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SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. The completed Work will provide Owner with the rehabilitation, repair, and replacement of 26-inch to 72-inch corrugated metal pipe that conveys surface drainage water near the Diamond Peak Ski Area in Incline Village, Nevada. The Project will be constructed using a combination of open-excavation pipe replacement and pipe rehabilitation using trenchless technologies. The total combined length of pipe to be rehabilitated, repaired, and replaced will be approximately 2,600 linear feet. The Project includes the following elements (note that approximate lengths are presented below to describe the Project; actual lengths of open-cut replacement and trenchless rehabilitation will vary as shown on Drawings):

1. Demolition of existing 36-inch and 72-inch corrugated metal culvert pipe.
2. Approximately 800 liner feet of 36-inch open-excavation pipe replacement using HDPE pipe, including drop inlets and drainage improvements.
3. Approximately 1,400 linear feet of open-cut replacement using 72-inch HDPE pipe, including drop inlets and drainage improvements.
4. Approximately 410 linear feet of 72-inch trenchless rehabilitation using sliplining and pipe ramming of 60-inch carrier pipe.
5. CMP debris removal and point repairs to facilitate trenchless rehabilitation.
6. Bypass pumping and groundwater management including dewatering, and erosion control.
7. Sheeting, shoring, and/or other means of providing a safe work area including trenches and buried confined spaces.
8. Site preparation, demolition, and surface restoration.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION
SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 PROPOSAL REQUESTS

A. Owner may, in anticipation of ordering an addition, deletion, or revision to the Work, request Contractor to prepare a detailed proposal of cost and times to perform contemplated change.

B. Proposal request will include reference number for tracking purposes and detailed description of and reason for proposed change, and such additional information as appropriate and as may be required for Contractor to accurately estimate cost and time impact on Project.

C. Proposal request is for information only; Contractor is neither authorized to execute proposed change nor to stop Work in progress as result of such request.

D. Contractor’s written proposal shall be transmitted to Engineer promptly, but not later than 14 days after Contractor’s receipt of Owner’s written request. Proposal shall remain firm for a maximum period of 45 days after receipt by Engineer.

E. Owner’s request for proposal or Contractor’s failure to submit such proposal within the required time period will not justify a Claim for an adjustment in Contract Price or Contract Times (or Milestones).

1.02 CLAIMS

A. Include, at a minimum:

1. Specific references including (i) Drawing numbers, (ii) Specification section and article/paragraph number, and (iii) Submittal type, Submittal number, date reviewed, Engineer’s comment, as applicable, with appropriate attachments.
2. Stipulated facts and pertinent documents, including photographs and statements.
3. Interpretations relied upon.
4. Description of (i) nature and extent of Claim, (ii) who or what caused the situation, (iii) impact to the Work and work of others, and (iv) discussion of claimant’s justification for requesting a change to price or times or both.
5. Estimated adjustment in price claimant believes it is entitled to with full documentation and justification.

6. Requested Change in Contract Times: Include at least (i) Progress Schedule documentation showing logic diagram for request, (ii) documentation that float times available for Work have been used, and (iii) revised activity logic with durations including sub-network logic revisions, duration changes, and other interrelated schedule impacts, as appropriate.

7. Documentation as may be necessary as set forth below for Work Change Directive, and as Engineer may otherwise require.

1.03 WORK CHANGE DIRECTIVES

A. Procedures:

1. Owner will:
   a. Initiate, including a description of the Work involved and any attachments.
   b. Affix signature, demonstrating Engineer’s recommendation.
   c. Transmit one electronic copy to Owner for authorization.

2. Owner will:
   a. Affix signature, demonstrating approval of the changes involved.
   b. Return one electronic copy to Engineer.

3. Upon completion of Work covered by the Work Change Directive or when final Contract Times and Contract Price are determined, Contractor shall submit documentation for inclusion in a Change Order.

4. Contractor’s documentation shall include but not be limited to:
   a. Appropriately detailed records of Work performed to enable determination of value of the Work.
   b. Full information required to substantiate resulting change in Contract Times and Contract Price for Work. On request of Engineer, provide additional data necessary to support documentation.
   c. Support data for Work performed on a unit price or Cost of the Work basis with additional information such as:
      1) Dates Work was performed, and by whom.
      2) Time records, wage rates paid, and equipment rental rates.
      3) Invoices and receipts for materials, equipment, and subcontracts, all similarly documented.

