Project Manual
Including Specifications for
The Construction of

SANTA FE COUNTY
HONDO 2 FIRE SUPPRESSION LINE
Santa Fe, New Mexico
September 2023

OWNER:

SANTA FE COUNTY
424 NM 599 Frontage Road
PO Box 276
Santa Fe, New Mexico 87504

ENGINEER:

MOLZEN CORBIN
2701 Miles Road, SE
Albuquerque, New Mexico 87106

MOLZENCORBIN
ENGINEERS | ARCHITECTS | PLANNERS

CES232-11

ENGINEER OF RECORD

Molzen Corbin
2701 Miles Road, S.E.
Albuquerque, New Mexico 87106
(505) 242-5700

The technical material and data contained in the Specifications were prepared under the supervision and direction of the undersigned, whose seal as a Professional Engineer, licensed to practice in the State of New Mexico, is affixed below.

9-7-23

Kenneth R. Muller, P.E.

N.M.P.E. No. 12548

All questions about the meaning or intent of these documents shall be submitted only to the Engineer of Record, stated above, in writing.

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TECHNICAL SPECIFICATIONS

SECTION 01 00 01

SPECIFICATION FORMAT

PART 1 GENERAL

1.01 FORMAT

A. The Division 1 through 48 Specifications are written in imperative and abbreviated form. This imperative language is directed at the Contractor, unless specifically noted otherwise. Incomplete sentences shall be completed by inserting “shall”, “the Contractor shall”, and “shall be” or similar mandatory phrases by inference in the same manner as they are applied to notes on the Drawings. The words “shall be” are to be placed by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, the Contractor shall fulfill (perform) all indicated requirements whether stated imperatively or otherwise.

B. All equipment and facilities shall be furnished, installed, and constructed by the Contractor to provide the Owner with complete, ready to use components, systems, and facilities. All necessary materials and Work required to accomplish this are the responsibility of the Contractor alone, whether or not specifically indicated on the Drawings or stated in the Specifications.

C. The various Sections of the Division 1 through 48 Specifications may contain references to standards, other specification sections, or items that do not apply to the Work covered in this project. These inappropriate references are to be considered irrelevant and ignored by the Contractor. If conflicts arise from erroneous references or lack of references to standards or other specification sections, Engineer will determine the relevancy of the apparent conflicts.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 11 00

SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK INCLUDED

A. Work under this Contract consists of constructing a new 420′ fire suppression line in Hondo 2 Fire Station with a reduced pressure backflow preventer and a 250′ discharge line from an existing roof drainage cistern to an existing retention pond in accordance with the Drawings and these Specifications for the County of Santa Fe.

1.02 DESCRIPTION

A. Work included under this Contract:
1. Construct approximately 310′ of 4″ PVC C900 pressure rated fire suppression line with associated valves, connections, and appurtenances.
2. Construct approximately 160′ of 4″ PVC SDR 26 gravity drain line with associated flap valve, connections, and appurtenances.
3. Construction 4″ reduced pressure backflow preventor and heated enclosure.
4. Construct approximately 15′ of 6″ PVC C900 pressure rated fire suppression line with associated connections and appurtenances.

1.03 ALLOWABLE PIPE MATERIALS FOR NEW WATERLINE

A. PVC Pipe, C900:
1. Where buried pipe restraint is required by these Contract Documents, use external pipe restraint devices for PVC C900 pipe as specified in Section 33 12 01 – Water Systems, Paragraph 2.01 D. – External Mechanical Restraint Devices.

B. Pipe Fittings:
1. All buried pipe fittings shall be ductile iron as specified in Section 33 12 01 – Water Systems, Paragraph 2.01 – Materials and Fabrication, and restrained with external mechanical restraint devices.

C. PVC Pipe, SDR26:
1. Buried PVC pipe and fittings as specified in Section 33 31 01 – Sanitary Sewerage Systems.

1.04 CONTRACT

A. The Work shall be performed under lump sum bid items and reimbursable allowances.

1.05 SUMMARY BY REFERENCES

A. Work of the Contract can be summarized by references to the Contract, General Conditions, Supplementary Conditions, Specification Sections, Drawings, Addenda, and Modifications to the Contract Documents issued subsequent to the initial printing of this Project Manual and including, but not necessarily limited to, printed material referenced by any of these. It is recognized that work of the Contract is also unavoidably affected or influenced by governing regulations, natural phenomenon, including weather conditions and other forces outside the Contract Documents.

1.06 CONTRACTOR USE OF THE PREMISES

A. The immediate premises of work will be at the disposal of the Contractor during the construction period.

1.07 FILL MATERIAL

A. All fill material provided by Contractor shall be in full compliance with requirements stipulated in Section 33 23 01 – Excavation and Fill for Site Work, Section 31 23 33 – Trenching and Backfilling, and where specified elsewhere in the Contract Documents.

B. Contractor is solely responsible for providing suitable backfill material where needed at no additional cost to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXECUTION

A. General: Immediately after award of the Contract, thoroughly and clearly advise all necessary personnel as to the nature and extent of the project.

END OF SECTION

SECTION 01 14 02

UTILITY OBSTRUCTIONS

PART 1 GENERAL

1.01 WORK INCLUDED

A. General provisions for handling utility obstructions and relocations.

1.02 UTILITIES SHOWN ON DRAWINGS

A. The Engineer has made reasonable efforts to show the general location of existing underground and overhead utility lines on the Drawings; however, Contractor shall recognize that buried utilities may not be in the locations shown on the Drawings, or there may be other utilities that are not shown on the Drawings.

1.03 CONTRACTOR RESPONSIBILITIES

A. For excavation work in New Mexico, Contractor is responsible to comply with the New Mexico Excavation Law (NMEL), as published in New Mexico Statutes Annotated (NMSA) 1978, section 62-14. Section 62-14-3 of the law requires the excavating Contractor to:
   1. Call the local notification center of NM811 One-Call in advance of excavating.
   2. NM811 One-Call will notify utility owners or operators to locate and mark their utilities.
   3. Notify directly all utility owners or operators who are not members of the local one-call center to locate and mark their utilities.
   4. In general, any utility located on the Owner's plant or station property belongs to the Owner past the utility meter or other termination point. The Owner is responsible to locate and mark such utilities.
   5. Do not start excavation until all utility owners have located and marked their utilities.
   6. Do not use mechanical excavation equipment, including bores and plows, within 18″ horizontally of the utility marks (tolerance zone) and continue excavation in a manner necessary to prevent damange.
   7. Repair any damage to utilities caused by Contractor, and report to utility owner and NM811 One-Call.

B. Additional Owner Requirements:
   1. Use non-mechanical means of excavating within 18″ of marked utilities to expose the utilities such as by hand digging or vacuum / dry type potholing.

C. This Work will be considered incidental Work to the Contract Documents' Bid items.

1.04 RELOCATION OF OVERHEAD UTILITIES

A. Determine in advance of construction operations if overhead utility lines, support structures, poles, guys, etc., whether shown on the Drawings or not, will obstruct construction operations. If any obstruction to construction operations is evident, coordinate with the appropriate utility company to remove or relocate the utility obstructions. Any charges by any utility company for removal or relocation of overhead utilities are the sole responsibility of the Contractor at no additional cost to the Owner.

1.05 RELOCATION OF UNDERGROUND UTILITIES

A. Determine in advance of construction operations locations of all underground utilities (gas, telephone, fiber optic cable, electrical, cable TV, water, sewer), whether shown on the Drawings or not, that may interfere with Contractor's construction operations.

B. All Underground Utilities Except Water and Sewer Lines: Coordinate with the appropriate utility company to remove or relocate the existing utilities which interfere with construction. Utility company charges for relocating these existing utilities will be paid from the utility line relocation allowance listed on the Bid Proposal.

C. Water and Sewer Lines:
   1. Adjust alignment on any waterline which Contractor is constructing to avoid existing underground utility lines and / or to maintain a minimum 3′ of cover; take other measures necessary (encasement of water or sewer line, change of pipe material, etc.) to protect new and existing lines.
   2. Adjust alignment of all existing waterlines as appropriate or required to avoid interference with:
      a. New sewer lines, or
      b. New structures, or
      c. New roadway, or
      d. To maintain at least 3′ of cover over existing waterlines unless otherwise approved in writing by Engineer.
   3. The following incidental work to be performed at no additional cost to Owner: All work required to adjust alignment of new waterlines around any existing waterlines or sewer lines, or other measures necessary to protect new and existing lines.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 14 03

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 APPLICABLE CODES AND ORDINANCES

A. All Work shall conform to the current versions of all applicable building, mechanical, plumbing, and electrical codes.

B. Contractor is responsible for acquiring all applicable building, mechanical, plumbing, and electrical permits related to this project.

C. Comply with all local laws, ordinances, and regulations which may impact Contractor's work.

1.02 OSHA REQUIREMENTS

A. All equipment and facilities provided, including but not limited to, handrails, guardrails, grating, hoists, equipment guards, ladders, etc., shall meet OSHA requirements whether or not such requirements are specifically indicated or described in the Contract Documents.

B. Any conflicts between OSHA requirements and Contract Documents shall be brought to the attention of the Engineer on a timely basis for resolution.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 14 19

USE OF SITE

PART 1 GENERAL

1.01 AVAILABLE SITES

A. Sites and easement limits available for the construction of the project are shown on the Drawings. Contractor shall not utilize any land not indicated as being available without the written approval of the applicable landowner.

B. If the Contractor requires the entire width of right-of-way or easement for construction, it shall be the Contractor's responsibility to have a licensed land surveyor establish the right-of-way line where it is not apparent.

1.02 PROTECTION AND RESTORATION

A. All existing features and improvements to or on easements shall be restored by the Contractor equivalent to those existing prior to construction at no additional cost to the Owner. Compliance with special requirements or considerations indicated on the Drawings for the use of easements shall be the Contractor's responsibility at no additional cost to the Owner.

B. Trees within construction easement shall be preserved to maximum practical extent, unless specifically indicated in the Drawings.

1.03 SPECIAL CONSTRUCTION METHODS

A. Special and hand construction methods may be required to remain within the available easements. Such methods shall be used by the Contractor at no additional cost to the Owner.

B. Other Contractors could be working on related work at or near the site; therefore, the Contractor is expected to cooperate and provide adequate access to all other working parties at or near the site.

1.04 STAGING AREAS

A. Staging area will be provided by the Owner. See Drawings for locations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. For the purposes of this Specification Section, the terms “material and equipment” and “Products” have the same meaning and are used interchangeably.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract.

1.03 SUBSTITUTIONS AND PRODUCT OPTIONS

A. Contractor’s Options:
   1. For Products specified only by reference standard, select any product meeting that standard.
   2. For Products specified by naming several products or manufacturers, select any one of the products or manufacturers named, which complies with the specifications.
   3. For Products specified by naming one or more Products or manufacturers and “or equal”, “or Engineer approved equivalent”, or “Engineer reviewed equivalent”, or similar term, Contractor shall submit a request as for substitutions for any Product or manufacturer not specifically named. The use of brand names is for the purpose of describing the standard of quality, performance, and characteristics desired, and is not intended to limit or restrict competition.
   4. For Products specified by naming only one Product and manufacturer, there is no option. This is usually done in cases where the Owner has standardized on previously purchased products and spare parts at its facilities, and needs to maintain consistent training, operation, and maintenance programs.

B. Substitutions:
   1. For a period of 30 days after the Preconstruction Conference, Engineer will consider written requests from Contractor for substitution of Products.
   2. Submit a separate request for each Product, supported with complete data, with Drawings and samples as appropriate, including:
      a. Comparison of the qualities of the proposed substitution with that specified.
      b. Changes required in other elements of the work because of the substitution.
      c. Effect on the construction schedule.
      d. Cost data comparing the proposed substitution with the Product specified.
      e. Any required license fees or royalties.
      f. Availability of maintenance service, and source of replacement materials.
   3. Engineer shall be the judge of the acceptability of the proposed Product substitution.

C. Contractor's Representation:

1. A request for a Product substitution constitutes a representation that Contractor:
    a. Has investigated the proposed Product and determined that it is equal to or superior in all respects to that specified.
    b. Will provide the same warranties or bonds for the substitution as for the Product specified.
    c. Will coordinate the installation of an accepted substitution into the Work and make such other changes as may be required to make the Work complete in all respects. Upon request, submit to Engineer to-scale dimensioned electronic drawing files of the specific model of the requested substituted equipment items. Drawings shall show general arrangement plan and sections. Drawing files shall be in AutoCAD dwg format.
    d. Waives all claims for additional costs or contract time, under his responsibility, which may subsequently become apparent.

D. Engineer will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of the decision to accept or reject the requested substitution.

1.04 INTENT OF TECHNICAL SPECIFICATIONS

A. Since the specified materials and details of equipment and component fabrication and assembly are given for specific functional, operational, maintainability, and compatibility reasons, which are not detailed in the Contract Documents, any substitution shall provide the functional intent as well as the specified intent in all details, as determined by the Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Measurement and Payment.

B. Schedule of Values.

C. Application for Payment.

1.02 ADDITIONAL REQUIREMENTS

A. Agreement and corresponding Bid.

B. Conditions of the Contract: Progress payments and final payments.

1.03 MEASUREMENT AND PAYMENT

A. Lump Sum Items: Payment for all lump sum Bid items includes all Work, labor, and materials required to provide a complete ready to use installation.

B. Materials:
1. Payment for materials delivered but not fully incorporated in project only made if such materials are included in the Schedule of Values and if such materials are available for inspection at Contractor's jobsite yard.
2. For small projects for which a schedule of values is not required, payment for materials delivered but not fully incorporated in the project will only be made if such materials are available for inspection at Contractor's jobsite yard, and for which invoices are presented to Engineer.
3. Payment for materials delivered but not fully incorporated into the project is only allowed if made without any Contractor markup or any other associated fees.

C. Incidental Work:
1. All Work, labor, materials, appurtenances, activities, and requirements to complete the facilities complete in place and ready for use, and to comply with all requirements and conditions of the Contract Documents are considered incidental Work to the Contract Documents' bid items. No separate, additional, or special payment will be due the Contractor for incidental Work.
2. Above, on, or below ground obstructions, utilities, features or improvements which interfere with the Work or which must be moved, removed, and / or restored to accomplish the Work are considered as incidental Work for which

separate payment will not be made if separate Bid items or allowances are not specifically given for such in the Contract Documents.

3. Traffic control work, signs, and devices unless otherwise specifically provided in the Bid Schedule.
4. Final adjustment of existing or new manhole rims, water valves, water meter lids, and fire hydrants to new finished grade, unless otherwise specifically provided in the Bid Schedule.
5. Removal and / or replacement of sidewalk, curb and gutter, driveway pavement, medians, and gravel surface are considered incidental to work.
6. Pipe identification tape and marker posts.
7. Repair of existing water service lines of 1″ and smaller.
8. Repair of existing sewer service laterals of 4″ and smaller.
9. All clearing and disposal costs.
10. Preparation of Shop Drawings prior to delivery of materials.
11. Water bacteriological testing for disinfection of domestic water systems other than water wells.

D. Operation and Maintenance (O&M) Manual: For equipment requiring O&M manuals, no payment for installation of said equipment will be made to the Contractor until final O&M manuals have been submitted and accepted by the Engineer.

E. Mobilization, Insurance, and Bonds: Bid item amount is shown on the Bid Form.

F. Demobilization and Submittal of All Closeout Documents: Bid item is shown on the Bid Form. Fifty percent of bid item will not be paid until Contractor has completed all closeout submittals to Engineer as specified in Section 01 77 00 – Contract Closeout.

1.04 APPLICATIONS FOR PAYMENT

A. Requirements Included:
1. Submit Applications for Payment to Engineer in accordance with the schedule established by conditions of the Contract and Agreement between Owner and Contractor.

B. Format and Data Required:
1. Cover and signature page: As reviewed and approved by Engineer.
2. Sheet size: 8.5″ by 11″ or 8.5″ by 14″.
3. Payment items: Follow approved schedule of values.
4. Preparation: Typed or machine printed.
5. Columns Included:
    a. Bid or payment item (from schedule of values).
    b. Unit.
    c. Contract:
        1) Contract or scheduled unit price.
        2) Quantity.
        3) Total price.

d. Previously completed:
    1) Quantity.
    2) Total price.
e. Completed this period:
    1) Quantity.
    2) Total price.
f. Total to date:
    1) Quantity.
    2) Total price.

6. Contractor's standard format can be used if it meets these requirements or is approved by the Engineer.
7. Submit draft payment applications electronically in Microsoft Excel spreadsheet format to Engineer for review. Include all supporting documents in email to Engineer. Note: Payment applications in .pdf format for review purposes are not allowed.

C. Preparation of Application for Each Progress Payment:
1. Application Form:
    a. Fill in required information, including that for Change Orders executed prior to date of submittal of application.
    b. Fill in summary of dollar values to agree with respective totals indicated on continuation sheets.
    c. Execute certification with signature of a responsible officer of Contract firm.
2. Continuation Sheets:
    a. Fill in total list of all scheduled component items of Work, with item number and scheduled dollar value for each item.
    b. Fill in dollar value in each column for each scheduled line item when Work has been performed or products stored.
    c. List each Change Order executed prior to date of submission, at the end of the continuation sheets.
    d. List by Change Order Number and description, as for an original component item of Work.
3. Limits of Payment for partially Fire Suppression Line:
    a. Not to exceed 80% of Unit Price for sections of line for which trench compaction tests and finish grading of the trench are complete but pressure testing has not been successfully completed.
4. Limits of Payment for partially complete Fire Suppression Line:
    a. Not to exceed 80% of Unit Price for sections of line for which trench compaction tests and finish grading of the trench are complete but pressure testing has not been successfully completed.
    b. Not to exceed 90% of Unit Price for sections of line for which disinfection has not been successfully completed.

D. Substantiating Data for Progress Payments:
1. Submit with each copy of application:
    a. Properly identified invoices supporting requests for materials payments.
    b. Properly identified invoices for inspection testing allowance payments.

c. Labor standards certificate in accordance with example form to be provided by Engineer.
d. If required by Engineer, certificate of payment of all suppliers and subcontractors for which payment has previously been received from Owner, in accordance with example form to be provided by Engineer.
e. Copy of construction schedule showing progress to date.

E. Preparation of Application for Final Payment:
1. Fill in application form as specified for progress payments.
2. Provide certificate of payment of all suppliers and subcontractors.
3. Provide release of lien certificates from all subcontractors.

F. Submittal Procedure:
1. Review quantities and obtain concurrence of Engineer's field representative before submission.
2. Submit Applications for Payment to Engineer at the times stipulated in the Agreement.
3. Number: 7 printed copies of each final, executed application, unless otherwise agreed to at the Pre-Construction Conference.
4. When Engineer finds Application properly completed and correct, he will transmit certificate for payment to Owner, with copy to Contractor.

PART 2 PRODUCT (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 31 19

PROJECT MEETINGS

PART 1 GENERAL

1.01 MEETINGS

A. Contractor to attend at no additional cost to Owner.

B. Preconstruction conference to be scheduled by Engineer.

C. Monthly progress meetings.

D. Special meetings as deemed necessary and scheduled by Owner or Engineer.

E. Special and final inspections by Owner or Engineer when requested.

F. Contractor responsible for preparing progress meeting agenda and distribution of meeting notes at no additional cost to Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 13

CONSTRUCTION SCHEDULES

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Promptly after award of the Contract, prepare and submit to Engineer estimated initial baseline construction progress schedules for the Work.

B. Submit revised progress schedules.

C. Schedule subject to approval of Engineer.

D. Schedule construction working hours.

1.02 FORM OF SCHEDULES

A. Basis of Schedule: Critical path network analysis of construction activities.

B. Format of Graphic Display of Schedule Submitted to Engineer:
1. Gantt horizontal bar chart as a printed copy or in PDF electronic file format, as specified herein.
2. Horizontal Time Scale: Identify the first workday of each week.
3. Provide separate horizontal bar for each activity. In general, subdivide activities into sub-activities having durations no more than 15 working days, so that progress can be easily tracked.
4. List the activities in chronological order according to the start date of each activity.
5. Indicate durations and start / stop dates for each activity.
6. Indicate the predecessor and successor activities for each activity.
7. Identify which activities are on the critical path.

1.03 CONTENT OF SCHEDULES

A. Activities: Show the complete sequence of construction by activity.
1. Include activities for:
    a. Preparation of submittals for major equipment items.
    b. Procurement of major equipment items.
    c. Mobilization.
    d. Preparation of operation and maintenance manuals for major equipment items.
    e. Shakedown / startup testing.
    f. Punchlist work.
    g. Preparation of closeout documents.
    h. Any sequence or scheduling constraints specified in Section 01 12 16 – Sequence of Work.

B. Milestones: Indicate milestone dates for:
   1. Notice to Proceed.
   2. Notice of Substantial Completion.
   3. Final Completion.

1.04 PROGRESS REVISIONS

A. Indicate effective date of revision and show progress of each activity to date of submission.

B. Show changes occurring since previous submission of schedule:
   1. Major changes in scope.
   2. Activities modified since previous submission.
      a. Revised projections of progress and completion.
      b. Revised critical path activities.
      c. Other identifiable changes.

C. Provide a narrative report as needed to define:
   1. Problem areas, anticipated delays, and the impact on the schedule.
   2. Corrective action to be taken.

1.05 SUBMISSIONS

A. Submit initial baseline schedules within 15 days after start of Contract Time.
   1. Engineer will review schedules and return review comments within 10 days after receipt.
   2. If required, resubmit within 7 days after return of review copy.

B. Submit updated schedules to show actual progress of Work with each application for payment: Section 01 29 00 – Payment Procedures.

C. Submit revised progress schedules when requested by Engineer or whenever project is more than 5% behind approved schedule as determined by monthly request for payment.

1.06 DISTRIBUTION

A. Distribute copies of the initial baseline and monthly updated schedules as follows:
   1. Engineer's Review Copy: One printed copy or electronic file in .pdf format.
   2. Engineer's Record Copy: 4 printed copies.

1.07 CONSTRUCTION WORKING HOURS SCHEDULING

A. Notify Engineer at least 48 hours in advance of any work to be done outside of usual working hours or any change in usual working hours.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop Drawings.

