate shall be stainless steel. Components and appurtenances not in contact with sludge or filtrate or not otherwise described herein, shall be coated with a two-part epoxy.

3. Controls for the replacement equipment are new and replace the existing. The Plant PLC will remain as-is with little if any changes. I/O’s for the replacement equipment are to be disconnected and reconnected to the new control panels.

END OF SECTION