B. Effective Date of Work Change Directive: Date of signature by Owner, unless otherwise indicated thereon.
1.04 CHANGE ORDERS

A. Procedure:

1. Engineer will prepare proposed Change Order and transmit such with Engineer’s written recommendation and request to Contractor for signature.

2. Contractor shall, upon receipt, either: (i) promptly sign copies, retaining one for its file, and return remaining copies to Engineer for Owner’s signature, or (ii) return unsigned copies with written justification for not executing Change Order.

3. Engineer will, upon receipt of Contractor signed copies, promptly forward Engineer’s written recommendation and partially executed copies for Owner’s signature, or if Contractor fails to execute the Change Order, Engineer will promptly so notify Owner and transmit Contractor’s justification to Owner.

4. Upon receipt of Contractor-executed Change Order, Owner will promptly either:
   a. Execute Change Order, retaining one copy for its file and returning additional copies to Engineer; or
   b. Return to Engineer unsigned copies with written justification for not executing Change Order.

5. Upon receipt of Owner-executed Change Order, Engineer will transmit two copies to Contractor, one copy to Resident Project Representative or other field representative, and retain one copy, or if Owner fails to execute the Change Order, Engineer will promptly so notify Contractor and transmit Owner’s justification to Contractor.

6. Upon receipt of Owner-executed Change Order, Contractor shall:
   a. Perform Work covered by Change Order.
   b. Revise Schedule of Values to adjust Contract Price and submit with next Application for Payment.
   c. Revise Progress Schedule to reflect changes in Contract Times, if any, and to adjust times for other items of Work affected by change.
   d. Enter changes in Project record documents after completion of change related Work.

B. In signing a Change Order, Owner and Contractor acknowledge and agree that:

1. Stipulated compensation (Contract Price or Contract Times, or both) set forth includes payment for (i) the Cost of the Work covered by the Change Order, (ii) Contractor’s fee for overhead and profit, (iii) interruption of Progress Schedule, (iv) delay and impact, including
cumulative impact, on other Work under the Contract Documents, and (v) extended overheads.

2. Change Order constitutes full mutual accord and satisfaction for the change to the Work.

3. Unless otherwise stated in the Change Order, all requirements of the original Contract Documents apply to the Work covered by the Change Order.

1.05 FIELD ORDER

A. Owner will issue Field Orders, with three copies to Contractor.

B. Effective date of the Field Order shall be the date of signature by Owner, unless otherwise indicated thereon.

C. Contractor shall acknowledge receipt by signing and returning one copy to Owner.

D. Field Orders will be incorporated into subsequent Change Orders, as a no-cost change to the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION
SECTION 01 31 13
PROJECT COORDINATION

PART 1   GENERAL

1.01    SUBMITTALS
A. Informational:
   1. Statement of Qualification (SOQ) for land surveyor
   2. Photographs:
      a. Digital Images: Each image is to have a minimum file size of 1.4 Mb (1,400 Kb) so viewed resolution is high quality. The production of larger file sizes with higher resolution is encouraged.

1.02    RELATED WORK AT SITE
A. General:
   1. Other work that is either directly or indirectly related to scheduled performance of the Work under these Contract Documents, listed henceforth, is anticipated to be performed at Site by others.
   2. Include sequencing constraints specified herein as a part of Progress Schedule.

B. Diamond Peak Ski Area:
   1. Agency and Contact Person: Mike Bandelin, telephone number: 775-832-1177.
   2. Work to be performed by (IVGID): Ongoing operations and maintenance activities.

1.03    UTILITY NOTIFICATION AND COORDINATION
A. Coordinate the Work with various utilities within Project limits including IVGID’s Diamond Peak Ski Area. Notify applicable utilities prior to commencing Work, if damage occurs, or if conflicts or emergencies arise during the Work.