B. Product Data.

C. Samples.

D. Contractor Responsibility.

E. Engineer Responsibility.

F. Schedule of Submittals.

1.02 RELATED WORK/REQUIREMENTS SPECIFIED ELSEWHERE

A. Conditions of the Contract: Definitions and Additional Responsibilities of Parties.

1.03 SHOP DRAWINGS

A. Present drawings in a clear and thorough manner.
   1. Sufficient detail to show kind, size, and arrangement and function of component materials and devices.

B. Minimum sheet size: 8-1/2″ by 11″.

1.04 PRODUCT DATA

A. Preparation:
   1. Provide information required in individual Sections.
   2. Where sheets are reproduced from a pamphlet, catalog, or similar publication, print the manufacturer's name and the title of the publication on each sheet, or set of sheets, if it is not already on the sheet.
   3. Clearly mark each copy to identify applicable products or models by either neatly encircling pertinent data and marking the circle with an arrow or by crossing out all extraneous data, with black, indelible ink. Do not use highlighter because it will not reproduce well.
   4. For items that may be installed at multiple locations throughout the project, such as pipe materials, valves, other pipe appurtenances, and field coatings, indicate in a cover letter where each item is intended to be installed.
   5. Show performance characteristics and capacities.
   6. Show dimensions and clearances required.

7. Indicate weights of major components.
8. Indicate materials of construction.
9. Do not prepare submittal materials from facsimile (FAX) copies of product data unless specifically authorized by Engineer.
10. Material described on Drawings but not shown in the Specifications: Provide cut sheets as a minimum, or as called for on the Drawings.

B. Installation data for all materials and equipment for which operation and maintenance (O&M) manuals will not be provided. Also provide installation data with Shop Drawing prior to delivery of equipment, if specified in the equipment Section.
1. Provide manufacturer's installation instructions and recommendations.
2. Provide referenced standards for installation.

C. Manufacturer's standard schematic drawings, diagrams, descriptions, and information:
1. Modify to delete information that does not apply to Work.
2. Supplement to provide information specifically applicable to the Work.

1.05 SAMPLES

A. Samples shall be of sufficient size and quantity to clearly illustrate:
1. Functional characteristics of the project, with integrally related parts and attachment devices.
2. Full range of color, texture, and pattern.

B. Include identification on each sample, with full project information.

1.06 CONTRACTOR RESPONSIBILITIES

A. If substitutions of materials are proposed, conform to Section 01 25 00 – Substitution Procedures.

B. Submit exactly the required quantity of materials.

C. Review Shop Drawings, Product Data, Certificates, Electrical Schematics, Electrical Connection Diagrams, Test Reports, Installation Instructions, Samples, and similar required submittal materials for completeness and accuracy prior to submission. Return unsatisfactory submittal materials to the supplier or manufacturer for correction.

D. Determine and Verify:
1. Field measurements.
2. Field construction criteria.
3. Catalog numbers and similar data.
4. Conformance with Specifications.
5. Conflicts with other items of construction past, present, or future.
6. Submittal materials are legible.

E. Coordinate each submittal with requirements of the Work and of the Contract Documents.

F. Notify the Engineer in writing, at time of submission, of any deviations in submittal from Contract requirements.

G. Begin no fabrication or work that requires submittals until return of submittals with Engineer's final review.

1.07 SUBMITTAL PROCEDURES

A. Make submittals promptly and in such sequence as to cause no delay in the Work.

B. Execute and attach “Contractor Submittal Form” to each submittal. Sample form is attached to the end of this Section. Sign, date, and forward the Form and the Contractor reviewed submittal materials to the Engineer.

C. Number submittals by respective section number followed by an “S” for submittals, “P” for preliminary O&M, and “F” for final O&M.

D. Include a copy of the respective Specification Section(s). For each paragraph of the Specifications, confirm that the submittal complies and include a tab and sheet number where the information can be found for each paragraph of the Specification. If the submittal does not comply with a paragraph, identify as such and provide an explanation why it does not. If this information is not provided with each submittal and preliminary O&M, then the Engineer will return as “Not Reviewed”. Final O&Ms are excluded from this requirement.

1.08 RESUBMISSION REQUIREMENTS

A. Make corrections / changes in the submittals to comply with comments made by the Engineer and resubmit until final review.
   1. Attach Engineer’s comments from previous submittal annotated with action taken in the current submittal.

B. Number resubmittals as identified in paragraph entitled “Submittal Procedures” and follow with a numeric value which identifies the number of resubmittals pertaining to that specific submittal.

C. Shop Drawings and Product Data:
   1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
   2. Indicate any changes that have been made other than those requested by the Engineer.

D. Samples: Submit new samples as required for initial submittal.

E. Specifically direct attention in writing to revisions other than the corrections called for by the Engineer on previous submittals.

F. Include a copy of previous "Contractor Submittal Forms".

G. Include a copy of previous Engineer's comments, marked to show Contractor's responses. If not provided, submittal will be returned as "Rejected/Resubmit."

H. Furnish all applicable information in the resubmittal, including information on material that was favorably reviewed. Upon request, the Engineer will return all but one of the original submittals for reuse by the Contractor.

I. Partial resubmittals are allowed, but following favorable review of the partial resubmittal, provide complete resubmittals including all favorably reviewed material.

1.09 DISTRIBUTION

A. Copy and distribute submittals returned by Engineer marked "No Exception Taken" or "Make Corrections Noted":
   1. Job site file.
   2. Job site record documents file.
   3. Subcontractors and suppliers as appropriate.

B. If returned by Engineer, distribute samples marked "No Exception Taken" or "Make Corrections Noted" as directed by the Engineer.

1.10 ENGINEER RESPONSIBILITIES

A. Review submittals with reasonable promptness as specified herein in the Timeliness subsection.

B. Return submittals with completed Contractor Submittal Form with signature and attach review comments if needed.

C. Return one copy of submittal to Contractor.

D. Submittal Review Status Categories:
   1. "NO EXCEPTION TAKEN" – Reviewed for general conformity to the requirements of the Contract Documents. Quantities shown not verified. Contractor's full responsibility is in no way relieved by this action.
   2. "MAKE CORRECTIONS NOTED" – Reviewed and noted for general conformity to requirements of the Contract Documents. Quantities shown not verified. Contractor's responsibility is in no way relieved by this action. Resubmittal is not required, provided Contractor concurs with, accepts, and complies with A/E's comments.
   3. "REVISE & RESUBMIT" – Reviewed and not accepted. Provide missing information, make corrections as noted, and resubmit full submittal.
   4. "REJECTED/RESUBMIT" – Reviewed or partially reviewed and not accepted. Resubmit information in conformance with the Contract Documents.
   5. "RECEIPT ACKNOWLEDGED" – Submittal for Section is not required or submittal is being held by A/E for coordination of work with that of another Section.

E. Return submittals with only cursory review and marked “Revise & Resubmit” or “Rejected/Resubmit” when:
   1. It becomes apparent the submittal is not acceptable,
   2. The submittal has not been thoroughly reviewed by the Contractor,
   3. Submittal does not cover all of a Section,
   4. Submittal improperly contains information for more than one Section, or
   5. Submittal is illegible.

F. Return resubmittals only containing partial information.

G. Discard submittal copies in excess of those scheduled.

1.11 LIMITS OF ENGINEER’S RESPONSIBILITY

A. Engineer’s review does not constitute acceptance or responsibility for accuracy of dimensions or quantities.

B. Engineer’s review does not relieve the Contractor from meeting requirements of the Contract Documents.

C. Engineer’s review does not constitute approval for any deviation from the Contract Documents unless such deviations are specifically stated as such on the submittal and specifically allowed by the Engineer by specific written notification for each such variation.

D. Engineer’s review does not relieve the Contractor from responsibility for errors or omissions in the Shop Drawings or from responsibility for having complied with the Contractor’s Responsibilities portion of this Section.

E. Engineer’s review will be only for conformance with the design concept of the Project and for compliance with the information given in the Contract Documents and shall not extend to means, methods, techniques, sequences, or procedures of construction or to safety precautions or programs incident thereto. The review of a separate item as such will not indicate approval of the assembly in which the item functions.

1.12 PAYMENT AND TIME FOR REVIEW OF EXCESSIVE SUBMITTALS

A. Submittals after first resubmittal:
   1. Owner will charge Contractor for all of Engineer’s review time and costs at Engineer’s standard billing rates through a credit by Change Order.
   2. Reviewed by Engineer at convenience of the Engineer.

1.13 FORMAT

A. Furnish individual submittal packages for each Section. Include a separate Contractor Submittal Form for each Section.

B. The Contractor may elect to make a single submittal for all Sections supplied by a single manufacturer / supplier. Such single submittal must conform to the following:
   1. Index the submittal with tabs with one and only one Section under a single tab.
   2. Include a separate Contractor Submittal Form for each Section.
   3. Identify submittal packages on the front or on the first page with the Owner's name, the project name, the Contractor's name, the subcontractor's name, the date, and the contents of the binder, including the Specification Section(s), title(s), and number(s).

C. Minimum Acceptable Binding Methods:
   1. Submittals of no more than 6 sheets per set, including cover sheets: Staple in sets.
   2. Submittals of 7 to 25 sheets per set: Punch sheets and assemble in a soft-cover binder with 3-hole metal fold-down clips to hold pages or in a ring binder.
   3. Submittals of 26 to 75 sheets: Punch sheets and assemble in a hard-cover ring binder.
   4. Submittals of more than 75 sheets: Punch sheets and assemble in a hard-cover D-ring binder.
   5. Fold 11″ by 17″ drawings to fit into bound sets of submittals.
   6. Furnish drawings larger than 11″ by 17″ folded and inserted in pockets in the binders. Provide a complete index in the submittal literature set.

1.14 TIMELINESS

A. As a minimum, the Contractor shall allow the following number of calendar days for submittal process:

	Engineer's Review Time
Initial Submittal	14
Resubmittal	7
Operation and Maintenance Manuals	16

   1. Engineer's Review Time is the time the submittal is in the Engineer's office.
   2. The Engineer will process first those items with higher priority based on a written request from the Contractor.

B. Turnaround time for complex submittals (such as process equipment systems with multiple components, mechanical systems, electrical equipment, instrumentation control systems, and electrical process and instrumentation drawings) may exceed the total indicated in Paragraph 1.14. A.

C. Materials, equipment, supplies, or labor to install such materials or equipment for which submittals have not been marked "No Exception Taken" or "Make Corrections Noted" are not eligible for payment and such materials and equipment shall not be allowed on the job site.

1.15 PROJECT RECORD DOCUMENTS

A. If the equipment installed deviates in any way from the submittal for the equipment, then submit copies of submittals that are corrected to show actual equipment supplied.

1.16 ATTACHMENTS TO THIS SECTION

A. Contractor Submittal Form.

1.17 REQUIRED SUBMITTALS

A. Quantity, submit in **one** of the following formats:
   1. Electronic Format:
      a. Submittals in electronic searchable .pdf format are allowed.
      b. Engineer's submittal review will be returned to Contractor in electronic format.
      c. After an electronic submittal is accepted by the Engineer as final, submit one printed copy to Engineer to retain for field use.
      d. Any additional printed copies received will be discarded by Engineer.
      e. Refer to Section 01 78 39 – Project Record Documents for submittal of one printed record set of submittals at Contract Closeout.
   2. Or Printed Format:
      a. For submittals in printed format only, submit 5 copies. Engineer will retain 4 copies.
      b. Engineer will return one copy to Contractor.
      c. Any additional copies received will be discarded by Engineer.

B. See individual Specification Sections for description of required submittals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

#	**CONTRACTOR SUBMITTAL FORM**	
Specification No. Title/Description:	Project: **Santa Fe County** **Hondo 2 Fire Suppression Line**	Contractor's Submittal No.: Date: Product Description:
	CONTRACTOR:	Dates of any previous submissions:
	Subcontractor / Supplier: Specification No.:	Manufacturer: Drawing Nos.:
	Are there any deviations to the Contract Documents? ☐ No ☐ Yes (Explain and Identify:) _____ *Undisclosed deviations/modifications do not relieve the Contractor from the obligation to provide the specified product and detail of installation, and may be cause for rejection of the Work. Deviations and modifications must be listed here or in a separate Request for Substitution.*	

CONTRACTOR'S CERTIFICATION: This submittal has been reviewed by the Contractor in compliance with Submittal Procedures of the CONTRACT DOCUMENTS' SPECIFICATIONS. Any deviations or substitutions to the CONTRACT DOCUMENTS have been identified above and submitted in compliance with the CONTRACT DOCUMENTS.

If this is a re-submittal, identify on a sheet(s) attached to this form all responses to comments on the previous submittal and all changes other than those specifically requested by the A/E on the previous submittal.

Signed _____ Date:

A/E'S REVIEW RESPONSE

(*Refer to Submittal Specification for explanation of categories.*)

Date Received:	No. Copies Received:
☐ **NO EXCEPTION TAKEN**	
☐ **MAKE CORRECTIONS NOTED**	
☐ **REVISE & RESUBMIT**	
☐ **REJECTED/RESUBMIT**	
☐ **RECEIPT ACKNOWLEDGED**	
By:	Date:
Date Returned:	No. Copies Returned:
A/E'S COMMENTS, IF ANY:	
A/E'S ATTACHMENTS, IF ANY:	

Note: DO NOT combine items from different specification sections into one submittal unless called for in the Section. If provisions in the "General Conditions" conflict with this form, the provisions as stated in the "General Conditions" shall prevail.

MOLZENCORBIN
ENGINEERS | ARCHITECTS | PLANNERS
2701 Miles Road SE, Albuquerque, NM 87106

SECTION 01 42 13

ABBREVIATIONS AND ACRONYMS

PART 1 GENERAL

1.01 SPECIAL

A. A/E – Architect/Engineer.

B. EPA – United States Environmental Protection Agency.

C. NMAC – New Mexico Administrative Code.

D. NMED – New Mexico Environment Department.

E. NMSA – New Mexico Statutes Annotated.

F. OSE – Office of State Engineer.

G. OSHA – Occupational Safety and Health Administration.

H. SFCU – Santa Fe County Utilities.

1.02 OTHER

A. As indicated on the Drawings, as apparent from the Drawings, or in accordance with standard practice.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Abbreviations and acronyms used in Contract Documents to identify reference standards.

1.02 QUALITY ASSURANCE

A. Application: When a standard is specified by reference, comply with requirements and recommendations stated in that standard, except when requirements are modified by the Contract Documents, or applicable codes establish stricter standards.

B. Publication Date: The publication in effect on the date of bid, except when a specific publication date is specified.

1.03 ABBREVIATIONS, NAMES, AND ADDRESSES OF ORGANIZATIONS

A. Obtain copies of referenced standards direct from publication source, when needed for proper performance of Work, or when required for submittal by Contract Documents.

AA	Aluminum Association 818 Connecticut Avenue, NW Washington, D.C. 20006
AASHTO	American Association of State Highway and Transportation Officials 444 North Capital Street, NW Washington, DC 20001
ABMA	American Bearing Manufacturers Association (formerly Anti-friction Bearing Manufacturers Association) 2025 M. Street, NW, Suite 800 Washington, DC 20036-3309
ACI	American Concrete Institute Box 19150 Reford Station Detroit, MI 48219
ADAAG	Americans with Disabilities Accessibility Act Guidelines www.access-board.gov/adaag

ADC	Air Diffusion Council 230 North Michigan Avenue Chicago, IL 60601
AGMA	American Gear Manufacturers Association 1001 N. Fairfax Street, Suite 500 Alexandria, VA 22314-1587
AI	Asphalt Institute Asphalt Institute Building College Park, MD 20740
AISC	American Institute of Steel Construction 1221 Avenue of the Americas New York, NY 10020
AISI	American Iron and Steel Institute 1000 16 Street, NW Washington, DC 20036
ANSI	American National Standards Institute 1430 Broadway New York, NY 10018
APWA	American Public Works Association 1313 E. 60th Street Chicago, IL 60637
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers 345 East 47 Street New York, NY 10017
ASME	American Society of Mechanical Engineers 345 East 47 Street New York, NY 10017
ASTM	American Society for Testing and Materials International 1916 Race Street Philadelphia, PA 19103
AWI	Architectural Woodwork Institute 1411 S. Rimpau Avenue, Suite 213 Corona, CA 92879-7500
AWWA	American Water Works Association 6666 W. Quincy Avenue Denver, CO 80235

AWS	American Welding Society 2501 NW 7 Street Miami, FL 33125
CBM	Certified Ballast Manufacturers 1422 Euclid Avenue Cleveland, OH 44115
CPSC	Consumer Products Safety Commission www.cpsc.gov
CRSI	Concrete Reinforcing Steel Institute 180 North LaSalle Street, Suite 2110 Chicago, IL 60601
CSA	Canadian Standards Association 178 Rexdale Boulevard Rexdale, Ontario, Canada M9W 1R3
DHI	Door and Hardware Institute 7711 Old Springhouse Road McLean, VA 22102
EEI	Edison Electric Institute 1111 19 Street, NW Washington, DC 20036
ETL	Electrical Testing Laboratories 2319 Dorris Place Los Angeles, CA 90031
FM	Factory Mutual www.fmglobal.com
FS	Federal Specification General Services Administration Specifications and Consumer Information Distribution Section (WFSIS) Washington Navy Yard, Bldg. 197 Washington, DC 20407 www.fss.gsa.gov/pub/fed-specs.cfm
GA	Gypsum Association 1603 Orrington Avenue Evanston, IL 60201
HI	Hydraulic Institute 6 Campus Drive, First Floor North Parsippany, NJ 07054-4405

IBC	International Building Code published by International Code Council 500 New Jersey Avenue, NW, 6th floor Washington, DC 20001
ICEA	Insulated Cable Engineers Association P.O. Box P South Yarmouth, MA 02664
IEEE	Institute of Electrical and Electronics Engineers 345 East 47 Street New York, NY 10017
ISA	Instrument Society of America 67 Alexander Drive P.O. Box 12277 Research Triangle Park, NC 27709
MIL	Military Specification Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
NACE	National Association of Corrosion Engineers P.O. Box 21830 Houston, TX 77218
NEC	National Electric Code Batterymarch Park P.O. Box 9101 Quincy, MA 02269
NEMA	National Electrical Manufacturers' Association 2101 L Street, NW Washington, DC 20037
NESC	National Electric Safety Code 345 East 47 Street New York, NY 10017
NFPA	National Fire Protection Association 470 Atlantic Avenue Boston, MA 02210
NFPA	National Forest Products Association 1619 Massachusetts Avenue, NW Washington, DC 30036

NMBC	New Mexico Building Code Code Regulations Licensing Department Construction Industries Divisions 725 St. Michaels Drive Santa Fe, NM 87504
NRCA	National Roofing Contractors Association www.nrca.net
NSF	National Sanitation Foundation International P.O. Box 130140 789 N. Dixboro Road Ann Arbor, MI 48105
NWWDA	National Wood Window and Door Association P.O. Box 34518 Memphis, TN 38184
OSHA	Occupational Safety & Health Administration www.osha.gov
PCA	Portland Cement Association 5420 Old Orchard Road Skokie, IL 20076
PCI	Prestressed Concrete Institute 20 North Wacker Drive Chicago, IL 60606
SDI	Steel Door Institute 712 Lakewood Center North Cleveland, OH 44107
SIGMA	Sealed Insulating Glass Manufacturer's Association 111 East Wacker Drive Chicago, IL 60601
SJI	Steel Joist Institute 1703 Parham Road Suite 204 Richmond, VA 23229
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association, Inc. 8224 Old Court House Road Vienna, VA 22180

SSPC	The Society for Protective Coatings (formerly Steel Structure Painting Council) 40 24th Street, 6th Floor Pittsburgh, PA 15222-4656 (877) 281-7772
UBC	Uniform Building Code International Conference of Building Officials 5360 Workman Mill Road Whittier, CA 90601-2298
UL	Underwriters' Laboratories, Inc. 333 Pfingston Road Northbrook, IL 60062
UPC	Uniform Plumbing Code International Association of Plumbing/Mechanical Officials 20001 Walnut Drive, South Walnut, CA 91789-2825

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 16.14

DIGITAL VIDEO RECORDING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Digital video record entire area affected by construction prior to construction.

B. Perform additional digital video recording during project as directed by Engineer.

C. Have digital video files available with viewing facilities for viewing by Engineer, Owner, and Contractor when requested.

D. Digital video recording requirement part of Contractor's general overhead for which separate payment shall not be made.

1.02 EQUIPMENT REQUIREMENTS

A. Digital Video Camera Equipment:
1. Recording Media: DVD.
2. Format: Digital files compatible with standard playback equipment, and as agreed upon beforehand with Owner.
3. Color picture.
4. Audio, clear narration in English of significant features observed during recording.
5. Zoom lens.
6. Indexing of locations on discs for easy reference.
7. File downloading capability: To a personal computer (PC) that operates on Microsoft operating system of Windows XP or higher.

B. Video Viewing System:
1. Screen: 26″ (diagonal dimension) or greater.
2. Color picture.
3. Audio.
4. Indexing of locations on discs for easy reference.
5. Slow motion.
6. Stop frame for viewing single picture.
7. Reversing.
8. Compatible with digital recording equipment.

C. Discs:
1. Catalogued, cross-referenced, indexed.

1.03 SYSTEM OPERATOR REQUIREMENTS

A. Familiar and experienced with equipment and equipment operations.

1.04 AVAILABILITY

A. Recording equipment and operator available on-site within 0.5 hours of Engineer's request during Contractor's normal working hours if scheduled.

B. Viewing system and appropriate discs available at meetings as scheduled or when requested by Engineer.

C. Deliver one complete set of files to the Owner upon acceptance by the Engineer.

1.05 DIGITAL VIDEO RECORDING REQUIRED IF SCHEDULED

A. All streets, alleys, curbs, culverts, vaults, manholes, areas, locations where construction will be done:
   1. Both directions along utility line or street to be constructed or reconstructed.
   2. Maximum speed of camera movement 4′ per second.
   3. Lateral and close-up view of any features or facilities that may be affected by construction.
   4. Not more than 14 calendar days prior to actual construction.
   5. Include data documentation on disc.
   6. Audio explanation of significant features observed during recording.
   7. Recording results acceptable to Engineer.
   8. Special documentation if requested by Engineer.

B. Drainage Documentation:
   1. Following general rainfall over area.
   2. Prior to any construction if practical.
   3. All areas where work will be performed.
   4. Recorded to document general preconstruction drainage patterns, problems, street surface conditions, and related items.
   5. On request of Engineer.