1.04    WORK SEQUENCING/CONSTRAINTS
A. Include the following work sequences in the Progress Schedule:
   1. Shop drawing submittals and material procurement.
2. Utility potholing and field verification.
3. Mobilization and dewatering system.
4. Required utility service outages including but not limited to the water main that conveys potable water to Tyrolian Village.
5. Trenchless rehabilitation activities.
6. Demolition.
7. Open-excavation pipe replacement.
8. Concrete pours including drop inlets and culvert inlet headwall.
9. Surface drainage improvements and surface restoration.
10. Streambank stabilization and streambed restoration.
11. Substantial completion and demobilization.

1.05 FACILITY OPERATIONS

A. Continuous operation of Owner’s facilities is of critical importance. Schedule and conduct activities to enable existing facilities to operate continuously, unless otherwise specified.

B. Perform Work continuously during critical connections and changeovers, and as required to prevent interruption of Owner’s operations.

C. When necessary, plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access, and similar items to maintain continuous operations of Owner’s facility.

D. Do not close lines, open or close valves, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after authorization by Owner and Engineer. Such authorization will be considered within 48 hours after receipt of Contractor’s written request.

E. Process or Facility Shutdown: Provide 7 days advance written request for approval of need to shut down a process or facility to Owner and Engineer.

F. Install and maintain bypass facilities, as required, to convey Incline Creek flows around Work areas without environmental degradation and in accordance with all permits and regulations.

G. Do not proceed with Work affecting a facility’s operation without obtaining Owner’s and Engineer’s advance approval of the need for and duration of such Work.
H. Relocation of Existing Facilities:

1. During construction, it is expected that minor relocations of Work will be necessary.
2. Provide complete relocation of existing structures and Underground Facilities, including piping, utilities, equipment, structures, electrical conduit wiring, electrical duct bank, and other necessary items.
3. Use only new materials for relocated facility. Match materials of existing facility, unless otherwise shown or specified.
4. Perform relocations to minimize downtime of existing facilities.
5. Install new portions of existing facilities in their relocated position prior to removal of existing facilities, unless otherwise accepted by Engineer.

1.06 ADJACENT FACILITIES AND PROPERTIES

A. Examination: After Effective Date of the Agreement and before Work at Site is started, Contractor, Engineer, and affected property owners and utility owners, including the USFS, shall make a thorough examination of pre-existing conditions including Incline Creek, which could be damaged by construction operations.

B. Documentation:

1. Record and submit documentation of observations made on examination inspections in accordance with Article Construction Photographs.
2. Such documentation shall be used as indisputable evidence in ascertaining whether and to what extent damage occurred as a result of Contractor’s operations, and is for the protection of adjacent property owners, Contractor, and Owner.

1.07 CONSTRUCTION PHOTOGRAPHS

A. General: Photographically document all phases of the Project including preconstruction, construction progress, and post-construction.

B. Preconstruction and Post-Construction:

1. After Effective Date of the Agreement and before Work at Site is started, and again upon issuance of Substantial Completion, take a minimum of 48 photographs of Site and property adjacent to perimeter of Site.
2. Particular emphasis shall be directed to Incline Creek, surface drainage features, and paved access roads.
C. Construction Progress Photos:

1. Photographically demonstrate progress of construction, showing every aspect of Site and adjacent properties as well as interior and exterior of new or impacted structures.

1.08 REFERENCE POINTS AND SURVEYS

A. Contractor’s Responsibilities:

1. Provide additional survey and layout required to layout the Work.
2. Notify Engineer at least 3 working days in advance of time when grade and line to be provided by Owner will be needed.
3. Check and establish exact location of existing facilities prior to construction of new facilities and any connections thereto.
4. In event of discrepancy in data or staking provided by Owner, request clarification before proceeding with Work.
5. Retain professional land surveyor or civil engineer registered in the State of Nevada who shall perform or supervise engineering surveying necessary for construction staking and layout.
6. Maintain complete accurate log of survey work as it progresses as a Record Document.
7. On request of Engineer, submit documentation.
8. Provide competent employee(s), tools, stakes, and other equipment and materials as Engineer may require to:
   a. Establish control points, lines, and easement boundaries.
   b. Check layout, survey, and measurement work performed by others.
   c. Measure quantities for payment purposes.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 SALVAGE OF MATERIALS

A. Meet with Owner prior to starting to dismantle equipment or piping designated to be salvaged.

B. Provide new or repair damaged equipment or material specified or indicated to be salvaged. Clean and protect equipment from dust, dirt, natural elements, and store as directed.
3.02 CUTTING, FITTING, AND PATCHING

A. Cut, fit, adjust, or patch Work and work of others, including excavation and backfill as required, to make Work complete.

B. Obtain prior written authorization of Engineer before commencing Work to cut or otherwise alter:
   1. Structural or reinforcing steel or other structural members.
   2. Efficiency, maintenance, or safety of element.
   3. Work of others.

C. Restore existing work, Underground Facilities, and surfaces that are to remain in completed Work including concrete-embedded piping, conduit, and other utilities as specified and as shown on Drawings.

D. Make restorations with new materials and appropriate methods as specified for new Work of similar nature; if not specified, use recommended practice of manufacturer or appropriate trade association.

E. Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces and fill voids.

F. Remove specimens of installed Work for testing when requested by Engineer.

END OF SECTION
PART 1   GENERAL

1.01   GENERAL

A. Contractor shall schedule meetings throughout progress of the Work, prepare meeting agenda with regular participant input and distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies of minutes within 5 days after each meeting to participants and parties affected by meeting decisions.

1.02   PRECONSTRUCTION CONFERENCE

A. Contractor shall be prepared to discuss the following subjects, as a minimum:

1. Required schedules.
2. Status of Bonds and insurance.
3. Sequencing of critical path work items.
4. Progress payment procedures.
5. Project changes and clarification procedures.
6. Use of Site, access, office and storage areas, security and temporary facilities.
7. Major product delivery and priorities.
8. Contractor’s safety plan and representative.

B. Attendees will include:

1. Owner’s representatives.
2. Contractor’s office representative.
3. Contractor’s resident superintendent.
4. Contractor’s quality control representative.
5. Subcontractors’ representatives whom Contractor may desire or Engineer may request to attend.
6. Engineer’s representatives.
7. Others as appropriate.

1.03   PRELIMINARY SCHEDULES REVIEW MEETING

A. As set forth in General Conditions and Section 01 32 00, Construction Progress Documentation.
1.04 PROGRESS MEETINGS

A. Owner will schedule regular progress meetings at Site, conducted weekly to review the Work progress, Progress Schedule, Schedule of Submittals, Application for Payment, quality control, contract modifications, and other matters needing discussion and resolution.

B. Attendees will include:
   1. Owner’s representative(s), as appropriate.
   2. Contractor, Subcontractors, and Suppliers, as appropriate.
   3. Others as appropriate.

1.05 PREINSTALLATION MEETINGS

A. When required in individual Specification sections, convene at Site prior to commencing the Work of that section.

B. Require attendance of entities directly affecting, or affected by, the Work of that section.

C. Notify Owner 5 days in advance of meeting date.

D. Provide suggested agenda to Owner to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

1.06 OTHER MEETINGS

A. In accordance with Contract Documents and as may be required by Owner and Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION
PART 1  GENERAL

1.01 SUBMITTALS

A. Informational Submittals:

1. Preliminary Progress Schedule: Submit within 14 calendar days after Effective Date of the Agreement.
2. Detailed Progress Schedule:
   a. Submit initial Detailed Progress Schedule within 30 calendar days after Effective Date of the Agreement.
   b. Submit an Updated Progress Schedule at each update, in accordance with Article Detailed Progress Schedule.
3. Submit with Each Progress Schedule Submission:
   a. Contractor’s certification that Progress Schedule submission is actual schedule being used for execution of the Work.

1.02 SCHEDULE COORDINATION

A. Contractor shall coordinate Work schedules for all subcontractors.

B. Upon review and acceptance, Engineer will transmit one hard copy and one electronic copy of all Contractors’ schedules to Construction Coordinator. Within 5 days of receipt, Construction Coordinator shall prepare and transmit to Engineer one hard copy of master Progress Schedule for each designated Contractor and one hard copy for Engineer.