1.06 SCHEDULE OF REQUIRED DIGITAL VIDEO RECORDING

A. Provide digital video recording as outlined in Part 1.05. A.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 45 23

TESTING LABORATORY SERVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

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

B. If the work includes bacteriological testing of water associated with disinfection, refer to Section 33 13 13 – Disinfection of Domestic Water Systems for certification of the water test laboratory and payment procedures for bacteriological testing.

1.02 ADDITIONAL REQUIREMENTS

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

B. Each specification section listed: Laboratory tests required and standards for testing.

1.03 SUBMITTALS

A. Submit for Engineer's review the name of proposed Laboratory to perform required testing and their statement of qualifications.
   1. Name(s) of professional engineer(s) registered in the state in which the project is located who will be signing test results.
   2. Qualifications of technicians and their certifications, such as NICET (National Institute for Certification in Engineering Technologies), to perform testing required for this project as specified in ASTM E329.
   3. Evidence of current participation in the AASHTO Materials Reference Laboratory (AMRL) program, and accreditation of the laboratory and list of test methods currently accredited by the AASHTO Accreditation Program (AAP).

1.04 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 Institute of Standards and Technology (NIST) (formerly 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 50 miles of the project site.

1.05 LABORATORY DUTIES

A. Cooperate with Engineer 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 Engineer and Contractor of observed irregularities or deficiencies of work or products.

D. Promptly submit written report of each test; one copy to Engineer, one copy to Structural Engineer, 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 technician.
   5. Date and time of sampling or field testing.
   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 test.
   11. Results of tests and compliance with Contract Documents.
   12. Interpretation of test results when requested by Engineer.

E. Perform additional tests as required by Engineer or the Owner.

F. In all cases, the Engineer 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.

1.06 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.

1.07 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 to be tested.
   2. To obtain and handle samples at the Project site or at the source of the product to be tested.
   3. To facilitate tests.
   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 Engineer.

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

1.08 PAYMENT

A. A Bid Item is included in the Bid Proposal to cover field testing performed by an independent testing laboratory including mileage and sample shipping.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 51 00

TEMPORARY UTILITIES

PART 1 GENERAL

1.01 WATER

A. Water required for construction may be drawn from Owner's water system. Coordinate with Owner's Water Department representative for water service and installation of Owner-provided water meter.

1.02 ELECTRICITY

A. Contractor's sole responsibility and expense.

1.03 OTHER

A. All other temporary utilities required to accomplish the Work to be the responsibility of and at the Contractor's sole expense.

1.04 RELATED REQUIREMENTS

A. Section 01 52 13 – Field Offices and Sheds.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 52 13

FIELD OFFICES AND SHEDS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Furnish, install, and maintain storage and work sheds needed for construction and temporary field offices during entire construction period.

B. At completion of Work, remove field offices, sheds, and contents.

1.02 OTHER REQUIREMENTS

A. Prior to installation of offices and sheds, consult with Engineer on location, access, and related facilities.

B. Furnish, install, and maintain temporary electrical, internet, and other services, as needed.

1.03 REQUIREMENTS FOR FACILITIES

A. Construction:
1. Structurally sound, weathertight, with floors raised above ground.
2. Temperature transmission resistance: Compatible with occupancy and storage requirements.
3. At Contractor's option, portable or mobile buildings may be used. Mobile homes, when used, shall be modified for office use.

B. Contractor's Office and Facilities:
1. Size: As required for general use.

C. Storage Sheds:
1. To requirements of various trades.
2. Dimensions: Adequate for storage and handling of products.
3. Ventilation: Comply with specified codes and requirements for products stored.
4. Heating: Adequate to maintain temperatures specified in respective sections for products stored.

1.04 USE OF EXISTING FACILITIES

A. Existing facilities at site shall not be used for field offices or for storage.

1.05 MATERIALS, EQUIPMENT, FURNISHINGS

A. May be new or used, but must be serviceable, adequate for required purpose, and must not violate applicable codes or regulations.

1.06 PREPARATION

A. Fill and grade sites for temporary structures to provide surface drainage.

1.07 INSTALLATION

A. Construct temporary field offices and storage sheds on proper foundations; provide connections for utility services.
   1. Secure portable or mobile buildings when used.
   2. Provide steps and landings at entrance doors.

1.08 MAINTENANCE AND CLEANING

A. Provide periodic maintenance and cleaning for temporary structures, furnishings, equipment, and services.

1.09 REMOVAL

A. Remove temporary field offices, contents, and services when no longer needed.

B. Remove storage sheds when no longer needed.

C. Remove foundations and debris; grade Site to required elevations and clean areas.

1.10 MEASUREMENT AND PAYMENT

A. Field offices and sheds are considered incidental to the Work to be completed. No separate payment shall be made for field offices and sheds.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 56 00

BARRIERS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Furnish, install, and maintain suitable barriers as required to prevent public entry and to protect the public, Work, and existing facilities; remove when no longer needed or at completion of Work.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.02 BARRIERS

A. Materials to Contractor's option, as appropriate to serve required purpose.

PART 3 EXECUTION

3.01 GENERAL

A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for required purposes.

B. Maintain barrier during entire construction period.

C. Relocate barriers as required by progress of construction.

D. Provide barriers to protect the public from excavations and hazardous conditions and operations.

E. If a trench or excavation, where accessible to the public, is left open at night or weekends, it must be barricaded with flashing lights.

3.02 FENCES

A. Fence Location:
   1. Locate fence to enclose substantially entire Project site or that portion the Contractor establishes as required to encompass entire Project construction operation.
   2. Locate vehicular entrance gates in suitable relation to construction facilities and to avoid interference with traffic on public thoroughfares.

B. Chainlink Fence:
   1. Fence not generally required for sewer lines, waterlines, and street work.
   2. Fence generally required for treatment plant, pump stations, and similar facilities.

3.03 REMOVAL

A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed.

B. Clean and repair damage caused by installation, fill and grade areas of the site to required elevations and slopes, and clean the area.

END OF SECTION

SECTION 01 57 00

TEMPORARY CONTROLS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Provide and maintain methods, equipment, and temporary construction, as necessary to provide controls over environmental conditions at the construction site and related areas under Contractor's control; remove physical evidence of temporary facilities at completion of Work.

1.02 NOISE CONTROL

A. Limit to practical extent.

B. Limit to normal working hours when practical.

1.03 DUST CONTROL

A. Provide positive methods and apply dust control materials to minimize raising dust from construction operations, and provide positive means to prevent airborne dust from dispersing into the atmosphere.

1.04 WATER CONTROL

A. Provide methods to control surface water to prevent damage to the Project, the site, or adjoining properties.
   1. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas, and to direct drainage to proper runoff.

B. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface water.

C. Dispose of drainage water and dewatering water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas. Any public agency or private landowner arrangements, permits, or other approvals required for the discharge of water are the sole responsibility of the Contractor.

1.05 PEST CONTROL

A. As found necessary during construction.

1.06 RODENT CONTROL

A. Provide rodent control as necessary to prevent infestation of construction or storage area.
   1. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.
   2. Should the use of rodenticides be considered necessary, submit an informational copy of the proposed program to Owner with a copy to Engineer. Clearly indicate:
      a. The area or areas to be treated.
      b. The rodenticides to be used, with a copy of the manufacturer's printed instructions.
      c. The pollution preventive measures to be employed.

B. The use of any rodenticide shall be in full accordance with the manufacturer's printed instructions and recommendations and applicable laws and regulations.

1.07 DEBRIS CONTROL

A. Maintain all areas under Contractor's control free of extraneous debris.

B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage, and parking areas, or along access roads and haul routes.
   1. Provide containers for deposit of debris as specified in Section 01 74 00 – Cleaning and Waste Management.
   2. Prohibit overloading of trucks to prevent spillages on access and haul routes.
      a. Provide periodic inspection of traffic areas to enforce requirements.

C. Schedule periodic collection and disposal of debris as specified in Section 01 74 00 – Cleaning and Waste Management.
   1. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.

1.08 POLLUTION CONTROL

A. Provide methods, means, and facilities required to prevent the discharge of hazardous substances from construction operations.

B. Perform emergency measures required to report, contain, and transport harmful substance discharges or spills by complying with Federal and State regulations.

C. Take special measures to prevent harmful substances from entering public waters.
   1. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.

D. Provide systems for control of atmospheric pollutants.
   1. Prevent toxic concentrations of chemicals.
   2. Prevent harmful dispersal of pollutants into the atmosphere.

1.09 EROSION CONTROL

A. Plan and execute construction and earthwork by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas, to prevent erosion and sedimentation.
   1. Hold the areas of bare soil exposed at one time to a minimum.
   2. Provide temporary control measures such as berms, dikes, drains, straw bales, silt fences, and wattles.

B. Construct fills and waste areas by selective placement to eliminate surface silts or clays which will erode.

C. Periodically inspect earthwork to detect any evidence of the start of erosion, apply corrective measures as required to control erosion.

1.10 SECURITY CONTROL

A. Provide temporary padlocks during construction on gates, hatches, doors, panels, and boxes having hasps. Coordinate with Owner to install specified permanent padlocks at completion of project.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 23

FIELD ENGINEERING

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Provide and Pay for Field Engineering Services Required for Project:
   1. Survey work required in execution of Project.
   2. Engineering work for civil, structural, or other professional engineering services specified or required to execute Contractor's construction methods.

1.02 QUALIFICATIONS OF SURVEYOR OR ENGINEER

A. Survey work during construction may be completed by the Contractor; however, all locations / elevations must be verified at the completion of the Contract by a qualified land surveyor registered in the state in which the construction is being done. Final survey data shall be documented on the Record Drawings.

B. Engineering work by qualified professional engineer registered in the state in which the construction is being done.

1.03 SURVEY REFERENCE POINTS

A. Original basic horizontal and vertical control points for the Project are those designated on Drawings.

B. Locate existing control points, reestablish original control points, protect control points prior to starting site work, and preserve all permanent reference points during construction.
   1. Make no changes or relocations without prior written notice to Engineer.
   2. Report to Engineer when any reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
   3. Require surveyor to replace Project control points which may be lost or destroyed.
   4. Establish replacements based on original survey control.

C. Reconfirm all existing and original vertical elevation control points prior to the use of such points for project surveying. Reference control point for such reconfirmation is shown on Drawings.

D. Refer any apparent discrepancies to Engineer for resolution. Surveyor to assist Engineer with field work required for resolution of such apparent discrepancies.

1.04 PROJECT SURVEY REQUIREMENTS

A. Establish lines and levels, locate, and lay out, by instrumentation and similar appropriate means:
   1. Site improvements:
   2. Stakes for grading, fill, and topsoil placement.
   3. Utility slopes and invert elevations.
   4. Batter boards for structures.
   5. Building foundation, column locations, and floor levels.
   6. Controlling lines and levels required for mechanical and electrical trades.

B. From time to time, verify layouts by same methods as required for control of the Work and when requested by the Engineer.

C. The Contractor shall take reasonable efforts to protect all existing property corners, permanent benchmarks, right-of-way markers, government established monuments, and similar reference points. If any must be disturbed, the monuments must be referenced before removal and replaced as soon as work in the area is completed. Referencing and replacing shall be done by a licensed surveyor, and in the case of U.S.G.S. monuments and NMDOT right-of-way markers, shall be a first order survey work.

1.05 RECORDS

A. Maintain a complete, accurate log of all control and survey work as it progresses.

B. On completion of improvements, prepare Record Drawings showing all dimensions, locations, and elevations of construction.

1.06 SUBMITTALS

A. Submit name and address of surveyor and professional engineer to Engineer.

B. Submit documents certifying current registration of surveyor and engineer.

C. On request of Engineer, submit documentation to verify accuracy of field engineering work.

D. Survey data and computations for all Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 74 00

CLEANING AND WASTE MANAGEMENT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Execute cleaning during progress of the Work and at completion of the Work, as required by General Conditions.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract.

B. Each Specification Section: Cleaning for specific products or work.

1.03 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property, and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

A. Execute periodic cleaning to keep the Work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris, resulting from construction operations.

B. Provide on-site containers for the collection of waste materials, debris, and rubbish.

C. Remove waste materials, debris, and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.02 DUST CONTROL

A. Clean interior spaces prior to the start of finish painting and continue cleaning on an as-needed basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

3.03 FINAL CLEANING SCHEDULE

A. Type 1 – For Buildings:
   1. Employ skilled workmen for final cleaning.
   2. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.
   3. Wash and shine glazing and mirrors.
   4. Polish glossy surfaces to a clear shine.
   5. Ventilating Systems:
      a. Clean permanent filters and replace disposable filters if units were operated during construction.
      b. Clean ducts, blowers, and coils if units were operated without filters during construction.
   6. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
   7. Prior to final completion or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify that the entire Work is clean.

B. Type 2 – For Grounds and Exposed Concrete Work:
   1. Broom clean exterior paved surfaces; rake clean other ground surfaces.
   2. Broom clean all concrete slabs.
   3. Remove grease, mastic, adhesives, dust, dirt, stains, labels, and other foreign materials from all piping systems surfaces and equipment.
   4. Prior to final completion or Owner occupancy, Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas to verify that the entire Work is clean.

END OF SECTION

SECTION 01 75 01

FIELD SERVICE REPRESENTATIVE

PART 1 GENERAL

1.01 FIELD SERVICE REPRESENTATIVE

A. Shall be employed by the manufacturer and shall regularly engage in field checkout, calibration, testing, troubleshooting, installation supervision, and startup of equipment or systems.

B. Shall have qualifications and experience acceptable to the Owner and the Engineer. Submit name and qualifications of Field Service Representative with the Shop Drawing submittal of the applicable equipment item.

C. A manufacturer's sales representative will not be acceptable as a field service representative unless the Contractor applies for and receives in writing a waiver for such from the Owner.

D. Shall be thoroughly familiar with the specific equipment or system for this project on arrival at the jobsite. The Field Service Representative shall perform installation supervision, field check-out, calibration, testing, troubleshooting, adjustment, or other services as specified in the pertinent section.

E. The Engineer reserves the right to require a substitute Field Service Representative at no extra cost to the Owner if the Field Service Representative supplied by the manufacturer is not able to properly perform the required tasks.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TEST EQUIPMENT

A. Coordinate requirements for test equipment with Field Service Representative and ensure that all necessary standard and special test, calibration, and diagnostic equipment is available for startup testing.

END OF SECTION

SECTION 01 77 00

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Comply with requirements stated in Conditions of the Contract and in Specifications for administrative procedures in closing out the Work.

1.02 RELATED REQUIREMENTS

A. Conditions of the Contract. Fiscal provisions, legal submittals, and additional administrative requirements.

B. Section 01 29 00 – Payment Procedures.

C. Section 01 33 23 – Shop Drawings, Product Data, and Samples.

D. Section 01 78 23 – Operation and Maintenance Data.

1.03 SUBSTANTIAL COMPLETION

A. When Contractor considers the Work is substantially complete, Contractor shall submit to Engineer:
1. A written notice that the Work, or designated portion thereof, is substantially complete.
2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, Engineer will make an inspection to determine the status of completion. If acceptable to Engineer and Owner, Engineer will notify Contractor in writing. Work is substantially complete when:
1. All systems are complete and functional.
2. All final Operation and Maintenance Manuals have been accepted.
3. Any required shakedown testing periods have been completed.
4. Utilities, alarms, electrical, area lighting, monitoring, controls, drains, piping, paving, and related components are in place and completed.
5. Facilities can be put to intended use.
6. Owner is able to use for intended use at no additional cost to Owner.

C. Should Engineer determine that the Work is not substantially complete:
1. Engineer will promptly notify the Contractor in writing, giving the reasons therefor.
2. Contractor shall remedy the deficiencies in the Work and send a second written notice of Substantial Completion to the Engineer.
3. Engineer will reinspect the Work.
4. Owner may charge Contractor for all of Engineer’s reinspection time and costs at Engineer’s standard billing rates through a credit by Change Order.

D. Contractor's warranty start date for equipment systems will be the date of Substantial Completion accepted by the Engineer / Owner for that specified equipment system.

E. After the Engineer and Owner have accepted the Work, or designated portion thereof, Owner will assume responsibility for operation and maintenance of the facilities and equipment, or designated portion thereof.

1.04 FINAL INSPECTION

A. When Contractor considers the Work is complete, Contractor shall submit written certification that:
   1. Contract Documents have been reviewed.
   2. Work has been inspected for compliance with Contract Documents.
   3. Work has been completed in accordance with Contract Documents.
   4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
   5. Work is completed and ready for final inspection.

B. Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should Engineer consider that the Work is incomplete or defective:
   1. Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.
   2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written certification to Engineer that the Work is complete.
   3. Engineer will reinspect the Work.

D. When the Engineer finds that the Work is acceptable under the Contract Documents, Engineer will request the Contractor to provide closeout submittals as listed in Paragraph 1.06.

1.05 REINSPECTION FEES

A. Should Engineer perform reinspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:
   1. Owner will compensate Engineer for such additional services.
   2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.06 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ENGINEER

A. Evidence of compliance with requirements of governing authorities.

B. Warranties and Bonds: To requirements of General Conditions.

C. Evidence of Payment and Release of Liens: To requirements of General and Supplemental Conditions.

D. Consent of Surety: To requirements of General Conditions.

E. Project Record Documents: To requirements of Section 01 78 39.

F. Operating and Maintenance Data: To requirements of Section 01 78 23.

G. Instructions to Owner's Personnel: To requirements of Section 01 79 01.

H. Spare Parts and Maintenance Materials: To requirements of Section 01 78 44.

I. Notarized affidavit confirming successful completion of disinfection of the system: To requirements of Section 33 13 13.

1.07 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to Engineer.

B. Statement shall reflect all adjustments to the Contract Sum:
   1. The original Contract Sum.
   2. Additions and deductions resulting from:
      a. Previous Change Orders.
      b. Allowances.
      c. Unit Prices.
      d. Deductions from uncorrected Work.
      e. Deductions for liquidated damages.
      f. Deductions for reinspection payments.
      g. Other adjustments.
   3. Total Contract Sum, as adjusted.
   4. Previous payments.
   5. Sum remaining due.

C. Engineer will prepare a final Change Order, reflecting approved adjustments to the Contract Sum which were not previously made by Change Orders.

1.08 FINAL APPLICATION FOR PAYMENT

A. After receiving written notification from the Engineer that Contractor has completed all requirements specified in Paragraphs 1.03, 1.04, 1.06, and 1.07, Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Contract Documents.

B. Contractor shall provide the consent of surety to final payment when submitting the application for final payment.

C. Contractor shall provide all other documents specified in the Contract Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Format and Content of Manuals.

B. Submittal of Manuals.

C. Schedule of Submittals.

1.02 RELATED WORK

A. Section 01 29 00 – Payment Procedures.

B. Section 01 77 00 – Contract Closeout.

C. Section 01 79 01 – Manufacturer's Instruction of Owner's Personnel.

1.03 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:
1. Trained and experienced in maintenance and operation of the described products.
2. Completely familiar with requirements of this Section.
3. Skilled as a technical writer to the extent required to communicate essential data.
4. Skilled as a draftsman competent to prepare required drawings.

B. Manuals for equipment and systems shall be prepared by the equipment manufacturer or system supplier.

1.04 FORMAT

A. Prepare data in the form of an instructional manual for use by Owner's personnel.
1. Binders:
   a. Preliminary manuals: Heavy paper covers.
   b. Final manuals: Commercial quality substantial, permanent, 3-ring or 3-post binders with durable, cleanable plastic covers. Covers of adequate size to easily contain required information.

B. Cover and Spine: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:
1. Title of Project.
2. Identity of separate structure as applicable.
3. Identity of general subject matter covered in manual.

C. Assemble and bind material in the same order as specified in Paragraph 1.06 with the material grouped in the same manner as the applicable portions of the Contract Documents.

D. Text: Manufacturer's printed data, or typewritten data on 20 lb minimum, white, paper. Size: 8-1/2″ by 11″.

E. Drawings:
1. Provide reinforced punched binder tab, bind in with text.
2. Reduced to 8-1/2″ by 11″ or 11″ by 17″ and folded to 8-1/2″ by 11″.
3. Where reduction is impractical, folded and placed in 8-1/2″ by 11″ envelopes bound in text.
4. Suitably identified on Drawings and envelopes.

F. Provide binder tab for each separate product, or each piece of operating equipment.
1. Provide typed description of product and major component parts of equipment.
2. Provide indexed tabs corresponding to items listed in the table of contents.

1.05 CONTENT OF MANUALS

A. Table of Contents:
1. Provide title of project.
2. Contractor, name of responsible principal, address, and telephone number.
3. Schedule of products and systems, indexed to the content of the volume.
4. List, with each product, the name, address, and telephone number of:
   a. Subcontractor or installer.
   b. Maintenance contractor, as appropriate.
   c. Local source of supply for parts and replacement.
   d. Manufacturer.
5. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:
1. Include only those sheets which are pertinent to the specific product.
2. Annotate each sheet to:
   a. Clearly identify the specific product or part installed.
   b. Clearly identify the data applicable to the installation.
   c. Delete references to inapplicable information.
3. Preventive maintenance information shall be given for each major component of every piece of equipment in the format attached to the end of this Section.

C. Drawings:
1. Supplement product data with Drawings as necessary to clearly illustrate:
   a. Relations of component parts of equipment and systems.
   b. Control and flow diagrams.
2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
3. Do not use Project Record Documents as maintenance drawings.

D. Written Text:
   1. Supplement product data for the particular installation.
   2. Organize in a consistent format under separate headings for different procedures.
   3. Provide a logical sequence of instructions for each procedure.

E. Warranties and Bonds:
   1. Copy of each Warranty, Bond, and Service Contract Issued.
   2. Provide information sheet for Owner's personnel.
   3. Proper procedures in the event of failure.
   4. Instances which might affect the validity of warranties or bonds.

F. Provide an installation and operation and maintenance (O&M) manual for each item of equipment or system listed in the schedule of manuals in the quantity listed in the submittal schedule.

G. Additional Requirements for Operation and Maintenance Data: The respective sections of specifications.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Each Item of Equipment and Each System. Include and identify:
   1. Description of unit or system and component parts.
   2. Function, normal operating characteristics, and limiting conditions.
   3. Performance curves with engineering data and tests.
   4. Complete nomenclature and commercial number of all replaceable parts.