1.03 PRELIMINARY PROGRESS SCHEDULE

A. In addition to basic requirements outlined in General Conditions, show a detailed schedule, beginning with Notice to Proceed, for the balance of Project through Final Completion.

B. Show activities including, but not limited to the following:

1. Notice to Proceed.
2. Permits including SWPPP
3. Submittals, with review time. Early procurement activities for long lead equipment and materials.
4. Initial Site work.
5. Dewatering.
6. Trenchless rehabilitation.
7. Earthwork.
11. Substantial Completion.
12. Project close-out summary.

C. Update Preliminary Progress Schedule monthly as part of progress payment process. Failure to do so may result in the Owner withholding all or part of the monthly progress payment until the Preliminary Progress Schedule is updated in a manner acceptable to Engineer.

1.04 DETAILED PROGRESS SCHEDULE

A. In addition to requirements of General Conditions, submit Detailed Progress Schedule beginning with Notice to Proceed and continuing through Final Completion.

B. Show the duration and sequences of activities required for complete performance of the Work reflecting means and methods chosen by Contractor.

C. When accepted by Engineer, Detailed Progress Schedule will replace Preliminary Progress Schedule and become Baseline Schedule. Subsequent revisions will be considered as Updated Progress Schedules.

D. Update monthly to reflect actual progress and occurrences to date, including weather delays.

1.05 PROGRESS OF THE WORK

A. Updated Progress Schedule shall reflect:

1. Progress of Work to within 5 working days prior to submission.
2. Approved changes in Work scope and activities modified since submission.
3. Delays in Submittals or resubmittals, deliveries, or Work.
4. Adjusted or modified sequences of Work.
5. Other identifiable changes.
6. Revised projections of progress and completion.
B. Produce detailed subschedules during Project, upon request of Owner or Engineer, to further define critical portions of the Work such as utility shutdowns.

C. If an activity is not completed by its latest scheduled completion date and this failure is anticipated to extend Contract Times (or Milestones), submit, within 7 days of such failure, a written statement as to how nonperformance will be corrected to return Project to acceptable current Progress Schedule. Actions by Contractor to complete the Work within Contract Times (or Milestones) will not be justification for adjustment to Contract Price or Contract Times.

D. Owner may order Contractor to increase plant, equipment, labor force, or working hours if Contractor fails to:

1. Complete a Milestone activity by its completion date.
2. Satisfactorily execute Work as necessary to prevent delay to overall completion of Project, at no additional cost to Owner.

1.06 NARRATIVE PROGRESS REPORT

A. Format:

1. Organize same as Progress Schedule.
2. Identify, on a cover letter, reporting period, date submitted, and name of author of report.

B. Contents:

1. Number of days worked over the period, work force on hand, construction equipment on hand (including utility vehicles such as pickup trucks, maintenance vehicles, stake trucks).
2. General progress of Work, including a listing of activities started and completed over the reporting period, mobilization/demobilization of subcontractors, and major milestones achieved.
3. Contractor’s plan for management of Site (for example, lay down and staging areas, construction access), use of construction equipment, buildup of trade labor, and identification of potential Contract changes.
4. Identification of new activities and sequences as a result of executed Contract changes.
5. Documentation of weather conditions over the reporting period, and any resulting impacts to the work.
6. Description of actual or potential delays, including related causes, and the steps taken or anticipated to mitigate their impact.
7. Changes to activity logic.
8. Changes to the critical path.
9. Identification of, and accompanying reason for, any activities added or deleted since the last report.
10. Steps taken to recover the schedule from Contractor-caused delays.

1.07 SCHEDULE ACCEPTANCE

A. Engineer’s acceptance will demonstrate agreement that:

1. Proposed schedule is accepted with respect to:
   a. Contract Times, including Final Completion and all intermediate Milestones, are within the specified times.
   b. Specified Work sequences and constraints are shown as specified.
   c. Submittal review times are as specified.

2. In all other respects, Owner’s acceptance of Contractor’s schedule indicates that, in Owner’s judgment, schedule represents reasonable plan for constructing Project in accordance with the Contract Documents. Owner’s review will not make any change in Contract requirements. Lack of comment on any aspect of schedule that is not in accordance with the Contract Documents will not thereby indicate acceptance of that change, unless Contractor has explicitly called the nonconformance to Engineer’s attention in submittal. Schedule remains Contractor’s responsibility and Contractor retains responsibility for performing all activities, for activity durations, and for activity sequences required to construct Project in accordance with the Contract Documents.

B. Unacceptable Preliminary Progress Schedule:

1. Make requested corrections; resubmit within 5 days.
2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process, including updating schedule on a monthly basis to reflect actual progress and occurrences to date.

C. Unacceptable Detailed Progress Schedule:

1. Make requested corrections; resubmit within 5 days.
2. Until acceptable to Engineer as Baseline Progress Schedule, continue review and revision process.

D. Narrative Report: All changes to activity duration and sequences, including addition or deletion of activities subsequent to Owner’s acceptance of Baseline Progress Schedule, shall be delineated in Narrative Report current with proposed Updated Progress Schedule.
1.08 ADJUSTMENT OF CONTRACT TIMES

A. Evaluation and reconciliation of Adjustments of Contract Times shall be based on the Updated Progress Schedule at the time of proposed adjustment or claimed delay.

1. Float time is a Project resource available to both parties to meet contract Milestones and Contract Times.

2. Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times are prohibited, and use of float time disclosed or implied by use of alternate float-suppression techniques shall be shared to proportionate benefit of Owner and Contractor.

3. Pursuant to above float-sharing requirement, no time extensions will be granted nor delay damages paid until a delay occurs which (i) impacts Project’s critical path, (ii) consumes available float or contingency time, and (iii) extends Work beyond contract completion date.

B. Claims Based on Contract Times:

1. Where Engineer has not yet rendered formal decision on Contractor’s Claim for adjustment of Contract Times, and parties are unable to agree as to amount of adjustment to be reflected in Progress Schedule, reflect an interim adjustment in the Progress Schedule as acceptable to Engineer.

2. It is understood and agreed that such interim acceptance will not be binding on either Contractor or Owner, and will be made only for the purpose of continuing to schedule Work until such time as formal decision has been rendered as to an adjustment, if any, of the Contract Times.

3. Revise Progress Schedule prepared thereafter in accordance with Engineer’s formal decision.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION
SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

A. Action Submittal: Written and graphic information submitted by Contractor that requires Engineer’s approval.

B. Informational Submittal: Information submitted by Contractor that requires Engineer’s review and determination that submitted information is in accordance with the Conditions of the Contract.

1.02 PROCEDURES

A. Direct submittals to Engineer, unless specified otherwise.

B. Electronic Submittals: Submittals shall, unless specifically accepted, be made in electronic format.

1. Each submittal shall be an electronic file in Adobe Acrobat Portable Document Format (PDF). Use the latest version available at time of execution of the Agreement.

2. Electronic files that contain more than 10 pages in PDF format shall contain internal bookmarking from an index page to major sections of the document.

3. PDF files shall be set to open “Bookmarks and Page” view.

4. Add general information to each PDF file, including title, subject, author, and keywords.

5. PDF files shall be set up to print legibly at 8.5-inch by 11-inch, 11-inch by 17-inch, or 22-inch by 34-inch. No other paper sizes will be accepted.


7. Include a copy of the Transmittal of Contractor’s Submittal form, located at end of section, with each electronic file.

C. Transmittal of Submittal:

1. Contractor shall:
   a. Review each submittal and check for compliance with Contract Documents.
b. Stamp each submittal with uniform approval stamp before submitting to Engineer.
   1) Stamp to include Project name, submittal number, Specification number, Contractor’s reviewer name, date of Contractor’s approval, and statement certifying submittal has been reviewed, checked, and approved for compliance with Contract Documents.
   2) Engineer will not review submittals that do not bear Contractor’s approval stamp and will return them without action.

2. Complete, sign, and transmit with each submittal package, one Transmittal of Contractor’s Submittal form.

3. Identify each submittal with the following:
   a. Numbering and Tracking System:
      1) Sequentially number each submittal.
      2) Resubmission of submittal shall have original number with sequential revision suffix.
   b. Specification section to which submittal applies.
   c. Project title and Engineer’s project number.
   d. Date of transmittal.
   e. Names of Contractor, Subcontractor or Supplier, and manufacturer as appropriate.