B. Installation Instructions, include:
   1. Manufacturer's complete installation instructions and recommendations.

C. Operating Procedures, include:
   1. Startup, break-in, and routine normal operating instructions and sequences.
   2. Regulation, control, stopping, shutdown, and emergency instructions.
   3. Summer and winter operating instructions, as applicable.
   4. Special operating instructions.

D. Maintenance Requirements, include:
   1. Routine procedures and guide for troubleshooting.
   2. Disassembly, repair, and reassembly instructions.
   3. Alignment, adjusting, balancing, and checking instructions.
   4. Preventive maintenance information for each major component of every piece of equipment as required on the "Preventive Maintenance Information & Equipment Data Sheet" attached at the end of this section.

E. Servicing and Lubrication Schedule, provide:
   1. List of lubricants required.
   2. Lubrication information for each major component of every piece of equipment as required on the "Preventive Maintenance Information & Equipment Data Sheet" attached at the end of this Section.

F. Provide manufacturer's printed O&M instructions.

G. Include sequence of operation by controls manufacturer.

H. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

I. Provide list of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

J. Provide control diagrams by controls manufacturer as installed.

K. Provide other data as required under pertinent sections of specifications.

1.07 MANUAL FOR ELECTRIC AND ELECTRONIC ITEMS OR SYSTEMS

A. Description of system and component parts, include and identify:
   1. Function, normal operating characteristics, and limiting conditions.
   2. Performance curves, engineering data, and tests.
   3. Complete nomenclature and commercial number of replaceable parts.

B. Circuit Directories of Panelboards; provide:
   1. Electrical service characteristics.
   2. Controls.
   3. Communications.

C. Provide as-installed color-coded wiring diagrams.

D. Operating Procedures, include:
   1. Routine and normal operating instructions.
   2. Sequences required.
   3. Special operating instructions.

E. Maintenance Requirements, include:
   1. Routine procedures and guide to troubleshooting.
   2. Adjustment, balancing, and checking instructions.

F. Provide manufacturer's printed O&M instructions.

G. Provide list of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

H. Provide other data as required under pertinent sections of specifications.

1.08 SUBMITTAL OF MANUALS

A. Preliminary Submittal of Manuals.
   1. Quantity:
      a. Submit number of preliminary manuals required by Contractor plus number to be retained by Engineer.
      b. As scheduled.
   2. Submit prior to the date of shipment of equipment or system.

3. Engineer will review for acceptance and return to Contractor with comments as appropriate.
4. Resubmittal Process:
    a. If unacceptable, Contractor to resubmit same number of preliminary copies for Engineer's review.
    b. Manuals will not be reviewed in detail once determined by the Engineer that a manual is not acceptable.
    c. No partial payment will be made for equipment materials or related system materials delivered to the site until preliminary manuals for that equipment are submitted and are acceptable to the Engineer.

B. Final Submittal of Manuals
1. Quantity:
    a. Submit number required by Contractor plus number to be retained by Engineer.
    b. As scheduled.
2. Submit copies no less than 30 calendar days prior to putting equipment or system in service.
3. Engineer will review and compare with accepted preliminary manual.
4. If acceptable, manuals will be distributed as follows:
    a. Contractor: For Project Record Documents.
    b. Engineer: For files.
    c. Owner: Held by Engineer for later transmittal to Owner.
5. If not acceptable, all copies will be returned to Contractor for revision or retained by Engineer and the necessary revision data requested from Contractor, at Engineer's option.
6. No portion of the Work is substantially complete until final equipment and system manuals relating to that portion of the Work are accepted by Engineer.
7. Submit copies of any revisions found desirable during instruction of Owner's personnel, with instructions for insertion for revising copies of manual.

C. Funding agency funds may be withheld from Owner if Owner's acceptable O&M manual is not submitted as required by the agencies. If this occurs and such is partially attributable to a delay by the Contractor in submitting the required O&M materials:
1. Owner may withhold payments from Contractor.
2. Contractor shall not terminate or suspend work.
3. No additional costs or Contract time shall be claimed by Contractor if Owner withholds payments.

D. If Contractor requires additional copies of the O&M manuals for the Contractor's, subcontractor's, or suppliers' use, such may be submitted and will be returned upon review by the Engineer.

1.09 REIMBURSEMENT FOR ENGINEER'S REVIEW COSTS

A. For all manual reviews beyond one review of the preliminary manual and one review of final manual:
1. Owner may charge Contractor for all of Engineer's review time and costs at Engineer's standard billing rates through a credit by Change Order.

2. Engineer will perform these unscheduled reviews in the same manner as other unscheduled work.

1.10 SUBSTANTIAL COMPLETION

A. Project will not be considered substantially complete until final O&M Manuals and manufacturer's instruction of Owner's personnel have been accepted by Engineer.

1.11 SCHEDULE OF SUBMITTALS

A. Prepare O&M Manuals for pieces of equipment where specified in the individual Specification Sections.

B. Quantities to be Processed by Engineer:
1. Preliminary Manuals: Submit Preliminary Manuals in **one** of the following formats:
   a. Electronic Format:
      1) Electronic file in searchable .pdf format, delivered via email or on one CD.
      2) One printed copy properly formatted in binder with labels and dividers as specified. Engineer will retain copy.
      3) Engineer's submittal review including submittal file will be returned to Contractor in electronic format.
   b. Or Printed Format:
      1) 2 printed copies properly formatted in binder with labels and dividers as specified.
      2) Engineer will return one copy to Contractor.
      3) Any additional copies received will be discarded by Engineer.
2. Final Manuals: Submit Final Manuals in **each** of the following formats:
   a. Electronic Format:
      1) 3 copies of electronic files in searchable .pdf format, delivered on 3 CDs.
   b. And Printed Format:
      1) 3 printed copies.
      2) Engineer will retain 3 copies.

C. The "Preventive Maintenance Information & Equipment Data Sheet" at end of this Section shall be completed and submitted with the preliminary and final O&M manuals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PREVENTIVE MAINTENANCE INFORMATION
AND
EQUIPMENT DATA SHEET

1. Equipment Name: _____

2. Equipment Number: _____

3. Equipment Manufacturer: _____

   Address: _____

   Phone: ( ) _____

4. Equipment Supplier: _____

   Address: _____

   Phone: ( ) _____

5. Nameplate Data:
   Drive Unit: _____ hp, _____ rpm, _____ volts, _____ O _____ FLA
   Motor class (dripproof, TEFC, etc.) _____
   Manufacturer _____
   Model No. _____ Serial No. _____
   Other _____

   Driven Unit: Flow with units _____
   Discharge Pressure with units _____
   Equipment Type _____
   Model No. _____ Serial No. _____
   Other _____

6. Method of Power Transmission (direct coupled, V-belt, etc.) _____
   _____

7. Maintenance Requirements (list on next sheet)

   Maintenance Operation: List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable.

   Frequency: List required frequency of each maintenance operation.

   Lubricant (if applicable): Refer by symbol to recommended lubricant from list in Item

8. Comments: Give other applicable comments concerning maintenance operation.

Maintenance Operation (including any special tools required) | Frequency | Lubricant | Comments

A.

B.

C.

Use additional sheets if necessary.

9. Lubricant List (provide Mobil number in addition to any other recommended manufacturers):

Reference Symbol	Mobil	Chevron	Shell	Arco	Or Equal
List symbols used in Item 7, above	List equivalent lubricants, as distributed by each manufacturer for the specific use recommended.				

10. This data sheet prepared by: _____

Firm: _____

Date: _____

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

A. Maintain one printed record copy of the following record documents at the site for the Owner:
   1. Drawings.
   2. Engineer's response to Requests for Information (RFIs).
   3. Engineer Field Orders or written instructions.
   4. Accepted Shop Drawings, Product Data and Samples.
   5. Field Test records.
   6. Receipts for delivery of items to Owner.

B. Prepare and submit to Owner record utility location survey data as specified herein.

1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in Contractor's field office apart from documents used for construction.
   1. Provide files and racks for storage of documents.
   2. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with specification format.

C. Maintain documents in a clean, dry, legible condition and in good order. Do not use Record Documents for construction purposes.

D. Make documents and samples available at all times for inspection by Engineer and Owner.

1.03 MARKING DEVICES

A. Provide felt tip marking pens for recording information in the color code designated by Engineer.

1.04 RECORDING

A. Label each document "PROJECT RECORD" in neat, large printed letters.

B. Record information concurrently with construction progress.
   1. Do not conceal any work until required information is recorded.

C. Drawings: Legibly mark to record actual construction:
   1. Changes made by addenda.
   2. Depths of various elements of foundation in relation to finish first floor datum.

3. Horizontal and vertical locations of underground utilities and appurtenances, including bends in pipes, and internal utilities and appurtenances concealed in the construction. Measure and show locations on the Record Drawings by either:
   a. Referenced to permanent surface features or referenced to visible and accessible features of the structure.
   b. Or tabulate and plot coordinates on the Record Drawings measured using survey grade GPS or GNSS to an accuracy of 0.1 meter (4″) using a baseline tied into the project coordinate system control points.
4. Field changes of dimension and detail.
5. Changes made by Field Order or by Change Order.
6. Details not on original Contract Drawings.
7. For sewer lines: Invert elevations at manholes, line and manhole alignment and locations, and location of each service line referenced by distance from downstream manhole and distance from sewer centerline to end of service line.

1.05 SUBMITTALS

A. At Contract Closeout, deliver Record Documents to Engineer for the Owner.

B. Submit to-scale dimensioned electronic drawing files of major equipment items installed that were not the design basis manufacturer. Drawings shall show general arrangement plan and sections. Drawing files shall be in AutoCAD dwg format.

C. Accompany submittals with transmittal letter in duplicate, containing:
   1. Date.
   2. Project title and number.
   3. Contractor's name and address.
   4. Title and number of each Record Document.
   5. Signature of Contractor or his authorized representative.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 PAYMENT

4.01 RECORD DRAWINGS

A. Project Record Documents are incidental Work to the Contract Documents' Bid items for which no separate payment will be made.

B. No payment will be made to the Contractor for any portion of the Work for which the Project Record Documents are not complete.

END OF SECTION

SECTION 01 78 40

DELIVERIES TO OWNER

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDE

A. Obtain signature of Owner's representative on Master List developed per Section 01 78 44 – Spare Parts and Maintenance Materials for all spare parts, supplies, maintenance materials, salvage, and similar items delivered to Owner.

B. Keep Master List and delivery receipts with Project Record Documents.

C. All deliveries to Owner shall be coordinated to occur during hours designated by Owner’s warehouse for receiving such items as described in Paragraph A.

D. Deliver all materials to Owner at one time at end of the Project. Payment for Extra Materials will not be made until after the Owner has accepted delivery.

E. Provide copy of Master List to both Owner and Engineer once all deliveries have been completed.

F. The Owner and / or Engineer will check the delivered items against the Master List. If the delivery is not complete and as stated on List, or if items are not correctly marked, then provide a schedule of when the remaining items shall be delivered.

1.02 RELATED REQUIREMENTS

A. Section 01 78 39 – Project Record Documents.

B. Section 01 78 44 – Spare Parts and Maintenance Materials.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 78 44

SPARE PARTS AND MAINTENANCE MATERIALS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDE

A. Provide spare parts and maintenance materials as specified in this Section and in Specifications for work in Divisions 2 through 48 that are part of this project.

1.02 RELATED REQUIREMENTS

A. Section 01 78 40 – Deliveries to Owner.

1.03 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
   1. Prepare and submit a Master List of all spare parts and maintenance materials to be delivered to Owner. Specific requirements for those spare parts and maintenance materials to be delivered are as stated within individual Specification Sections for work in Divisions 2 through 48.

1.04 MAINTENANCE MATERIALS

A. Provide:
   1. Lubricant for all equipment and facilities sufficient for three months normal usage, unless specified otherwise.
   2. Any non-standard tools required to adjust or service equipment supplied.

B. Label all materials by equipment name and usage.

1.05 SPARE PARTS

A. Label and identify by equipment name, part name, part number.

B. Packaged for storage.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 79 01

MANUFACTURER'S INSTRUCTION OF OWNER'S PERSONNEL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Instruction of Owner's Personnel.

B. Schedule of Instruction.

1.02 QUALITY ASSURANCE

A. Instruction shall be performed by a qualified, experienced regular employee of the equipment or system manufacturer or a full-time field service representative (not sales personnel) approved by the equipment or system manufacturer.

1.03 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated personnel in the operation, adjustment and maintenance of all scheduled products, equipment, and systems.

B. Manufacturer's Operation and Maintenance (O&M) Manual shall constitute the basis of instruction for:
   1. Review of contents of manual with Owner's personnel in full detail to explain all aspects of O&M.
   2. Review in field with Owner's personnel in full detail the O&M of each scheduled system or equipment.

C. Additional requirements for specialized instruction of Owner's personnel are given in the detailed equipment specifications.

D. Submit in writing proposed dates for instruction of Owner's personnel at least 15 days in advance of date when instruction is proposed to start; resubmit alternate schedule if proposed dates are not acceptable to Engineer or Owner.

E. Do not begin instruction of Owner's personnel until equipment for which instruction is required is fully operational and functioning satisfactorily and Final O&M Manuals for same have been reviewed and accepted by Engineer.

F. If the Engineer or Owner judges the instruction to be incomplete, inadequate, or inaccurate, additional instruction shall be scheduled and provided at no additional cost to the Owner.

G. Prepare and include additional data when the need for such data becomes apparent during the instruction of Owner's personnel or as necessary to provide complete O&M instructions.

1.04 SCHEDULE OF INSTRUCTION

A. Instruct Owner's personnel on pieces of equipment where specified in the individual Specification Sections or as scheduled herein.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

TRAINING SCHEDULE

SECTION NO.	EQUIPMENT	NO. OF SESSIONS	MINIMUM HOURS PER SESSION	OWNER'S PERSONNEL TO ATTEND		COMMENTS
				Maint.	Oper.	
40 27 02.09	Backflow Preventer	1	2	✓	✓	

END OF SECTION

SECTION 05 50 00

METAL FABRICATIONS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes shop fabricated metal items:
   1. Pipe bollards.
   2. Structural supports for miscellaneous attachments.

1.02 REFERENCES

A. ASTM International:
   1. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
   2. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   3. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   4. ASTM A153/A153M – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   5. ASTM A307 – Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
   6. ASTM A563 – Standard Specification for Carbon and Alloy Steel Nuts.
   7. ASTM A780 – Repairs of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal requirements.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel:
   1. Bolts: ASTM A307; Grade A or B. ASTM A325; Type 1.
      a. Finish: Unfinished. Hot dipped galvanized. Mechanically galvanized.
   2. Nuts: ASTM A563 heavy hex type.
      a. Finish: Unfinished. Hot dipped galvanized. Mechanically galvanized.

3. Washers: ASTM F436; Type 1.
    a. Finish: Unfinished. Hot dipped galvanized. Mechanically galvanized.

2.02 PIPE BOLLARDS

A. Bollards: Steel pipe, concrete filled, crowned cap, 6″ diameter, length as indicated on Drawings; galvanized - prime paint, one coat.

B. Concrete Fill: 3,000 psi as specified in Section 03 30 00.

2.03 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

2.04 FACTORY APPLIED FINISHES - STEEL

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.

B. Galvanizing: ASTM A123/A123M; minimum 1.2 2.0 oz/ft^2 coating thickness; galvanize after fabrication.

C. Galvanizing for Fasteners, Connectors, and Anchors:
1. Hot-Dipped Galvanizing: ASTM A153/A153M.
2. Mechanical Galvanizing: ASTM B695; Class 50 minimum.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.

B. After erection, touch up welds, abrasions, and damaged finishes with cold galvanizing compound meeting ASTM A780 to match shop finishes.

END OF SECTION

SECTION 05 50 01

ANCHOR BOLTS AND CHEMICAL ANCHORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cast-in anchor bolts for structural connections and to secure equipment.

B. Bolts, threaded rods, and deformed rods to be placed in holes drilled into hardened concrete or masonry and secured by chemical grouts.

1.02 SUBMITTALS

A. Section 01 33 23: Shop Drawings, Product Data, and Samples.

B. Product Data.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver anchor bolts and templates in time to permit setting when structural concrete is placed.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bolts:
1. Carbon steel: ASTM A 307.
2. Galvanized steel: Carbon steel, hot-dip galvanized, ASTM A 153; or zinc plated, ASTM A 164, type GS.
3. Stainless steel: ASTM F 593.

B. Nuts:
1. Same material as bolts.
2. Carbon steel: ASTM A 563, Grade B heavy hexagonal.
3. Stainless steel: ASTM F 594.
4. Self-locking: Prevailing torque, IFI-100, Grade A.

C. Washers:
1. Same material as bolts.
2. Flat: ASTM F 436.
3. Locking: Spring type ANSI B27.1.

D. Sleeves:
1. Pipe: ASTM A 53, galvanized.
2. Bearing plates: ASTM A 36, galvanized.

E. Chemical Anchor Systems:
1. Fastener or connector: Bolt, threaded rod, or deformed rod as shown on Drawings, material as indicated on Drawings or specified.
2. Screen sleeves: For attachment to hollow masonry walls, provide stainless steel screen sleeves specifically manufactured for the purpose and approved by the manufacturer of the adhesive to be used.
3. Chemical adhesive: Two component system to be mixed at the site and placed into pre-drilled holes.
4. Acceptable products: Subject to compliance with the requirements of these Specifications, products which may be used in the work include, but are not limited to, the following:
   a. Epcon Epoxy Injection System as manufactured by ITW Ramset/Red Head.
   b. HIT Renovation Anchor System as manufactured by the HILTI Corporation.
   c. Molly PARAFAST Resin Mortar as manufactured by the Molly Fastening Systems Group of Emhart Corporation.

2.02 FABRICATION AND MANUFACTURE

A. Anchor Bolts:
1. 3/4″ minimum, except as indicated on the Drawings.
2. Type:
   a. General use: L-shaped hook type.
   b. Where indicated on Drawings or specified:
      1) Straight bolt with square head.
      2) Straight bolt with square plate welded to bolt and nut welded to plate and bolt.
      3) Through-bolt with sleeve and square plate assembly.
      4) Coupled bolt with sleeve welded to square plate and bolt.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify that holes for anchor bolts in forms and templates match applicable equipment Shop Drawings.

3.02 INSTALLATION

A. Anchor Bolts:
1. Where installed in cast-in-place concrete, install a nut on the concrete side of the form or supporting template.
2. Provide 3 nuts for each equipment anchor bolt for which a lock nut is indicated, 2 for others.

3. Sleeved anchor bolts:
    a. Centered in pipe sleeve.
    b. Sleeve ID: Approximately 2-1/2 times bolt OD.
    c. Sleeve length: Approximately 8 times bolt OD.
    d. Bearing plate minimum thickness: 1/2 times bolt OD.
4. Through bolts:
    a. Sleeved with bearing plates.
    b. Bearing plates welded to bolt and plate welded to sleeve.
    c. Dimension: As specified for sleeved anchor bolts.

B. Chemical Anchor Systems:
1. Install in conformity with the manufacturer's instructions.

3.03 SCHEDULE

A. Anchor bolts to be Type 316 stainless steel unless noted otherwise on Drawings.

B. All sleeves and plates galvanized unless noted otherwise on Drawings.

C. Wedge anchors not acceptable unless noted otherwise on Drawings.

END OF SECTION

SECTION 09 97 01

INDUSTRIAL COATINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish labor, materials, tools, scaffolding, and paint for:
   1. Exposed piping, valves, fittings, and other metal surfaces, interior and exterior.
   2. Submerged metal surfaces.
   3. Structural and miscellaneous steel, including tanks and wet wells.
   4. Exterior above-ground concrete and masonry to 6″ below ground level.
   5. Interior of concrete structures.
   6. Equipment furnished without factory finished surfaces.
   7. Ferrous metal portions of slide gate and valve pedestals and operators.
   8. All other surfaces requiring protection.

B. Recoat, or touchup, all equipment furnished with factory coatings which are damaged, scratched, or rusted during shipping, storage, or installation. Recoating to match original finish, quality, and appearance.

1.02 REFERENCES

A. The Society for Protective Coatings (formerly Steel Structures Painting Council – SSPC):
   1. Steel Structures Painting Manual Vol. 2: Systems and Specifications.
   2. SSPC-SP 1: Surface Preparation Method – Solvent Cleaning.
   3. SSPC-SP 2: Surface Preparation Method – Hand Tool Cleaning.
   4. SSPC-SP 6/NACE No. 3: Surface Preparation Method – Commercial Blast Cleaning.
   5. SSPC-SP 7/NACE No. 4: Surface Preparation Method – Brush-off Blast Cleaning.
   6. SSPC-SP 10/NACE No. 2: Surface Preparation Method – Near-White Metal Blast.
   7. SSPC-SP 13/NACE No. 6: Surface Preparation of Concrete.

B. American Society for Testing Materials International (ASTM):
   1. ASTM B117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
   2. ASTM D522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
   3. ASTM D610 – Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces.
   4. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
   5. ASTM D4258 – Standard Practice for Surface Cleaning Concrete for Coating.
   6. ASTM D4414 – Standard Practice for Measurement of Wet Film Thickness by Notch Gages.
   7. ASTM D4787 – Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.
   8. ASTM D7234 – Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

C. National Association of Corrosion Engineers International (NACE):
   1. NACE SP0188 – Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.
   2. NACE SP0288 – Inspection of Lining Application in Steel and Concrete Equipment.

1.03 SUBMITTALS

A. Product Data: Section 01 33 23 – Shop Drawings, Product Data, and Samples.

B. Schedule of products to be used and mil thicknesses to be applied in accordance with manufacturer's recommendations.

C. Manufacturer's standard color selection charts. Engineer will use charts to select colors of industrial coatings.

D. Coatings submitted as a substitution for the specified coating under each Service Condition shall include proof of equivalency to the specified coating. The equivalency data shall be submitted in tabular form and shall be as follows:

	Brand X	Brand Specified
Product		
Theoretical coverage rate		
Recommended wet and dry film thickness		
Pot life		
Shelf life		
% solids		
% VOC or solvent		
Any additional requirement for surface preparation beyond those specified		
Recommended temperature range for application		
Curing time		
Curing agent		

Submission of the equivalency data in any other format, or incomplete information, will be cause for rejection by the Engineer.