4. Identify and describe each deviation or variation from Contract Documents.

D. Format:

   1. Do not base Shop Drawings on reproductions of Contract Documents.
   2. Package submittal information by individual specification section. Do not combine different specification sections together in submittal package, unless otherwise directed in specification.
   3. Present in a clear and thorough manner and in sufficient detail to show kind, size, arrangement, and function of components, materials, and devices, and compliance with Contract Documents.
   4. Index in orderly manner.

E. Timeliness: Schedule and submit in accordance Schedule of Submittals, and requirements of individual specification sections.
F. Processing Time:

1. Time for review shall commence on Engineer’s receipt of submittal.
2. Engineer will act upon Contractor’s submittal and transmit response to Contractor not later than 21 days after receipt, unless otherwise specified.
3. Resubmittals will be subject to same review time.
4. No adjustment of Contract Times or Price will be allowed as a result of delays in progress of Work caused by rejection and subsequent resubmittals.

G. Resubmittals: Clearly identify each correction or change made.

H. Incomplete Submittals:

1. Engineer will return entire submittal for Contractor’s revision if preliminary review deems it incomplete.
2. When any of the following are missing, submittal will be deemed incomplete:
   a. Contractor’s review stamp; completed and signed.
   b. Transmittal of Contractor’s Submittal; completed and signed.
   c. Insufficient number of copies.

I. Submittals not required by Contract Documents:

1. Will not be reviewed and will be returned stamped “Not Subject to Review.”
2. Engineer will keep one copy and return submittal to Contractor.

1.03 ACTION SUBMITTALS

A. Prepare and submit Action Submittals required by individual specification sections.

B. Shop Drawings:

1. Identify and Indicate:
   a. Applicable Contract Drawing and Detail number, products, units and assemblies, and system or equipment identification or tag numbers.
   b. Component Title: Identical to title shown on Drawings.
   c. Critical field dimensions and relationships to other critical features of Work. Note dimensions established by field measurement.
d. Project-specific information drawn accurately to scale.

2. Manufacturer’s standard schematic drawings and diagrams as follows:
   a. Modify to delete information that is not applicable to the Work.
   b. Supplement standard information to provide information specifically applicable to the Work.

3. Product Data: Provide as specified in individual specifications.

C. Action Submittal Dispositions: Engineer will review, comment, stamp, and distribute as noted:

1. Approved: Contractor may incorporate product(s) or implement Work covered by submittal.
2. Approved as Noted: Contractor may incorporate product(s) or implement Work covered by submittal, in accordance with Engineer’s notations.
3. Partial Approval, Resubmit as Noted:
   a. Make corrections or obtain missing portions, and resubmit.
   b. Except for portions indicated, Contractor may begin to incorporate product(s) or implement Work covered by submittal, in accordance with Engineer’s notations.
4. Revise and Resubmit: Contractor may not incorporate product(s) or implement Work covered by submittal.

1.04 INFORMATIONAL SUBMITTALS

A. General: Refer to individual specification sections for specific submittal requirements.

B. Certificates:

1. General:
   a. Provide notarized statement that includes signature of entity responsible for preparing certification.
   b. Signed by officer or other individual authorized to sign documents on behalf of that entity.
2. Welding: In accordance with individual specification sections.
3. Installer: Prepare written statements on manufacturer’s letterhead certifying installer complies with requirements as specified in individual specification section.
4. Material Test: Prepared by qualified testing agency, on testing agency’s standard form, indicating and interpreting test results of material for compliance with requirements.
5. Certificates of Successful Testing or Inspection: Submit when testing or inspection is required by Laws and Regulations or governing agency or specified in individual specification sections.

6. Manufacturer’s Certificate of Compliance: In accordance with Section 01 61 00, Common Product Requirements.

7. Manufacturer’s Certificate of Proper Installation: In accordance with Section 01 43 33, Manufacturers’ Field Services.

C. Construction Photographs: In accordance with Section 01 31 13, Project Coordination, and as may otherwise be required in Contract Documents.