1.04 ADDITIONAL REQUIREMENTS

A. Workmanship:
1. Work to be done by skilled craftsmen in a manner comparable with the best standards of practice found in each trade.
2. Applicable surface preparation, coating, and painting to conform with the requirements of the SSPC Steel Structures Painting Manual.
3. Contractor to provide a resident supervisor during cleaning and coating operations.
4. All coating and painting equipment to be suitable for each specific material being applied and kept in first class working condition at all times.
   a. Compressors to have suitable traps and filters installed.
   b. All equipment to be subject to Engineer's and / or paint manufacturer's approval.

B. Surface Preparation:
1. Evaluated as compared with SSPC-VIS 1 and SSPC-VIS 2 (ASTM D610).
2. Surfaces with grease to be hot detergent washed and rinsed as necessary prior to sandblasting and / or painting.
3. Type-Sandblasting Test: Standard metal plates of 8-1/2″ by 11″.
4. Plates to be prepared for each type sandblasting specified.
5. Any material applied upon improperly prepared surfaces will be removed and redone to the satisfaction of the Engineer at the sole expense of the Contractor.

C. Environmental Requirements:
1. Contractor responsibilities include:
   a. Ensuring that coating work only occurs when environmental conditions comply with manufacturer's written requirements for same.
   b. Continuously monitoring air and substrate temperatures and relative humidity to determine acceptability of environmental conditions and maintaining written logs for same which are available for Owner or Engineer's inspection.
   c. Furnishing temporary environmental controls as needed to meet manufacturer's environmental requirements.
   d. Preventing contamination of painted surfaces by adequate means.
   e. Cleaning, washing, and recoating of areas which become contaminated with dirt, dust, or foreign material at no additional cost to Owner.
   f. Anticipating when unfavorable environmental conditions are likely to occur, e.g., time of day when condensation occurs, and scheduling coating work around such times.
2. Do not apply coatings during the following conditions:
   a. Air or substrate temperature measured in the shade is less than manufacturer's written minimum required temperature.
   b. Surface to be coated is wet, damp, or has condensation present.
   c. During rain, snowfall, mist, or when relative humidity exceeds manufacturer's written recommendations or within 18 hours of such conditions occurring.
   d. During dust storms.

3. Suspend coating application whenever dew or moist conditions are present; do not resume until such conditions improve.
4. Complete coating work in advance of time of day when condensation occurs.
5. Contractor's efforts to fulfill environmental requirements as described are considered incidental work and no separate payment will be made therefor.

D. Inspection:
1. Concrete and non-ferrous metal, surfaces to be manually inspected with approved wet film thickness gauge.
2. Ferrous metal surfaces to be mechanically inspected with approved dry film thickness gauge.
3. Insufficient or defective areas: Rework as necessary.

E. Thickness Checking:
1. Thickness on ferrous metals to be checked with a non-destructive, magnetic type gauge in conformance with SSPC – PA 2 – Measurement of Dry Film Thickness with Magnetic Gages.
2. Thickness on concrete surfaces to be tested with a wet film thickness gage, such as those available through Paul N. Gardner Company, Inc. meeting ASTM D4414 shall be used to ensure a monolithic lining and uniform thickness during application.

F. Acceptable Thickness Inspection Devices:
1. Tinker-Rasor Models: AP and AP-N.
2. Tinker-Rasor Model M-1 6/ 1/2 volt.
3. Microtest units for dry-film thickness gauging.
4. Inspection devices to be operated as recommended by the manufacturer.
5. Devices and calibration plates furnished by the Contractor to be certified by the U.S. Department of Commerce, National Institute of Standards and Technology.
6. Devices to be supplied by Contractor at no additional cost to Owner and to be on project site whenever coatings are being applied.

1.05 DELIVERY AND HANDLING

A. All materials to be brought to the site in the original sealed containers.

B. Containers to be open or used only after Engineer's inspection for contents.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Products specified herein.

B. Substitutions considered only if:
1. Engineer has reviewed and taken no exceptions to Contractor's proof of equivalency data submitted per Paragraph 1.04. D.
2. The substitute coating has a substantiated 5-year record on projects of similar nature.

C. All coating materials shall be VOC compliant in accordance with the latest version of EPA regulations 40 CFR Part 59 Subpart D – National Volatile Organic Compound Emission Standards for Architectural Coatings. All coating materials shall be certified lead and chromate free.

D. Paint and coatings for equipment shall not conflict with equipment manufacturer's recommendations.

E. Field-applied coatings shall be compatible with shop primer furnished by others.

2.02 BLAST MEDIA

A. Media for sandblasting operations: Copper slag, or other media, free of clays, or other contaminants and which has sharp irregular edges and particle size gradation to produce an anchor profile in accordance with coating manufacturer's recommendations.

B. Reuse of blast media is prohibited without the Engineer's written authorization.

2.03 SERVICE CONDITIONS: See Tables at end of this Section.

2.04 MAINTENANCE MATERIALS

A. All unused single component paint and coatings in partially used containers remaining from work.

B. Not less than 1% of all single component paint and coatings used in work; resealed partially used containers can be used to meet this requirement.

PART 3 EXECUTION

3.01 GENERAL

A. Sandblasting and priming to be completed on any particular area within the period of an 8-hour working day.

B. Primer application shall follow immediately after surface preparation and prior to any sign of corrosion.

C. Surfaces not primed right after preparation within the 8-hour working period shall be re-prepared before primer application.

D. Prior to final and unchangeable assembly, all surfaces shall be finished to the full satisfaction of the Engineer.

3.02 SURFACE PREPARATION

A. Field blast cleaning for all surfaces: Dry sandblasting method unless otherwise directed.

B. Existing facilities or finished coatings to be protected from sandblasting at all times.

C. Cleaning of the sandblasting area: Section 01 74 00 – Cleaning and Waste Management.

D. Prior to application of coatings: Dry clean sandblasted surfaces.

E. Welds to be neutralized with a suitable solvent compatible with the specified coating material.

3.03 APPLICATION

A. Notify Engineer immediately after surface preparation and before commencement of coating operations of each large piece of the work.

B. Starting work in a specific area shall be construed as acceptance of the surfaces, and thereafter, the Contractor shall be fully responsible for satisfactory work as required herein.

C. All materials to be applied as recommended by their respective manufacturer.
1. Recoat epoxy coatings within time limit specified by manufacturer. If time limit is exceeded, prepare epoxy surface as recommended by manufacturer, using such techniques as brush-off blasting to achieve the recommended surface profile.

D. Each application of paint or coating to be:
1. Applied at the proper consistency.
2. Free of brush marks, sags, runs, or evidence of poor workmanship.
3. Avoid lapping on glass or hardware.
4. Finished surfaces shall be free from defects or blemishes.

E. Use protective coverings or drop cloths for floors, fixtures, and equipment.

F. Whenever two or more coats of a dark colored paint or coating are specified, coats must be of variable color.

G. All welds and irregular surfaces shall receive a brush coat prior to, and in addition to, application of the first complete specified coat.

3.04 CLEANUP

A. Section 01 74 00 – Cleaning and Waste Management.

B. All spilled or splattered paint shall be cleaned up immediately.

C. All sandblasting media shall be cleaned up and disposed of properly off-site at Contractor’s expense.

D. All discarded materials shall be disposed of properly off-site at Contractor’s expense.

3.05 TABLE OF SERVICE CONDITIONS - SEE PAGES WHICH FOLLOW

3.06 SCHEDULE OF SURFACES TO RECEIVE INDUSTRIAL COATINGS

	Surface	Service Condition	Notes
A.	General		
	1. All exposed ferrous metal and piping without topcoat and not galvanized.	F8	

DFT: Dry Film Thickness, mils

TABLE OF SERVICE CONDITIONS FOR INDUSTRIAL COATINGS

Condition	Surface Data	Manufacturer	Prime Coat		Intermediate Coat		Finish Coats		Remarks
			Product	Mils	Product	Mils	Product	Mils	
F8	Surface Exposed shop-primed ductile iron pipe subject to corrosive moisture, incidental splash, atmosphere or condensation, but not subject to submergence.	Tnemec	Touch-up Shop Primer with 1029 Enduratone	3.0 DFT	Series 1029 Enduratone	2-3 DFT	Series 1029 Enduratone	2-3 DFT	Total system film thickness shall not be less than 7.0 mils DFT.
	Surface Preparation Method SSPC-SP1: Solvent clean	Sherwin Williams	Touch up shop primer with Kem Kromik Universal Metal Primer, B50 Series	3.0-5.0 DFT	0 VOC Acrylic, B66-600	2.5-4.0 DFT	0 VOC Acrylic, B66-600	2.5-4.0 DFT	---
		Carboline	Carbomastic 94 Epoxy	5.0 DFT	Carbocrylic 3359	2-3 DFT	Carbocrylic 3359	2-3 DFT	---
		Or Engineer reviewed substitute							

SECTION 31 10 00

REMOVALS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This work includes the removal and disposal of all obstructions, materials, and resultant debris required for the completion of construction.

1.02 REFERENCES

1.03 QUALITY ASSURANCE

A. Conduct removal operations to prevent damage to adjacent property, buildings, and other facilities.

B. Any damage to adjacent property or facilities shall be promptly repaired at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 EXPLOSIVES

A. The use of explosives for removals is prohibited.

PART 3 EXECUTION

3.01 REMOVAL

A. Remove all items shown on Drawings to be removed.

B. Contractor shall not remove any other items without approval from Engineer.

C. Excavation created during removal operations shall be barricaded in accordance with MUTCD.

D. Contractor shall perform miscellaneous excavating, backfilling, and reshaping of slopes as required.

3.02 DISPOSAL

A. Contractor shall haul and dispose of all debris, rubbish, broken concrete, broken asphaltic concrete, rocks, and other material removed.

B. Disposal: In accordance with applicable State and Federal Regulations.

C. Burning of debris and rubbish will not be permitted on the project site.

END OF SECTION

SECTION 31 23 01

EXCAVATION AND FILL FOR SITE WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Site excavation, filling, and backfilling.

B. Precast utility structure excavation, filling, and backfilling.

C. Compaction of fill and backfill.

D. Finish grading.

1.02 RELATED WORK

A. Section 31 23 33 – Trenching and Backfilling.

1.03 REFERENCES

A. ASTM C33 – Standard Specification for Concrete Aggregates.

B. ASTM C136 – Sieve Analysis of Fine and Coarse Aggregates.

C. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

D. ASTM D4318 – Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.04 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
   1. Laboratory Test Results for Select Fill, Ordinary Fill, and Pea Gravel:
      a. Moisture-density relationships (ASTM D1557).
      b. Gradation (ASTM C136).
      c. Liquid limit, plastic limit, plasticity index (ASTM D4318).

1.05 PROTECTION

A. Protect trees, shrubs, lawns, and other features remaining as a portion of final site.

B. Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from equipment and vehicular traffic.

C. Protect above and below grade utilities which are to remain.

D. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

E. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

F. Grade excavation top perimeter to prevent surface water run-off into excavation.

G. Protect structure walls, foundation, and similar features from structural stress during backfilling operations.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Material removed from excavations may be used for fill or backfill provided such material meets the requirements for fill and backfill specified in this Section. Some blending of materials may be necessary.

B. Exclude debris, large rocks, roots, organic material, expansive material, and other deleterious materials.

C. Provide additional fill materials if necessary from off-site locations obtained by Contractor.

D. Do not use any materials containing any contaminants that may endanger public health. Do not use mine tailings.

E. Do not use any materials which have not been reviewed by the Engineer.

2.02 MATERIALS

A. Select Fill:
1. Clean, well graded, relatively cohesionless material free of organic or frozen matter.
2. Largest rock or clod dimension, 1″.
3. Plasticity index less than 8.
4. Maximum percent passing sieve (unless otherwise reviewed by Engineer):
    a. #10, 50%.
    b. #40, 30%.
    c. #200, 15%.

B. Ordinary Fill:
1. Clean, free of organic or frozen matter.
2. Largest rock or clod dimension, 3″.
3. Normally acceptable are Unified Soil Classification System Classified Materials: GW, GP, SW, SP, GM, SM, or GC.

C. Normal Backfill:
   1. Excavated earth or sand thoroughly mixed to create uniform material.
   2. Free of trash, debris, organic or frozen matter.
   3. Largest rock or clod dimension, 2″.

D. Pea Gravel:
   1. Mineral aggregate graded 0.25″ to 0.38″.
   2. Free of soil, clay, and shale; free of organic, frozen debris, or foreign matter.

E. Sandfill:
   1. Clean, well-graded material conforming to requirements of ASTM C33 for fine aggregate.

F. Moisture Barrier: 10 mil minimum polyethylene sheet.

PART 3 EXECUTION

3.01 GENERAL

A. The type of bearing material and the thickness and extent of structural fill (if required) are shown on the Drawings.

B. Interior non-structural slabs-on-grade are to be supported on granular fill not less than 6″ thick on structural fill not less than one foot thick. See Drawings for location where sand fill over polyethylene moisture barrier is required over granular fill.

C. Do not place or compact fill or backfill when the atmospheric temperatures are below 35°F. Protect completed fill or backfill areas from freezing. Recondition, reshape, and recompact to the requirements of this Section without additional cost to the Owner any areas which are damaged by freezing.

3.02 SHEETING, SHORING AND BRACING

A. Provide sheeting, shoring, and bracing where required to hold walls of excavation and to protect workers and existing construction. Contractor shall be responsible for proper sizing and placement of Work.

B. Remove sheeting, shoring, and bracing in manner to avoid damage to disturbance to Work. Leave sheeting and shoring in place where removal will endanger Work, adjacent construction, or personnel. If sheeting or shoring is to be left in place, remove all traces of sheeting or shoring to a minimum depth of 2′-0″ below finish grade unless otherwise reviewed by the Engineer.

3.03 CLEARING AND GRUBBING

A. General: Clearing and grubbing are required for all areas shown on the Plans to be excavated or where fill is to be constructed.

B. Clearing:
   1. Remove and dispose of trees and other vegetation, downed timber, snags, brush, and rubbish within areas to be cleared.

C. Grubbing:
   1. Remove stumps, matted roots, and roots larger than 2″ in diameter from within 6″ of the surface of areas on which fills are to be constructed, and within 18″ of finished subgrade of roadways.
   2. Areas disturbed by grubbing shall be filled as specified in this Section for embankment.

3.04 PREPARATION

A. Excavation:
   1. Identify required lines, levels, contours, and datum.
   2. Identify all underground utilities and other facilities. Stake and flag locations.
   3. Identify and flag surface and aerial utilities.
   4. Maintain and protect existing utilities remaining which pass through work area.

B. Backfilling:
   1. When necessary, compact subgrade surfaces to density requirements for backfill material.
   2. Cut out soft areas of subgrade not readily capable of in situ compaction. Backfill with select fill and compact to density equal to requirements for subsequent backfill material.

3.05 EXCAVATION

A. Earth excavation shall consist of the excavation and removal of suitable soils for use as embankment as well as the satisfactory disposal of all vegetation, debris, and deleterious materials encountered within the area to be graded and / or in a barrow area.

B. Excavate soil to the extent required for structure foundations, construction operations, and other work. See Drawings for extent of excavation required beneath and adjacent to structures.

C. Barricade open excavations, keep spoil piles out of the way of the Owner’s personnel and otherwise maintain safe access by the Owner’s employees to the Owner’s facilities during construction.

D. Do not undercut existing construction.

E. Do not permit surface water to enter open excavations. Provide barriers and positive drainage away from excavations as necessary. Remove promptly any water which may enter excavations from any source.

F. Machine slope banks.

G. After excavations are complete, notify Engineer for inspection of completed excavation. Do not begin placement of fill or begin other construction operations until excavation is reviewed by Engineer.

H. Fill unauthorized over excavated areas beneath structures with select fill and compact to density required for subsequent fill or backfill. If unauthorized excavation will result in structure being supported partly on select fill and partly on native material, extend excavation under entire structure and fill as specified below. Fill unauthorized overexcavated areas away from structures with fill of the type specified for subsequent fill compacted to the density specified.

I. Dispose of all excess excavated material and material unsuitable for backfilling generated by construction activities, off-site or as directed by Owner, unless otherwise stated in Contract Documents at no additional cost to Owner. Properly dispose of all materials in accordance with regulatory requirements.

3.06 SUBGRADE TREATMENT

A. At areas to receive structural fill, scarify the exposed native soils to a depth of not less than 12″. Add or remove water as necessary to bring the scarified material to optimum moisture content (within −0, +2 percentage points). Compact the scarified soil to not less than 95% of maximum dry density as determined by ASTM D1557.

3.07 FILLING AND BACKFILLING

A. Provide all fill material required to complete Work, either from on-site excavations or imported from off-site, at no additional cost to Owner.

B. Backfill areas to contours and elevations shown on Drawings using unfrozen materials.

C. Place fill under structures and elsewhere as shown on the Drawings. Fill all unauthorized or excess excavations to the elevations shown or specified.

D. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet or spongy subgrade surfaces.

E. Backfilling Around Structures:
   1. Backfill after concrete has attained sufficient strength to withstand backfill pressures without detrimental effects.
   2. Prevent displacement of construction during backfilling operations; backfill opposite sides simultaneously.

F. Placement:
   1. Maintain surfaces free of water, debris, and other deleterious materials.
   2. Place backfill and fill materials in successive horizontal layers not more than 8″ in loose depth.
   3. Place material at optimum moisture content (±2 percentage points).
   4. Material too dry or too wet shall be moistened or aerated to extent necessary to bring moisture content to within specified limits.

G. Compaction:
   1. Compact fill and backfill using appropriate equipment as needed to achieve the densities specified below. Densities are expressed as percentages of the maximum dry density as determined by ASTM D1557.
   2. Do not use heavy equipment in areas where existing construction may be damaged by the use of such equipment. Repair or replace without additional cost to the Owner, any damage to existing construction caused by earthwork operations.

H. Slope grade away from building minimum 2″ in 10′ unless noted otherwise. Fill depressions and provide for positive drainage away from buildings and structures.

I. Make changes in grade gradual. Blend slopes into level areas. Finish grade to smooth uniformly sloping surfaces to elevations required for drainage.

J. Finish surface by grading to provide finished appearance.

K. Place polyethylene moisture barrier at locations shown on the Drawings. Overlap not less than 6″ at all joints; tape joints securely. Protect from damage during placement of sand fill. Repair any rips or tears. Place not less than 3″ of sand fill over polyethylene moisture barrier beneath slabs-on-grade where shown on Drawings.

3.08 TOLERANCES

A. Top Surface of Backfill: ±2″.

B. Top Surface of Fill Beneath Structures: −1 +0″.

3.09 FIELD QUALITY CONTROL

A. Section 01 45 23 – Testing Laboratory Services.

B. Test Schedule:
   1. One field density test for each 250 square yards of prepared subgrade.
   2. One field density test for each 100 cubic yards of fill or for each layer of fill, whichever results in the greater number of tests.
   3. Or where directed by Engineer.

C. If tests indicate that work does not meet specified requirements, remove work, replace and retest at no cost to Owner.

3.10 SCHEDULE OF FILL AND BACKFILL

Area	Type of Material	Degree of Compaction
Beneath footings and slabs more than 10″ thick and for a distance outside their perimeters equal to the depth of fill.	Select fill	95%
Beneath slabs less than 10″ thick; pavements (except roadways) unless otherwise shown on Drawings.	Select fill	90%
General fills and embankments on the site.	Ordinary fill	90%
Non-structural areas except as otherwise shown on Drawings or directed by the Engineer.	Ordinary fill	85%
Backfill behind walls and below or adjacent to additional construction.	Select fill	95%
Backfill behind retaining walls.	Ordinary fill	90%
Backfill except as described above.	Normal backfill	90%
Where indicated on Drawings.	Select fill	95%
Fill within treatment structures, fill beneath interior slabs on grade over moisture barrier.	Sand fill	95%

END OF SECTION

SECTION 31 23 18

ROCK EXCAVATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This Section includes requirements for rock excavation in trenches, pits, and open excavations.

1.02 CLASSIFICATION OF ROCK EXCAVATION

A. Excavation to required subgrade elevations or trench dimensions will be classified as either "rock excavation" or "unclassified excavation."

1. **Rock Excavation** includes all materials which, in the opinion of the Engineer, require barring, wedging and / or special impact tools such as hydraulic rock hammers, jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock for removal from their original beds and which have compressive strengths in their natural undisturbed state in excess of 300 psi. Boulders or masonry larger than one cubic yard in volume are classed as rock excavation.
2. **Rock Excavation Field Tests:** Rock excavation is material that meets any one of the following field test criteria:
   a. Ripping Test: Material that cannot be broken down by one pass with a single tooth ripper mounted on a crawler-type tractor in low gear with a minimum net flywheel power rating of 255 hp.
   b. Seismic Test: Material that has a seismic velocity greater than 6,000 feet/second. Submit the qualifications of the person performing and interpreting the seismic testing for Engineer approval at least 14 days before testing. Perform the Ripping Test to resolve differences in material classification if seismic velocities fall below 6,000 feet/second.
   c. Handling Test: Rock with a volume greater than one cubic yard that cannot be readily broken down with excavation equipment.
3. **Unclassified Excavation** includes excavation of pavements and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with soil and other materials encountered that are not classified as rock or unauthorized excavation. Unclassified Excavation includes excavation done with intermittent drilling or ripping performed solely to increase production, but not necessary to permit excavation of material encountered.

1.03 RELATED WORK

A. Section 01 29 00 – Payment Procedures.

1.04 VERIFICATION

A. If verification is required, Contractor shall employ a Geotechnical Firm to perform rock excavation field tests and verify quantity and depth of rock excavation at no additional cost the Owner. These field tests are not part of material testing specified under Section 01 45 23 – Testing Laboratory Services.

B. The quantity of detached rocks and boulders shall be measured before they are incorporated into earth haul. Rock material that is not measured and is incorporated into the earth haul will be considered Unclassified Excavation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SITE CONDITIONS

A. Classification and Quantity: Make investigations and determinations necessary to determine the classification and quantities of rock excavation and the methods to be used to excavate these materials.

B. Determination of Classification: If difficult excavation conditions are encountered within defined limits, they will be classified as "Rock Excavation" if mutually agreed upon by the Contractor's superintendent and the Owner's Resident Project Representative at the time the condition is encountered, and the Contractor will be paid at the rock excavation unit bid price. If the Contractor's superintendent and the Owner's Resident Project Representative do not mutually agree on the classification, the Contractor shall demonstrate to the Engineer's satisfaction that the areas in question meet one of the Rock Excavation Field Tests as specified herein.

3.02 BLASTING

A. Blasting of rock is not permitted.

3.03 ROCK EXCAVATION – MECHANICAL METHOD

A. Excavate rock using mechanical methods.
   1. Cut away rock at bottom of excavations to form level bearing that follows natural strata. Form with sharp steps.
   2. Remove final layers carefully to provide sound and unshattered base for footings and foundations as needed.
   3. Remove boulders and fragments that may slide or roll into excavated areas.

PART 4 PAYMENT

4.01 MEASUREMENT

A. Unit of Measurement for Rock Excavation in Trenches: Linear foot of trench, or as specified otherwise in the Bid Form.

B. Unit of Measurement for Rock in Open Excavations: Cubic yard, or as specified otherwise in the Bid Form.

4.02 PAYMENT ITEMS

A. Payment for Rock Removal and Disposal will be at the Contract unit price for Rock Excavation. The unit price will be full compensation for labor, material, equipment, and work required for verification, drilling, excavation, loading, dumping, and spreading rock material; forming embankments; shaping and trimming slopes and surfaces; and replacing with specified fill.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Trenching, Backfilling, and Compacting for Buried Pipes and Manholes.

B. Bedding of Buried Pipes.

C. Pipe Marking Systems.

1.02 REFERENCES

A. ASTM C12 – Installing Vitrified Clay Pipe Lines.

B. ASTM D256A – Determining the Izod Pendulum Impact Resistance of Plastics, Method A.

C. ASTM D638 – Tensile Properties of Plastic.

D. ASTM D695 – Compressive Properties of Rigid Plastics.

E. ASTM D790 – Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

F. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).

G. ASTM D1593 – Non-Rigid Vinyl Chloride Plastic Film and Sheeting.

H. ASTM D2321 – Underground Installation of Flexible Thermoplastic Sewer Pipe.

I. ASTM D2583 – Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

J. ASTM D2774 – Underground Installation of Thermoplastic Pressure Piping.

K. ANSI/AWWA C150/A21.50 – Thickness Design of Ductile-Iron Pipe.

L. ANSI/AWWA C151/A21.51 – Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.

M. ANSI/AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances.

N. ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fitting for Water.

O. OSHA Regulations, 29 CFR 1926 Subpart P – Excavations.

1.03 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
   1. Testing laboratory results on bedding materials to demonstrate compliance with Specifications.
   2. Product data for identification tape, marker posts, tracer wire system, and electronic marker device system, if scheduled.

1.04 JOB CONDITIONS

A. All trenching is unclassified.

B. Protect adjacent structures and surrounding areas.

C. Work to remain within available easements.

D. Weather:
   1. No backfill placement during freezing weather.
   2. No frozen materials, ice, or snow in backfill or fill.
   3. No backfill or fill on frozen surfaces.

1.05 REGULATORY REQUIREMENTS

A. Comply with OSHA Standard 29 CFR Part 1926, Subpart P – Excavations, during all excavation, trenching, and shoring operations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Bedding Materials:
   1. Bedding materials are those materials located a maximum of 8″ below bottom of pipe to bottom or spring line of pipe, depending on bedding class or condition required.
   2. Material shall be granular and free flowing:
      a. Maximum particle or clump size:
         1) Plastic Pipe 8″ Diameter and Smaller: 0.25″.
         2) All other Pipe: 0.75″.
      b. Portion Passing No. 200 Sieve: 50% maximum.
      c. Free from refuse, organic material and frozen soils.
   3. Materials require prior written approval.
   4. Concrete: Division 03.

B. Initial Backfill Materials:
   1. Initial backfill material is that material placed above the bedding material, around and over the pipe to 12″ over the top of the pipe.
   2. Material to be defined and required by applicable ASTM standard for installation for bedding class or type required or scheduled.

3. In no case shall initial backfill material contain particles or clumps with any dimension greater than:
    a. Plastic Pipe 8″ Diameter and Smaller: 0.25″.
    b. All Other Pipe: 0.75″.
4. If not otherwise defined, same as bedding material.

C. Backfill Materials:
1. Backfill materials are those materials placed in the trench between the initial backfill material and the top of the trench.
2. Material to be as defined and required by applicable ASTM standard for installation for bedding class or type required or scheduled.
3. Backfill shall have no particles or clumps having a dimension larger than 6″ within 3′ of the top of the pipe.

D. Materials Not Allowed:
1. All pipe bedding, initial backfill, and backfill material shall be clean and free of roots, vegetable or organic material, frozen material, mine tailings, or any contaminants that could endanger public health.

E. Identification Tape:
1. Identification tape shall consist of high visibility, color coded inert polyethylene tape that is impervious to all known alkalis, acids, chemical reagents and solvents found in the soil.
2. The tape shall have the following properties:
    a. Minimum overall thickness: ASTM D1593: Plain, 4.0 mils; detectable, 4.5 mils.
    b. Minimum tensile strength (longitudinal): ASTM D638: Plain, 1500 psi; detectable, 4,544 psi.
    c. Maximum imprint length: 36″.
    d. Detectable Tape Metallic Foil Stripes: Permanently laminated to the polyethylene tape so that tape may be more readily located using a metal detector. Refer to Part 3 for application of use. Width: 6″.
3. Tape to meet the APWA Uniform Color Code for utilities.
4. Imprinted message, “Caution Buried Utility Line Below”, printed with black letters on APWA approved colors.
5. Acceptable Manufacturers:
    a. Seton Identification Products, Branford, CT or Engineer reviewed equivalent.

F. Tracer Wire System:
1. Provide tracer wire system as shown on the Drawings and as specified herein.
2. Install single run of tracer wire on top of pipe.
3. Secure wire to pipe every 10′ with pipe wrap tape (tape required to hold wire in place during backfill).
4. Bring wire to surface at every valve box, vault, hydrant, manhole, every 1,000 linear feet, and where shown on Drawings.
5. Terminate wire at surface using a tracer terminal box.
6. All tracer system components such as terminal box cover, wire insulation, and connectors shall be in accordance with APWA Uniform Color Code for utilities.

7. Tracer Wire: #12 AWG, UL listed, 30V single conductor, tracer wire, with 30 mil high density polyethylene (HDPE) insulation.
    a. Copper-clad annealed high carbon 1055 grade steel wire, break load 452 lbs. steel core shall be manufactured in the United States. Copperhead Industries LLC, High Strength HS-CCS, or Engineer reviewed equivalent.
    b. Solid strand copper, Agave Wire LTD, Paige Tracer, or Engineer reviewed equivalent.
    c. If tracer wire is scheduled to be used on utilities installed by horizontal directional drilling, refer to Section 33 05 23.13 – Utility Horizontal Directional Drilling.
8. Pipe Wrap Tape:
    a. Material: 10 mil all weather polyvinyl film.
    b. Durability: Resistant to moisture and corrosive soil.
    c. Adhesion: Adheres to metal and plastic, and conforms to irregularities in substrate surface.
    d. Elongation: 245%.
    e. Tensile Strength: 30 psi.
    f. Width: 2″.
    g. Printed Identification Marking: UPC code, and mil thickness.
    h. Acceptable Manufacturer: Northtown Company, or Engineer reviewed equivalent.
9. Tracer Terminal Box (Test Box):
    a. Copperhead Industries, LLC, Snake Pit Magnetized Tracer Boxes, or Engineer reviewed equivalent.
        1) Light Duty Box: Locate next to structures and not subject to direct damage (such as adjacent to a fire hydrant).
        2) Roadway Box: Locate in or adjacent to road and subject to road traffic.
        3) Concrete / Driveway Box: Locate in areas of concrete pavement.
10. Corrosion-Resistant Wire Connectors:
    a. Direct bury twist-on wire nuts, prefilled with dielectric silicone. For use when connecting between spools (2 conductors max.). Copperhead Industries, LLC, Agave Wire LTD, or Engineer reviewed equivalent.
    b. Direct bury lugs, prefilled with dielectric silicone. For use when connecting to terminal electrical box. Copperhead Industries, LLC, Agave Wire LTD, or Engineer reviewed equivalent.
    c. Acceptable for use in place of wire nuts and / or lugs, Copperhead Industries, LLC, twist locking, watertight connectors, with dielectric silicone, or Engineer reviewed equivalent.
11. Test for electrical continuity after installation in accordance with manufacturer's recommendations using manufacturer's cable tracing equipment. Provide test reports to Engineer for review.

PART 3 EXECUTION

3.01 INSPECTION

A. Field verify location of underground utilities and obstructions.

3.02 CLEARING AND GRUBBING

A. General: Clear and grub all areas within the construction limits that will be disturbed by trenching or stockpiling.

B. Clearing: Remove and dispose of trees and other vegetation, downed timber, snags, brush, and rubbish within areas to be cleared.

C. Grubbing: Remove stumps, matted roots, and roots larger than 2″ in diameter from areas to be excavated and from within 6″ of surface of areas to receive stockpiled material. Do not allow grubbed material to mix with trench backfill.

D. Disposal:
1. Haul and dispose of all debris, rubbish, vegetation, broken concrete, broken asphaltic concrete, rocks, and other material to be removed.
2. Properly dispose of material in accordance with applicable state and federal regulations.
3. Burning of debris and rubbish will not be permitted on the project site.

3.03 DEWATERING

A. Provide and maintain adequate dewatering equipment to remove and dispose of surface and groundwater entering excavations, trenches, and other parts of the Work.

B. Keep excavation dry during subgrade preparation and continuously thereafter until the structure to be built or the pipe to be installed is completed to the extent that no damage from hydrostatic pressure, flotation or other cause will result.

C. Dewater excavations which extend to or below groundwater by lowering and keeping the groundwater level beneath such excavation at least 12″ below the bottom of the excavation.

D. Divert surface water or otherwise prevent it from entering excavated areas or trenches to the extent practical without damaging adjacent property.

E. Contractor is responsible for the condition of any pipe or conduit he uses for drainage; all drainage pipes, ditches, etc. shall be left clean and free of sediment.

3.04 BLASTING

A. Blasting is not allowed.

3.05 SHEETING

A. If used, cut off at top of pipe and leave in place unless removal is specifically reviewed by Engineer.

3.06 STABILIZATION

A. Thoroughly compact and consolidate trench bottoms so they remain firm, dense, and intact during required construction activities.

B. Remove all mud and muck during excavation.

C. Reinforce trench bottom with crushed rock or gravel if it becomes mucky during construction activities.

D. Allow no more than 1/2″ depth of mud or muck to remain on trench bottoms when pipe bedding material is placed thereon.

E. Where trench bottoms-out in rock, rock is to be removed to 8″ below bottom of pipe and replaced with bedding material.

3.07 TRENCH EXCAVATION

A. Slope, bench, or support all trenches in conformance with OSHA Excavation Regulations, and follow all specified safety requirements.

B. Do not open more trench in advance of pipe laying than is necessary to expedite the Work; not more than 400′, unless otherwise authorized by Engineer.

C. Except where jacking and boring is indicated on the Drawings, specified or permitted by Engineer, excavate trenches by open cut from the surface.

D. Alignment, Grade, and Minimum Cover:
1. Establish alignment and grade or elevation from offset stakes.
2. Excavate trenches so pipes can be laid straight at uniform grade without dips or bumps, between the terminal elevations indicated on the Drawings.
3. Comply with pipe specification sections regarding vertical and horizontal alignment and max joint deflection.
4. Water lines to have minimum bury as shown on the Drawings, and in general, grade shall follow surface contours unless otherwise shown on the Drawings.

E. Limiting Trench Widths:
1. Excavate to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, embedment.
2. If needed to reduce earth loads to prevent sloughing cut banks back on slopes which extend not lower than 1′ above the top of the pipe.
3. Trench widths and minimum clearances between installed pipe and trench wall:

Pipe Size	Minimum Trench Width	Minimum Clearance	Maximum Trench Width at Top of Pipe
18″ or less	O.D. plus 16″	8″	O.D. plus 24″
Larger than 18″	O.D. plus 24″	12″	O.D. plus 24″

F. Mechanical Excavation:
   1. Do not use where its operation would damage trees, buildings, culverts, or other existing property, structures, or utilities above or below ground; hand-excavate only in such areas.
   2. Use mechanical equipment of a type, design, and construction and operated so that:
      a. Rough trench bottom elevation can be controlled.
      b. Uniform trench widths and vertical sidewalls are obtained from 1′ above the top of the installed pipe to the bottom of the trench.
      c. Trench alignment is such that pipe is accurately laid to specified alignment and is centered in the trench with adequate clearance between pipe and trench sidewalls.
      d. Do not undercut trench sidewalls.

G. Cuts in Existing Paved Surfaces:
   1. Applies to streets, sidewalks, curbs, driveways, and other existing paved surfaces.
   2. No larger than necessary to provide adequate working space.
   3. Cut a clean groove not less than 1-1/2″ deep along each side of trench or around perimeter of excavation area.
   4. Remove pavement and base pavement to provide shoulder not less than 6″ wide between cut edge and top edge of trench.
   5. Do not undercut trenches, resulting in bottom trench width greater than top widths.
   6. Make pavement cuts to and between straight or accurately marked curved lines parallel to trench centerline or limits of excavation.
   7. Where the trench crosses existing paved surfaces, remove and replace the paved surface between saw cuts as specified for pavement.

H. Excavation Below Pipe:
   1. Except as otherwise required, excavate trenches below the underside of pipes as indicated on the Drawings to allow placement of granular pipe bedding material.
   2. Where excavating in earth for 6″ and smaller pipe, Contractor has the following options for excavating trench bottoms:
      a. Excavate below pipe subgrade and place granular embedment.
      b. Grade trench bottom to provide uniform and continuous support between bell holes or end joints.

I. Excavation for Bell Holes:
   1. Excavate to provide adequate clearance for tools and methods of pipe installation.
   2. Do not allow any part of bells or couplings to contact the trench bottom, walls, or granular embedment when pipe is joined.

J. Excavated Material: Place stockpiled excavated materials in a manner that will not obstruct work or endanger personnel or the public.
   1. Excavated materials shall not obstruct sidewalks or driveways for extended periods of time.

2. Excavated materials shall not obstruct hydrants, valve pit covers, valve boxes, or other utility controls.
3. Excavated materials shall not obstruct gutters, unless other temporary provisions have been made for street drainage.
4. Excavated materials shall not obstruct natural drainage ways.

K. Surplus Excavated Material: Excavated material in excess of that needed to backfill to the limits indicated in the Contract Documents shall be properly disposed off-site in compliance with regulatory requirements at no additional cost to the Owner.

3.08 PIPE BEDDING

A. Class D per ASTM C12.

B. Class C per ASTM C12.

C. Class B per ASTM C12.

D. Crushed Stone Encasement per ASTM C12.

E. Class A-I: ASTM C12 Class A-1 using plain concrete.

F. Class A-II: ASTM C12 Class A-1 using reinforced concrete; No. 4 A-36 steel reinforcing bars parallel to pipe with steel area not less than 0.4% of the area of concrete above top of pipe.

G. Class A-III: ASTM C12 reinforced concrete encasement; 3000 psi concrete; No. 4 A-36 steel reinforcing bars; reinforcing parallel to pipe with steel area not less than 0.4% of the area of concrete above and below pipe; reinforcing bars wrapped around parallel bars at 36″ maximum spacing.

H. Bedding class or type as scheduled.

I. Carefully place bedding in accordance with ASTM C12 to provide uniform and continuous support to pipe barrel, except at bell holes in all cases. No bridging will be allowed.

3.09 MANHOLE SUBGRADE

A. Subgrade Material: Use same bedding class as specified for adjacent pipe bedding.

B. Compaction: 90% ASTM D1557.

3.10 TRENCH BACKFILL

A. Material as defined by applicable reference for installation for type of pipe used.

B. Bedding, Initial Backfill, and Backfill: If native materials cannot meet the requirements of Part 2 specified herein or if the specified field compaction cannot be obtained, Contractor shall import suitable material at no additional cost to the Owner.

C. Bedding: Carefully “shovel-slice” or tamp bedding so that the material fills and supports the haunch area under the pipe without voids.

D. Initial Backfill: Place in layers that do not exceed 8″ in height of backfill material in its uncompacted state.

E. Backfill: Place in layers heights suitable to enable the Contractor to achieve the specified compaction throughout the full depth of backfill using Contractor’s selected means and methods and without damaging the pipe.

F. Paved Traveled Areas:
1. 90% ASTM D1557 compaction.
2. Top 12″ below subgrade, 95% ASTM D1557 compaction.

G. Unpaved Traveled Areas and Treatment Plant/Pump Station Sites:
1. 90% ASTM D1557 compaction.

H. Untraveled Areas: Compacted to at least undisturbed natural density but not less than 85% ASTM D1557.

I. Water Settled Backfill: Use only where permitted by Engineer:
1. Where permitted, apply to obtain effective settlement with a minimum of water.
2. Do not permit trench to overflow.
3. Do not settle by water puddling until after trench has been backfilled to ground surface.
4. Introduce water above the pipe embedment through a long pipe nozzle so disturbance of granular embedment or compacted material is held to an absolute minimum.
5. Add backfill material to compensate for settlement below surface grade and settled during puddling operations.

J. Install identification tape in backfill 24″ directly above top of all buried pipe, unless otherwise scheduled or shown on Drawings. Use tape with metallic foil stripes for all non-metallic pipes.

K. Upper 18″ of trench shall contain no particles larger than 6″ in any dimension.

L. Surface Finish:
1. For placement of paving or gravel surfacing, subgrade where applicable.
2. Match existing and surrounding contours.
3. Graded finished appearance.

3.11 FIELD QUALITY CONTROL

A. Section 01 45 23 – Testing Laboratory Services.

B. Section 01 71 23 – Field Engineering.

C. Test Schedule unless otherwise directed by the Engineer:
   1. Minimum of one field density test for each compacted layer of trench backfill for each 250 linear feet of trench in traveled areas.

D. Minimum of one field density test for each compacted layer of trench backfill for each 500 linear feet of trench in untraveled areas.

E. Minimum of two field density tests for each compacted layer of trench backfill at each road crossing.

3.12 PIPE BEDDING SCHEDULES

A. Cast or Ductile Iron Pipe:
   1. Minimum Bedding Class:

Pipe Diameter	Trench Depth To Top of Pipe	Bedding Class
14″ or less	5′ or less	D
	5′ – 12′	C
	More than 12′	B
Larger than 14″	12′ or less	C
	More than 12′	B

B. PVC, HDPE, and Other Plastic Type Pipes:
   1. As recommended by manufacturer.
   2. Minimum Bedding Class:
      a. Trench depth to top of pipe less than 10′; Class C.
      b. Trench depth to top of pipe 10′ or more; Class B.
   3. Gravity sewer lines bedded to meet maximum deflection requirements given with pipe specifications.

C. Unstable Trench Conditions Due to Groundwater:
   1. Crushed stone encasement with the following minimum limits:
      a. 12″ below bottom of pipe.
      b. Full width of excavated trench.
      c. 12″ above top of pipe.

3.13 PIPE MARKING SCHEDULE

A. Identification Tape: All buried piping.

B. Tracer Wire: All buried piping.

END OF SECTION

SECTION 32 09 00

REMOVAL AND REPLACEMENT OF EXISTING SURFACES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Removal and replacement of existing asphalt and concrete paving, sidewalks, curb and gutter, and driveways removed incidental to the Work of the contract.

1.02 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):
   1. AASHTO T 166 – Test for Bulk Specific Gravity (Gmb) of Compacted Hot Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens.
   2. AASHTO T 209 – Theoretical Maximum Specific Gravity and Density of Hot-Mix Asphalt Paving Mixtures.

B. American Society for Testing and Materials International (ASTM):
   1. ASTM D1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
   2. ASTM D2950 – Density of Bituminous Concrete in Place by Nuclear Methods.

C. New Mexico State Department of Transportation (NMDOT):
   1. Standard Specifications for Highway and Bridge Construction.

1.03 TESTING AND INSPECTION

A. Representative samples shall be taken from each concrete truck and tested for:
   1. Slump.
   2. Air entrainment.
   3. Compressive strength (7 day, 14 day, 28 day) (4 cylinders per truck).

1.04 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
   1. Product Data.
   2. Gradations and other laboratory results.

B. Design mix for asphalt and concrete.

C. Certify that materials comply with specification requirements.

D. Testing Laboratory Test Results.

PART 2 PRODUCTS

2.01 MATERIALS

A. All replacement materials to be new and of same quality or better than existing.

PART 3 EXECUTION

3.01 REMOVAL

A. Asphaltic and Concrete Paving Material:
   1. Sawcut lines, the full depth of the material, straight and parallel without abrupt jogs, vertical to the surface.
   2. Broken out and removed entirely; rubble to be wasted at an approved location.

B. Sidewalks and Curb and Gutter:
   1. Sawcuts at exiting joints only.
   2. Broken out and removed entirely; rubble to be wasted at an approved location.

C. Gravel Surface and Subgrade Material:
   1. Removed entirely.
   2. May be stockpiled and reused for replacement or removed and wasted at an approved location.
   3. Material for reuse must be clean, free of debris, organic, and deleterious substances, and used only with the review of the Engineer.

3.02 PREPARATION FOR REPLACEMENT

A. Subgrade materials same thickness and type as removed.

B. Subgrade compaction as shown on the Drawings, not less than 90% modified Proctor, ASTM D1557.

C. Existing gravel materials to be reused to be clean as required.

3.03 REPLACEMENT SCHEDULE

A. Replacement shall be constructed to conform to existing lines, grades, shape, thickness, and finish, unless otherwise scheduled or shown on Drawings.

B. Asphalt pavement to be placed with laydown machine when practical.

C. Mix design for asphalt pavement shall meet New Mexico Department of Transportation Department Standard Specifications for Highway and Bridge Construction, current edition, Section 423.2.8 – Mix Design, Hot Mix Asphalt (HMA) Superpave SP-IV requirements. Unless indicated otherwise, standard section shall be 4″ asphalt on 6″ compacted base course and 12″ of subgrade preparation.

D. Quality Control for Asphalt Pavement Compaction:

1. Monitor the compaction process by determining the density of the Superpave SP-IV with a portable nuclear density test device in conformity with ASTM D2950. Calibration of the portable nuclear device shall be established from cut pavement samples. The density readings of the cut pavement samples shall be determined in accordance with AASHTO T 166 (weight, volume method) and the density readings of the pavement shall be determined by the portable nuclear density test device in conformity with ASTM D950 and shall be correlated by the test lab. Conduct three density tests for each 500 yd^2, or fraction thereof, of each lift each day.
2. The range density for acceptance of Superpave SP-IV shall be 95% (±3%) of the theoretical maximum density as determined from AASHTO T 209.

E. Concrete pavement, curb and gutter, and gutter, equipment pads, and sidewalks shall conform to City of Albuquerque Mix Code 55.21. Unless indicated otherwise, standard section shall match existing thickness (minimum 4″ on 6″ compacted base course and 12″ of subgrade preparation.) Sections for concrete sidewalks do not require base course.

F. Base course mix design shall conform to the New Mexico Department of Transportation, Standard Specifications for Highway and Bridge Construction, current edition, Section 303, gradation I.

END OF SECTION

SECTION 33 12 01

WATER SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Pipes, Materials, Valves, and Appurtenances for buried potable water and non-potable water service or uses as scheduled.

B. Installation.

1.02 RELATED WORK

A. Section 31 23 33 – Trenching and Backfilling.

B. Section 33 13 13 – Disinfection of Domestic Water Systems.

1.03 REFERENCES

A. American Society for Testing and Materials International (ASTM):
1. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM A90 – Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
3. ASTM A123 – Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
4. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
5. ASTM A234 – Piping Fittings of Wrought Carbon Steel and Allow Steel for Moderate and High Temperature Service.
6. ASTM A307 – Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
7. ASTM A536 – Ductile Iron Castings.
8. ASTM A746 – Ductile Iron Gravity Sewer Pipe.
9. ASTM A780 – Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
10. ASTM C76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
11. ASTM C443 – Joints for Concrete Pipe And Manholes, Using Rubber Gaskets.
12. ASTM D523 – Test Method for Specular Gloss.
13. ASTM D1248 – Polyethylene Plastics Extrusion Materials for Wire and Cable.
14. ASTM D1784 – Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
15. ASTM D1785 – Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.
16. ASTM D2239 – Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.
17. ASTM D2241 – Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).

18. ASTM D2464 – Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
19. ASTM D2466 – Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
20. ASTM D2467 – Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
21. ASTM D2564 – Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
22. ASTM D2672 – Joints for IPS PVC Pipe Using Solvent Cement.
23. ASTM D2737 – Polyethylene (PE) Plastic Tubing.
24. ASTM D3034 – Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
25. ASTM D3139 – Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
26. ASTM D3350 – Polyethylene Plastics Pipe and Fittings Materials.
27. ASTM E8 – Test Methods for Tension Testing of Metallic Materials.
28. ASTM E23 – Test Methods for Notched Bar Impact Testing of Metallic Materials.
29. ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
30. ASTM F714 – Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.
31. ASTM F794 – Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe And Fittings Based On Controlled Inside Diameter.
32. ASTM F876 – Cross-Linked Polyethylene (PEX) Tubing.
33. ASTM F894 – Polyethylene (PE) Large Diameter Profile Wall Sewer And Drain Pipe.
34. ASTM F1803 – Poly (Vinyl Chloride)(PVC) Closed Profile Gravity Pipe And Fittings Based On Controlled Inside Diameter.
35. ASTM F2620 – Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

B. American Water Works Association (AWWA):
1. AWWA C213 – Fusion-Bonded Epoxy Coatings and Linings for Steel Water Pipe and Fittings.
2. AWWA C302 – Reinforced Concrete Pressure Pipe, Noncylinder Type.

C. American National Standards Institute (ANSI) / AWWA C104 / A21.4 – Cement Mortar Lining for Ductile-Iron Pipe and Fittings.
1. ANSI / AWWA C105 / A21.5 – Polyethylene Encasement for Ductile-Iron Pipe Systems.
2. ANSI / AWWA C110 / A21.10 – Ductile-Iron and Gray-Iron Fittings.
3. ANSI / AWWA C111 / A21.11 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
4. ANSI / AWWA C115 / A21.15 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
5. ANSI / AWWA C116 / A21.16 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings.
6. ANSI / AWWA C151 / A21.51 – Ductile-Iron Pipe, Centrifugally Cast.
7. ANSI / AWWA C153 / A21.53 – Ductile-Iron Compact Fittings.

8. AWWA C207 – Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm).
9. ANSI / AWWA C213 – Fusion-Bonded Epoxy Coating for the Interior of Steel Water Pipelines.
10. ANSI / AWWA C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe.
11. ANSI / AWWA C228 – Stainless-Steel Pipe Flange Joints for Water Service – Sizes 2 In. Through 72 In. (50 mm Through 1,800 mm).
12. ANSI / AWWA C303 – Concrete Pressure Pipe, Bar-Wrapped, Steel-Cylinder Type.
13. ANSI / AWWA C500 – Metal-Seated Gate Valves for Water Supply Service.
14. ANSI / AWWA C502 – Dry-Barrel Fire Hydrants.
15. ANSI / AWWA C504 – Rubber-Seated Butterfly Valves.
16. ANSI / AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.
17. ANSI / AWWA C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
18. ANSI / AWWA C550 – Protective Interior Coatings for Valves and Hydrants.
19. ANSI / AWWA C600 – Installation of Ductile-Iron Mains and Their Appurtenances.
20. ANSI / AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
21. ANSI / AWWA C700 – Cold-Water Meters – Displacement Type, Metal Alloy Main Case.
22. ANSI / AWWA C701 – Cold-Water Meters – Turbine Type, for Customer Service.
23. ANSI / AWWA C704 – Propeller-Type Meters for Waterworks Applications.
24. ANSI / AWWA C800 – Underground Service Line Valves and Fittings.
25. ANSI / AWWA C900 – Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm), for Water Transmission and Distribution.
26. ANSI / AWWA C901 – Polyethylene (PE) Pressure Pipe and Tubing, ¾ In. (19 mm) Through 3 In. (76 mm), for Water Service.
27. AWWA C904 – Cross-Linked Polyethylene (PEX) Pressure Tubing, ½ In. (13 mm) Through 3 In. (76 mm) For Water Service.
28. ANSI / AWWA C906 – Polyethylene (PR) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks.
29. AWWA Manual M23 – PVC Pipe – Design and Installation.
30. AWWA Manual M55 – PE Pipe – Design and Installation.

D. National Sanitation Foundation International (NSF):
1. NSF / ANSI 14 – Plastics Piping System Components and Related Materials.
2. NSF/ANSI 61 – Drinking Water System Components – Health Effects.
3. NSF/ANSI 372 – Drinking Water System Components – Lead Content.
4. NSF / ANSI Standard 600: Health Effects Evaluation and Criteria for Chemicals in Drinking Water.

1.04 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
   1. Product data for pipe materials, including pipe size, dimensions, pressure class, and color; valves and appurtenances.
   2. Non-Toxic and Lead-Free Certification: Written statement that all materials in contact with potable water or raw water supply shall be NSF/ANSI 61 compliant, and shall be lead-free, as certified by the Water Quality Association to comply with NSF/ANSI 372.
   3. Manufacturer's installation instructions for pipe materials.
   4. Layout drawings for DIP furnished with ring-type integral buried joint restraint.

B. Section 01 78 23 – Operation and Maintenance Data:
   1. Operation and maintenance data for valves 4″ and larger and hydrants.

1.05 GENERAL REQUIREMENTS

A. Pipes, fittings, and materials to be new.

B. Use appropriate equipment and methods for unloading, reloading, hauling, and laying pipe as well as proper trench excavation. Use slings with broad, well padded contact surfaces for pipe protection.

C. All pipe of the same type shall be made by the same manufacturer. All fittings of the same type shall be made by the same manufacturer. Pipe manufacturer need not be the same as the fittings manufacturer.

D. Provide labor, equipment, and materials for pipe field testing.

1.06 QUALITY ASSURANCE

A. PVC Pipe and Fittings:
   1. Tests: ASTM D3034, ANSI/AWWA C900, ASTM D 1784, and ASTM D 1785, as applicable.
   2. Marking: Indelible, in each pipe.
      a. Nominal pipe diameter and cell classification.
      b. Manufacturer's name or trade name, PVC, ASTM and SDR designation, AWWA pressure class, and date of production.
      c. Service designation.
      d. NSF-61 certified.
   3. Gasket rings: Marked with the manufacturer's identification, size, year of production, and classes of pipe in which they are to be used.

PART 2 PRODUCTS

2.01 MATERIALS AND FABRICATION

A. Polyvinyl Chloride (PVC):
1. Water Service Condition:
a. Potable Water Service:
1) Pipe manufactured from compounds certified by the National Sanitation Foundation (NSF).
2) Color: Blue pigment.
b. Reclaimed Water Service:
1) Color: Purple pigment.
2) Marking: Continuous text, “Reclaimed Water – Do Not Drink”.
c. Non-Potable Water other than Reclaimed Water Service:
1) Color: White pigment.
2. Pipe and Fittings:
a. Pipe sizes 4″ through 60″:
1) ANSI/AWWA C900.
2) Pressure class as scheduled.
a) Class 235 psi (DR 18) minimum for 12″ and smaller if not scheduled or indicated otherwise.
b) Class 165 psi (DR 25) minimum for 14″ and larger if not scheduled or indicated otherwise.
3) Fittings: Cast from ductile iron; ANSI/AWWA C110/A21.10, full body or ANSI/AWWA C153/A21.53, short body; mechanical joint ANSI/AWWA C111/A21.11, external mechanical restraint devices as specified herein. Encase fittings and all external restraint assemblies with polyethylene encasement per ANSI/AWWA C105, unless scheduled otherwise.
b. Pipe sizes 3.5″ and smaller:
1) Unless otherwise scheduled or shown on the Drawings.
a) ASTM D2241.
b) 1.5″ and smaller: SDR 21.
c) 2″ through 3.5″: SDR 26.
d) Pressure rating as scheduled; 160 psi minimum if not scheduled.
2) If scheduled or shown on the Drawings:
a) Schedule 40 and 80 Pipe Dimensions and Workmanship: ASTM D1785.
b) Schedule 40 minimum unless otherwise scheduled or shown on Drawings.
c) Material: ASTM D1784, Class 12454-B.
d) Fittings:
i. ASTM D2466, Schedule 40.
ii. ASTM D2464, Schedule 80, threaded.
iii. ASTM D2467, Schedule 80, socket type.

3. Joints:
    a. Gasket Bell End: ASTM D3139 for plastic pressure pipes using elastomeric seals.
    b. Gaskets: ASTM F477, elastomeric.
    c. Solvent Cement Bell End: ASTM D2672.
    d. Solvent-Cement: ASTM D2564, NSF approved.
        1) Use only where specifically scheduled, shown on Drawings, or reviewed by Engineer.
4. PVC Joint Restraint:
    a. Furnish restraint devices where scheduled or noted on Drawings. Furnish type of device as specified herein or where scheduled.
    b. Buried Joints: External Mechanical Restraint Devices as specified herein.
    c. Exposed Joints: External Mechanical Restrained Flange Adapters as specified herein.

B. External Mechanical Restraint Devices:
1. Works on principle of multiple wedging action against pipe, which increases its resistance as line pressure increases while maintaining joint flexibility. Set screw devices are not acceptable. Split non-serrated back-up rings behind bells are acceptable. Split serrated restraint rings are not acceptable, except on spigot end of bell restraint harness of C900 PVC pipe up to 12″. EBAA Iron Sales, Inc. or Engineer reviewed equivalent.
2. Gland: Ductile iron with dimensions which match standard mechanical joint bells per ANSI/AWWA C153/A21.53, ASTM A536, Grade 65-45-12.
3. Wedges: Heat-treated ductile iron with minimum Brinnel hardness of 370 BHN.
4. Wedges tightened during installation via twist-off nuts.
5. Devices shall be designed for the following working pressure:
    a. 250 psi for 18″ to 48″ DIP, with 2:1 safety factor.
    b. 350 psi for 3″ to 16″ DIP, with 2:1 safety factor.
    c. Meets or exceeds standardized pressure rating of host PVC piping.
6. Devices shall be designed for the type of pipe material and pipe joint being harnessed.
7. An identification number shall be cast into each gland body with the following information: Date and shift of manufacture, and plant location.
8. All physical and chemical test results shall be made available to Engineer for review upon request by referencing the identification number.
9. Coating for wedges, wedge actuators, bolts, tie bolts, nuts, and related fastener and gripping components:
    a. Surface Preparation: Cleaner wash, phosphatizing, rinse, and drying.
    b. Coating: Liquid applied fluoropolymer-matrix consisting of lubricating compounds, UV stabilizers, and coloring agents or pigments. Heat cured. Two coats, 0.7 to 1.0 mil total DFT.
    c. Designed to prevent corrosion and facilitate makeup torque and provide color product identification.

10. Coating for Cast Bodies:
    a. Surface Preparation: Cleaner wash, phosphatizing, rinse, and drying.
    b. Coating: Electrostatically applied TGIC polyester-based powder. Heat cured. 1.5 to 4.0 mils total DFT.
    c. Designed to prevent corrosion, impact, and UV resistance.
    d. Appearance: Class 5 (orange peel) PCI smoothness standard; 75% to 85% gloss at 60° per ASTM D523; pinhole free.

C. Couplings:
1. Use only where indicated on Drawings or reviewed by Engineer. Do not use where restrained fittings are specified.
2. For buried service, furnish factory-applied fusion-bonded epoxy coating in accordance with AWWA C213, and corrosion-resistant alloy bolts equivalent to Dresserloy.
3. Shall meet AWWA C219: Described by reference to couplings manufactured by Dresser Industries, Inc., Bradford, PA; equivalent couplings by Ford Meter Box, JCM Industries, Romac Industries, or by other manufacturers may be used:
    a. Dresser Style 38 for exposed steel, cast iron, and ductile iron pipe, unless indicated otherwise on Drawings or scheduled.
    b. Dresser Style 253 cast iron couplings for buried steel, cast iron, ductile iron, and asbestos cement pipe, unless indicated otherwise on Drawings.
    c. Dresser Style 40 long couplings where long couplings are indicated.
    d. Dresser Style 62 Type reducing couplings where reducing couplings are indicated.
    e. Dresser Style 162 couplings for transition between different pipe materials.
    f. Dresser Style 63 expansion coupling where expansion coupling is indicated; type as indicated on Drawings or scheduled.
    g. Dresser Style 227 and 128 coupling with flanged adaptor where indicated on Drawings.

2.02 APPURTENANCES

A. Resilient Wedge Gate Valves 2″-24″ (Buried Service):
1. Size as shown on Drawings.
2. AWWA C509 or AWWA C515.
3. Mueller A-2361 series or Engineer reviewed equivalent.
4. Fully unobstructed, oversize flow way. The sealing mechanism is withdrawn from the flow way in a full open position. No pockets in bottom of flow way to trap sediment or debris.
5. Anti-friction washers above and below the thrust collar portion of stem to reduce friction.
6. Triple O-ring seals on the stem, two above and one below the thrust collar to protect from contamination.
7. A symmetrical rubber encapsulated disc with no exposed iron.
8. Forged bronze stem for added strength and reliability.

9. Coating: AWWA C550 and NSF-61 certified fusion-bonded epoxy coating on all interior and exterior cast iron surfaces 10 mils nominal thickness.
10. 2″ AWWA operating nut.
11. Ends: Mechanical joint, or as required for pipe or as shown on Drawings.
12. Threaded operator: Open left (counter clockwise) unless scheduled otherwise.
13. Lead Free: Furnish certification as specified in Submittals section of this specification.

B. Post Indicator Valve and Post:
1. Size as shown on Drawings.
2. AWWA C515.
3. Mueller PIV style P-2361 series gate valve with A-20806 adjustable indicator post, or Engineer reviewed equivalent.
4. Conformance: UL listed and FM approved.
5. Pressure Rating: 350 psig.
6. Fully unobstructed, oversize flow way capable of bi-directional flow. The sealing mechanism is withdrawn from the flow way in a full open position. No pockets in bottom of flow way to trap sediment or debris.
7. Polymer guide cap bearings on wedge guides.
8. Anti-friction washers above and below the thrust collar portion of stem to reduce friction.
9. Triple O-ring seals on the stem, two above and one below the thrust collar to protect from contamination.
10. A symmetrical rubber encapsulated disc with no exposed iron.
11. Non-rising forged bronze stem and thrust collar for added strength and reliability.
12. Coating: AWWA C550 and NSF-61 certified fusion-bonded epoxy coating on all interior and exterior cast iron surfaces 10 mils nominal thickness.
13. 2″ AWWA operating nut with indicator post style stuffing box.
14. Ends: Mechanical joint, or as required for pipe or as shown on Drawings.
15. Threaded operator: Open left (counterclockwise) unless scheduled otherwise.
16. Lead Free: Furnish certification per NSF 372, as specified in Submittals section of this Specification.
17. Indicator Post:
    a. Adjustable to match trench depth.
    b. Visible “open” / ”closed” target windows.
    c. Allowable Operating Torque: 900 ft-lbs.
    d. Designed to operate PIV valve, 14 turns for a 4″ valve.
    e. Cast bosses on upper barrel tapped with 1/2″ NPT to allow for optional supervisory switch installation.
    f. Conformance: UL listed and FM approved.

C. Pipe Marking Systems: Refer to Section 31 23 33 – Trenching and Backfilling.

PART 3 EXECUTION

3.01 INSTALLATION

A. General:
1. Install as indicated on Drawings.
2. Trenching, Backfilling, and Compacting: Section 31 23 33 – Trenching and Backfilling.
3. Pipe cutting measurement taken at site.
4. Clean all pipe, accessories, and appurtenances before use. Thoroughly clean interior of each section of pipe after installing it in trench.
5. Protection of stored materials: Section 01 66 01 – Product Delivery, Storage, and Handling Requirements.
6. Securely close the end of the pipe at the end of each day or whenever the work ceases with a watertight seal.
7. Take precautions necessary to prevent uplift and floating of the pipe prior to backfilling.

B. Jointing and Assembling, General:
1. Manufacturer's recommendations.
2. Lubricants: Vegetable soap solution suitable for use on potable water systems.
3. Prevent entrance of soil and other contaminants.
4. Use mechanical or push-on for exterior locations.

C. Delivery, Handling, and Storage of PVC Pipe:
1. All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Engineer.
2. Inspect each pipe shipment prior to unloading to see if the load has shifted or otherwise been damaged. Notify Engineer immediately if more than immaterial damage is found. Check each pipe shipment for quantity and proper pipe size, color, and type.
3. Off-load and handle pipe in accordance with AWWA M23 and AWWA C605, and all of the Pipe Supplier's guidelines.
4. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
5. During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.
6. Lower pipe from trucks carefully. Do not drop pipe.
7. Mark as rejected and remove at once from the work any pipe showing a crack or which has received a blow that could have caused an incident fracture, even though no such fracture can be seen.
8. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and shall be rejected unless determined acceptable by the Engineer.
9. Store and place pipe lengths on level ground. Store pipe at the job site in the unit packaging provided by the Pipe Supplier. Exercise caution to avoid

compression, damage, or deformation to the ends of the pipe. Keep the interior of the pipe, as well as all end surfaces, free from dirt and foreign matter.

10. Handle and support pipe using woven fiber pipe slings or approved equivalent. Exercise care when handling the pipe to not cut, gouge, scratch, or otherwise abrade the piping in any way.
11. If pipe is to be stored for periods longer than 90 days, the pipe and gaskets should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe shall be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.
12. Store and stack pipe in accordance with the Pipe Supplier's guidelines.

D. PVC Pipe Joint Assembly:

1. Conformance to AWWA C605 – Underground Installation of Polyvinyl Chloride (PCV) Pressure Pipe and Fittings for Water:
    a. Assemble PVC pipe in conformance with AWWA C605, section 5.5.2 – Joint Assembly, which states:
        1) "Pipe spigot ends are pre-marked at the factory with a circumferential insertion line. This line references how far the spigot should be inserted into the adjoining PVC pipe bell. Field-cut spigot ends shall be marked and beveled to match the manufacturer's insertion line. Pipe-to-pipe joints shall be assembled only to the insertion line. After assembly, the insertion line shall remain visible and be nearly flush with the lip of the adjoining PVC pipe bell. Joints assembled beyond the insertion line shall be considered over-assembled and may result in damaging stresses or leakage."
2. Field Quality Control to Prevent Over-Assembly (Over-Insertion):
    a. If a joint is found to be over-inserted, Contractor shall expose previously assembled joints until properly assembled joints are found. All over-inserted joints shall be properly re-assembled.
    b. Contractor is permitted to use mechanical bell stop devices that meet the following criteria:
        1) Designed specifically to handle pipe insertion forces to prevent insertion beyond the marked insertion line.
        2) Incorporates a resilient expansion retention spring that allows for pipe expansion and contraction.
        3) Ebaa Iron Mega-Stop™ Series 5000 Bell Protection System, or Engineer reviewed equivalent.

E. PVC Pipe Tapping:

1. Tapping shall be performed using standard tapping saddles designed for use on PVC piping in accordance with AWWA C605 and as specified herein. Tapping shall be performed only with use of tap saddles or sleeves. NO DIRECT TAPPING WILL BE PERMITTED. Tapping shall be performed in accordance with the applicable sections for Saddle Tapping in accordance with Uni-Pub-08.

2. All connections requiring a larger diameter than that recommended by the Pipe Supplier, shall be made with a pipe connection as specified and indicated on the Drawings.
3. Equipment used for tapping shall be made specifically for tapping PVC pipe:
    a. Tapping bits shall be slotted "shell" style cutters, specifically made for heavy-walled PVC pipe and designed to retain the coupon. "Hole saws" made for cutting wood, steel, ductile iron, or other materials are strictly prohibited.
    b. Manually operated or power operated drilling machines may be used.
4. Taps may be performed while the pipeline is filled with water and under pressure ("wet" tap,) or when the pipeline is not filled with water and not under pressure ("dry" tap).

F. Clean all lines by repeated flushings after installations.

G. Disinfection: Section 33 13 13 – Disinfection of Domestic Water Systems.

H. Pipe Sleeves:
1. For all pipes passing through concrete or masonry.
2. Install before concrete is placed where practical.
3. Sleeve seal: Watertight, modular sealing element when sleeve is placed in slabs with one side against soil.

I. Buried Pipe Anchorage:
1. Furnish and install thrust blocking, anchors, joint restraint devices, or other acceptable means of preventing pipe movement whether indicated or not for:
    a. Unlugged bell and spigot or all unflanged tees.
    b. Y branches.
    c. Bends deflecting 22-1/2° or more.
    d. Plugs.
    e. Fittings in fills or unstable ground.
    f. Above grade or exposed piping.

J. Valves: Installed as shown on Drawings with valve boxes and blocking.

K. Fire Hydrants: As indicated on Drawings with concrete supports.

3.02 FIELD QUALITY CONTROL

A. PVC Pipe and Fusible PVC Pipe: AWWA C605 for pressure rated, and AWWA Manual M23, except as specified otherwise herein.

B. All pipes and fittings tested in presence and to the satisfaction of the Engineer.

C. Test Conditions:
1. Working Pressure: See Schedule.
2. Medium: **Water only**. **Do not test PVC, FPVC or CPVC with air** because pipe failure from pressurized air may result in explosive shards.
3. Unless otherwise scheduled, perform test at 50% greater than working pressure, or 150 psi, whichever is greater, for 2 hour minimum.

D. Procedure:
1. Coordinate pressure testing with filling, disinfection and flushing procedures as submitted in the Disinfection Plan submittal specified in Section 33 13 13 – Disinfection of Domestic Water Systems.
2. Disconnect fixtures, equipment and accessories which may be damaged by test pressure.
3. Plug ends as required.
4. No installation will be accepted unless the leakage is less than the number of gallons per hour as determined by the following formula, except HDPE waterlines:
   a. L = (N) (D) (P^0.5) / 133,200
   b. Where:
      1) L = allowable leakage in gallons per hour.
      2) N = length of pipeline tested in feet.
      3) D = nominal diameter of pipe in inches.
      4) P = average test pressure during test, psig.

E. Sequence for Pressure Testing:
1. If an isolation valve is used to isolate a segment of pipe for pressure testing, the piping on both sides of the valve shall be installed with backfill and compaction fully completed on both sides of the valve for a minimum distance of 250′.

3.03 SCHEDULE

A. The waterline shall be constructed using any combination of the following pipe materials, unless noted otherwise in the Contract Documents for specific areas:
1. PVC Pipe:
   a. C900, Pressure Class 235, DR 18.

B. Buried Ductile Iron Piping, Fittings, and All External Restraint Assemblies; and Buried Metal Valves and All Metal Appurtenances: Install with polyethylene encasement.

END OF SECTION

SECTION 33 13 13

DISINFECTION OF DOMESTIC WATER SYSTEMS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide personnel, equipment, and supplies and disinfect and test all potable water systems, including water treatment systems, waterlines, water storage reservoirs, water wells, and new building system including flushing at completion of treatment.

1.02 RELATED REQUIREMENTS

A. American Waterworks Association Standards:
   1. AWWA B100 – Granular Filter Material.
   2. AWWA B300 – Hypochlorites.
   3. AWWA B301 – Liquid Chlorine.
   4. AWWA C651 – Disinfection Water Mains.
   5. AWWA C652 – Disinfection of Water Storage Facilities.
   6. AWWA C653 – Disinfection of Water Treatment Plants.
   7. AWWA C654 – Disinfection of Wells.
   8. AWWA C655 – Field Dechlorination.

1.03 RELATED WORK

A. National Sanitation Foundation International (NSF):
   1. NSF/ANSI 60 – Drinking Water Treatment Chemicals – Health Effects.

1.04 QUALITY ASSURANCE

A. Regulatory Agency Requirements: Comply with applicable state requirements.

1.05 SUBMITTALS

A. Disinfection Plan:
   1. Submittal Requirements:
      a. Prior to filling water system with water, submit electronic file of Disinfection Plan to Engineer for review and comment. Flushing, disinfection, and sampling procedures shall be in accordance with the referenced AWWA standards.
      b. Address Engineer's comments and submit electronic file of Final Disinfection Plan to Engineer and NMED Drinking Water Bureau pursuant to NMAC 20.7.10.201 B.(3), NMAC 20.7.10.201 T.(2), and NMAC 20.7.10.400 F.
      c. Do not fill system with water until NMED has approved the plan.

d. After disinfection has been completed and prior to placing components into service, submit Certification of Disinfection of Water Facilities in the form of a notarized affidavit to the Engineer and NMED Drinking Water Bureau confirming that disinfection of project components has been completed according to the referenced AWWA standards. Owner will withhold payment of the disinfection portion of the affected Work items until Contractor successfully submits Certification.
e. Do not place the system into service until NMED has accepted the Certification.

2. Proposed Actions Described in Plan:
   a. How pipes and tanks will be filled with source water. Coordinate availability of water with Owner.
   b. Identify the sequence of filling system, chlorinating water, pressure testing and flushing system. Follow procedures specified in the referenced AWWA disinfection standards. Reference which AWWA method of chlorination will be followed.
   c. If system will be disinfected, tested, and flushed in segments, identify where and in what sequence the segments will be isolated and tested. Be aware that elevation differences may require breaking up a pipeline into segments with no more than approximately 50 psi (115 vertical feet) pressure difference within the segment.
   d. Identify points in the system where water will be introduced, chlorine added (or swabbed), initial and residual chlorine concentrations measured, flushing water blown off, final chlorine residuals measured after flushing, and bacteriological sample points.
   e. Identify method of measuring chlorine residual in the field.
   f. Identify the bacteriological test lab that will be used, test method, and sampling, chain of custody, and transportation procedures.
   g. Describe how highly chlorinated flush water will be properly disposed.

B. Test Reports: Submit 2 copies as follows:
1. Disinfection report, include:
   a. Date issued.
   b. Project name and location.
   c. Treatment contractor's name, address, and phone number.
   d. Type and form of disinfectant used.
   e. Time and date of disinfectant injection start.
   f. Time and date of disinfectant injection completion.
   g. Test locations.
   h. Initial and 24-hour disinfectant residuals in ppm for each outlet tested.
   i. Time and date of flushing start.
   j. Time and date of flushing completion.
   k. Disinfectant residual after flushing in ppm for each outlet tested.
2. Bacteriological report, include:
   a. Date issued.
   b. Project name and location.
   c. Laboratory's name, certification number, address, and phone number.

d. Time and date of water sample collection.
e. Name of person collecting samples.
f. Test locations.
g. Time and date of laboratory test start.
h. Coliform bacteria test results for each outlet tested.
i. Certification that water conforms or fails to conform to bacterial standards of Federal Safe Drinking Water Act.
j. Microbiologist's signature.

1.06 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Protect against damage and contamination.

B. Maintain caution labels on hazardous materials.

C. Maintain storage room dry and with temperatures as uniform as possible between 60°F (15.6°C) and 80°F (26.7°C).

1.07 PROTECTION

A. Provide necessary signs, barricades, and notices to prevent any person from accidentally consuming water or disturbing system being treated.

PART 2 PRODUCTS

2.01 MATERIALS

A. Disinfectant:
1. Free chlorine; liquid, powder, tablet, or gas: Per AWWA B300.
2. Certified compliant with NSF/ANSI Standard 60.

PART 3 EXECUTION

3.01 INSPECTION

A. Prior to starting Work verify that domestic water system is completed and cleaned.

B. Do not start Work until conditions are satisfactory.

3.02 SYSTEM TREATMENT

A. New Building Water System: Per local or State Plumbing Code.

3.03 BACTERIOLOGICAL TEST

A. Take samples where and when as required by referenced standards or codes.

B. Analyze water samples in accordance with *Standard Methods for the Examination of Water and Wastewater*, latest edition, published by American Water Works Association.

C. Analyze water samples as otherwise required or allowed by referenced standards or codes.

D. Employ the services of an independent test laboratory certified by the New Mexico Environment Department Drinking Water Bureau to perform all bacteriological testing.

E. Payment for bacteriological testing for all other domestic water systems is considered incidental Work to the Contract Documents' Bid items.

3.04 DISPOSAL OF HEAVILY CHLORINATED WATER

A. Test heavily chlorinated water for chlorine residual in accordance with Appendix A of the AWWA C651.

B. Chlorine residual of water being disposed of, shall be neutralized in accordance with AWWA C655 – Field Dechlorination to meet residual acceptable for domestic use.

C. Dispose of water flushed from water main, after neutralization to designated receiving drainage. Coordinate with Engineer.

3.05 FAILURE OF DISINFECTION AND / OR BACTERIOLOGICAL TESTS

A. If test results do not comply with criteria required by referenced standards or codes, system shall undergo redisinfection in accordance with Section 5.2 of the AWWA C651.

END OF SECTION

CERTIFICATION OF DISINFECTION
OF WATER FACILITIES

I, _____, hereby certify that the facilities constructed under the project Santa Fe County Hondo 2 Fire Suppression Line were disinfected in accordance with the Disinfection Plan submitted under Specification Section 33 13 13 – Disinfection of Domestic Water Systems and with the following American Water Works Association (AWWA) standards:

C651 – AWWA Standard for Disinfecting Water Mains
C652 – AWWA Standard for Disinfection of Water-Storage Facilities
C653 – AWWA Standard for Disinfection of Water Treatment Plants
C654 – AWWA Standard for Disinfection of Wells

Contractor: _____

Signature: _____

Printed Name: _____

Title: _____

Date: _____

Notary Certification:

State of _____

(County) of _____

Signed or attested before me on _____ by _____

SEAL

_____
Notary Public

My Commission Expires:_____

SECTION 33 31 01

SANITARY SEWERAGE SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Sanitary sewerage piping, non-pressure, non-surcharged, drain lines, sewer service lines, fittings, and accessories.

1.02 RELATED WORK

A. Section 31 23 33 – Trenching and Backfilling.

1.03 GENERAL REQUIREMENTS

A. Pipes, fittings, and materials to be new.

B. Use appropriate equipment methods for unloading, reloading, and handling the pipe.

C. Pipe, Fittings, and Appurtenances of the Same Type: Made by the same manufacturer.

D. Provide labor, equipment, and materials for field pipe testing.

1.04 QUALITY ASSURANCE

A. PVC Pipe and Fittings:
   1. Tests: ASTM D2665, ASTM D3034, and ASTM F79, as applicable.
   2. Marking: Indelible, in each pipe.
      a. Nominal pipe diameter and cell classification.
      b. Manufacturer's name or trade name, PVC, ASTM and SDR designation, and date of production.
      c. Service designation.

1.05 REFERENCES

A. American Society for Testing and Materials International:
   1. ASTM A536 – Ductile Iron Castings.
   2. ASTM A746 – Ductile Iron Gravity Sewer Pipe.
   3. ASTM C76 – Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
   4. ASTM C443 – Joints For Concrete Pipe And Manholes, Using Rubber Gaskets.
   5. ASTM D395 – Rubber Property – Compaction Set.
   6. ASTM D412 – Vulcanized Rubber and Thermoplastic Elastomer- Tension.
   7. ASTM D882 – Tensile Properties of Thin Plastic Sheeting.
   8. ASTM D1784 – Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

9. ASTM D2321 – Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
10. ASTM D2412 – Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
11. ASTM D2564 – Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems.
12. ASTM D2665 – Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings.
13. ASTM D3034 – Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
14. ASTM D3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
15. ASTM D3311 – Drain, Waste, and Vent (DWV) Plastic Fittings Patterns.
16. ASTM D4976 – Polyethylene Plastics Molding and Extrusion Materials.
17. ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
18. ASTM F679 – Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
19. ASTM F794 – Poly(Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe And Fittings Based On Controlled Inside Diameter.
20. ASTM F894 – Polyethylene (PE) Large Diameter Profile Wall Sewer And Drain Pipe.
21. ASTM F1417 – Installation Acceptance of Plastic Non-Pressure Sewer Lines Using Low-Pressure Air.
22. ASTM F1668 – Procedures for Buried Plastic Pipe.
23. ASTM F1803 – Poly (Vinyl Chloride)(PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter.
24. ASTM F1866 – Poly (Vinyl Chloride) (PVC) Plastic Schedule 40 Drainage and DWV Fabricated Fittings.

B. American Water Works Association:
1. ANSI/AWWA C104/A21.4 – Cement Mortar Lining for Ductile-Iron Pipe and Fittings.
2. ANSI/AWWA C105/A21.5 – Polyethylene Encasement for Ductile-Iron Pipe Systems.
3. ANSI/AWWA C110/A21.10 – Ductile-Iron and Gray Iron Fittings.
4. ANSI/AWWA C111/A21.11 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. ANSI/AWWA C116/A21.16 – Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Flirtings.
6. ANSI/AWWA C153/A21.53 – Ductile-Iron Compact Fittings.
7. ANSI/AWWA C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe.
8. ANSI/AWWA C302 – Reinforced Concrete Pressure Pipe, Noncylinder Type.
9. ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings.
10. AWWA Manual M23 – PVC Pipe – Design and Installation.

C. PVC Pipe Association (Uni-Bell PVC Pipe Association):
1. UNI-B-06 – Recommended Low-Pressure Air Testing of Installed Sewer Pipe.

1.06 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples:
   1. Product data for pipe and appurtenances.
   2. Manufacturer's installation instructions.
   3. Certifications showing conformance to standards specified herein.

PART 2 PRODUCTS

2.01 MATERIALS

A. PVC Non-Pressure Pipe:
   1. Pipe and Fittings:
      a. 18″ and Larger: Solid wall, ASTM F679, SDR 26 (Pipe Stiffness PS 115 psi in accordance with ASTM D2412).
      b. 4″ to 15″: Solid wall, ASTM D3034, SDR 26 (Pipe Stiffness PS 115 psi in accordance with ASTM D2412).
      c. PVC plastic minimum cell classification per ASTM D1784: 12454 or 12364.
      d. Laying Length: Standard 20′ or 14′.
   2. Joints:
      a. Internally cast bell with one sealing ring.
      b. Leak-Proof, Rubber Rings: ASTM D3212 and F477.
      c. Lubricant: Manufacturer's recommendations.

B. Cleanout Fittings: In-line connections required unless not available as an industry standard for a particular size of line.

C. Pipe Marking Systems: Refer to Section 31 23 33 – Trenching and Backfilling.

PART 3 EXECUTION

3.01 INSTALLATION OF PIPE

A. General:
   1. Install as indicated on Drawings.
   2. Trenching, Backfilling, and Compacting: Section 31 23 33 – Trenching and Backfilling.
   3. Pipe Cutting: Measurement taken at site.
   4. Handling and Installation: ASTM D2321, AWWA C605, and manufacturer's recommendations.
   5. Securely close the end of the pipe at the end of each day or whenever the work ceases with a watertight seal.
   6. Take precautions necessary to prevent uplift and floating of the pipe prior to backfilling.

B. Delivery, Handling, and Storage of PVC Pipe:
   1. All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the Engineer.

2. Inspect each pipe shipment prior to unloading to see if the load has shifted or otherwise been damaged. Notify Engineer immediately if more than immaterial damage is found. Check each pipe shipment for quantity and proper pipe size, color, and type.
3. Off-load and handle pipe in accordance with AWWA M23 and AWWA C605, and all of the Pipe Supplier's guidelines.
4. Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.
5. During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.
6. Lower pipe from trucks carefully. Do not drop pipe.
7. Mark as rejected and remove at once from the work any pipe showing a crack or which has received a blow that could have caused an incident fracture, even though no such fracture can be seen.
8. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and shall be rejected unless determined acceptable by the Engineer.
9. Store and place pipe lengths on level ground. Store pipe at the job site in the unit packaging provided by the Pipe Supplier. Exercise caution to avoid compression, damage, or deformation to the ends of the pipe. Keep the interior of the pipe, as well as all end surfaces, free from dirt and foreign matter.
10. Handle and support pipe using woven fiber pipe slings or approved equivalent. Exercise care when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.
11. If pipe is to be stored for periods longer than 90 days, the pipe and gaskets should be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe shall be covered with an opaque material while permitting adequate air circulation above and around the pipe as required to prevent excess heat accumulation.
12. Store and stack pipe in accordance with the Pipe Supplier's guidelines.

C. PVC Pipe Joint Assembly:
1. Conformance to ASTM D2321 and manufacturer's instructions.
2. Pipe spigot ends are pre-marked at the factory with a circumferential insertion line. This line references how far the spigot should be inserted into the adjoining PVC pipe bell. Field-cut spigot ends shall be marked and beveled to match the manufacturer's insertion line. Pipe-to-pipe joints shall be assembled only to the insertion line. After assembly, the insertion line shall remain visible and be nearly flush with the lip of the adjoining PVC pipe bell. Joints assembled beyond the insertion line shall be considered over-assembled and may result in damaging stresses or leakage.
3. Field Quality Control to Prevent Over-Assembly (Over-Insertion):
    a. If a joint is found to be over-inserted, Contractor shall expose previously assembled joints until properly assembled joints are found. All over-inserted joints shall be properly re-assembled.

D. Clean sewer lines of all sand, gravel, dirt, and other foreign materials after installation.

3.02 FIELD QUALITY CONTROL

A. Grade Tolerances:
   1. Free from noticeable depressions or humps.
   2. Invert elevations shall not exceed ±0.2′ from elevations shown on Drawings or which can be computed from Drawings.
   3. Shall comply with the lesser of the following:
      a. Not more than 0.1% difference from grade shown on Drawings.
      b. Not more than 10% of grade shown on Drawings.

3.03 SCHEDULE

A. As indicated on Drawings.

END OF SECTION

SECTION 40 27 02.09

MISCELLANEOUS VALVES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Furnish and install all miscellaneous valves specified herein.

1.02 SUBMITTALS

A. Section 01 33 23 – Shop Drawings, Product Data, and Samples: Product data for all items listed in Part 2 Products, except for hose bibbs and plug cocks.

B. Section 01 78 23 – Operation and Maintenance Data: Operation and Maintenance Manuals for all items listed in Part 2 Products, except for hose bibbs, plug cocks, stop gates, gate valves under 4″, and elastomeric check valves.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Same manufacturer for each type of valve throughout where practical.

B. Manufacturer’s name or initials and working pressure ratings cast on valve body.

2.02 DESIGN REQUIREMENTS

A. General: Unless otherwise indicated, use valves suitable for 125 minimum psi WOG and 150°F.

B. Lead Free: All materials in contact with potable water shall be lead-free, as certified by the Water Quality Association to comply with NSF/ANSI 372, and shall be NSF 61 compliant.

C. Reduced Pressure Backflow Preventer:
1. Assembly shall consist of two independently operating, spring loaded, “Y” pattern check valves and one hydraulically dependent differential relief valve.
2. Automatically reduce the pressure in the zone between the check valves to at least 5 psi lower than inlet pressure.
3. Mainline valve body and caps including relief valve body and cover: Bronze.
4. Seat Discs: Nitrile, reversible.
5. Springs: Stainless steel.
6. 175 psi water working pressure rating and water temperature range from 32°F to 180°F.

7. FEBCO Reduced Pressure Zone Backflow Preventer Model LF860-FS-OSY with air gap drain funnel and cellular integrated flood sensor, or Engineer reviewed equivalent.
8. Conformance:
    a. AWWA C511 – Reduced Pressure Principal Backflow Prevention Assembly.
    b. Approved by the Foundation for Cross Connection Control and Hydraulic Research at USC.
    c. And listed in the American Society of Sanitary Engineering International (ASSE) “Prevention Rather Than Cure” Seal Authorization Booklet.
9. Furnish with air gap drain funnel and 4″ Sch. 80 PVC drain piping to the enclosure drain port, unless shown otherwise on Drawings.
10. Shutoff Valves: Outside stem and yoke gate valves with handwheel operators, integral with assembly.
11. Heated Insulated Enclosure: Aluminum or FRP, and as noted in Backflow Preventor Detail on Drawings.

D. Flap Gate:
1. Size: As indicated on Drawings.
2. Style: Light duty cast iron drainage-style flap gate.
3. Cover: Cast in one piece, with integral cast lifting eye.
4. Frame: Spigot back adapted to attach to SDR 35 PVC pipe.
5. Seat Incline:
    a. 5°.
6. Materials:
    a. Frame and Cover: ASTM A126, Class B cast iron.
    b. Hinge Links: Galvanized steel.
    c. Hinge Bushings: Bronze.
7. Coating on Cast Iron: Factory-applied liquid epoxy.

2.03 PROTECTIVE COATING

A. Factory enamel paint unless specified otherwise.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manufacturer’s recommendations.

B. Per code or best trade or industry practice.

C. As indicated on Drawings.

3.02 SCHEDULE

A. As indicated on Drawings.

END OF SECTION

SECTION 40 27 02.10

VALVE BOXES

PART 1 GENERAL

1.01 WORK INCLUDED

A. Boxes for all buried, manually operated valves, and appurtenances.

B. Box covers with cast markings.

1.02 SUBMITTALS

A. Section 01 33 23: Product data for all items specified in Part 2 – Products.

B. Section 01 78 23: Operation and Maintenance Manual for valve position indicators.

PART 2 PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. ASTM A48 Class 35 cast iron, adjustable screw extension type, traffic type.

B. Minimum thickness of metal at any point: 3/16″.

C. Coating: Asphaltic bituminous coating, inside and out, 1.5 mil minimum thickness.

D. Removable cast iron cover, 5-1/4″ diameter standard drop lid, cast marking with words, “WATER”, “SEWER”, “REUSE”, or “GAS” to match appropriate utility.

E. Cast iron base properly sized to fit over valve bonnet and bear on bricks, as shown on Drawings.
   1. Base shall be large enough to extend 6″ below bottom of valve operating nut.
   2. Base shall be large enough so no part of the base or its bearing bricks shall bear on any part of the valve.

F. For valves on washwater and irrigation system only: Class 200 PVC pipe.

G. Valve Boxes Scheduled Without Position Indicators:
   1. Furnish valve stem extension to position standard AWWA 2″ operating nut within 3.5′ to 2.5′ below the lid.

PART 3 EXECUTION

3.01 INSTALLATION

A. Per AWWA Manual M44: Distribution Valves: Selection, Installation, Field Testing, and Maintenance, Latest Edition.

B. With concrete collar, as shown on Drawings.

C. Shall not bear on pipe or valve.

3.02 SCHEDULE

A. As indicated on Drawings.

END OF SECTION