D. Closeout Submittals: In accordance with Section 01 77 00, Closeout Procedures.

E. Contractor-design Data (related to temporary construction):
   1. Written and graphic information.
   2. List of assumptions.
   3. List of performance and design criteria.
   4. Summary of loads or load diagram, if applicable.
   5. Calculations.
   6. List of applicable codes and regulations.
   7. Name and version of software.
   8. Information requested in individual specification section.

F. Manufacturer’s Instructions: Written or published information that documents manufacturer’s recommendations, guidelines, and procedures in accordance with individual specification section.

G. Quality Control Documentation: As required in Section 01 45 16.13, Contractor Quality Control.

H. Schedules:
   1. Schedule of Submittals: Prepare separately or in combination with Progress Schedule as specified in Section 01 32 00, Construction Progress Documentation.
      a. Show for each, at a minimum, the following:
         1) Specification section number.
         2) Identification by numbering and tracking system as specified under Paragraph Transmittal of Submittal.
         3) Estimated date of submission to Engineer, including reviewing and processing time.
b. On a monthly basis, submit updated Schedule of Submittals to Engineer if changes have occurred or resubmittals are required.

2. Progress Schedules: In accordance with Section 01 32 00, Construction Progress Documentation.

I. Special Guarantee: Supplier’s written guarantee as required in individual specification sections.

J. Statement of Qualification: Evidence of qualification, certification, or registration as required in Contract Documents to verify qualifications of professional land surveyor, engineer, materials testing laboratory, specialty Subcontractor, trade, Specialist, consultant, installer, and other professionals.

K. Submittals Required by Laws, Regulations, and Governing Agencies:

1. Promptly submit promptly notifications, reports, certifications, payrolls, and otherwise as may be required, directly to the applicable federal, state, or local governing agency or their representative.

2. Transmit to Engineer for Owner’s records one copy of correspondence and transmittals (to include enclosures and attachments) between Contractor and governing agency.

L. Test, Evaluation, and Inspection Reports:

1. General: Shall contain signature of person responsible for test or report.

2. Factory:
   a. Identification of product and specification section, type of inspection or test with referenced standard or code.
   b. Date of test, Project title and number, and name and signature of authorized person.
   c. Test results.
   d. If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.
   e. Provide interpretation of test results, when requested by Engineer.
   f. Other items as identified in individual specification sections.

3. Field:
   a. As a minimum, include the following:
      1) Project title and number.
      2) Date and time.
      3) Record of temperature and weather conditions.
      4) Identification of product and specification section.
      5) Type and location of test, Sample, or inspection, including referenced standard or code.
6) Date issued, testing laboratory name, address, and telephone number, and name and signature of laboratory inspector.

7) If test or inspection deems material or equipment not in compliance with Contract Documents, identify corrective action necessary to bring into compliance.

8) Provide interpretation of test results, when requested by Engineer.

9) Other items as identified in individual specification sections.

1.05 SUPPLEMENTS

A. The supplement listed below, following “End of Section”, is part of this Specification.

1. Forms: Transmittal of Contractor’s Submittal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION
### TRANSMITTAL OF CONTRACTOR’S SUBMITTAL

**INCLINE VILLAGE GENERAL IMPROVEMENT DISTRICT**  
**INCLINE CREEK CMP CULVERT REHABILITATION FINAL DESIGN PROJECT**

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<th>Date: ____________________________</th>
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<tr>
<td><strong>TO:</strong> _________________________</td>
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<tr>
<td>Submittal No.: ____________________</td>
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<tr>
<td>☐ New Submittal ☐ Resubmittal</td>
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<tr>
<td>Project: Incline Creek Culvert Rehabilitation Project</td>
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<tr>
<td>Project No.: 393670</td>
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</table>
| Specification Section No.: ____________  
  *(Cover only one section with each transmittal)* |
| Schedule Date of Submittal: ________________ |
| **FROM:** Contractor |
| SUBMITTAL TYPE: ☐ Shop Drawing  
  ☐ Sample  
  ☐ Informational  
  ☐ Deferred |

**The following items are hereby submitted:**

| Number of Copies | Description of Item Submitted  
  (Type, Size, Model Number, Etc.) | Spec. and Para. No. | Drawing or Brochure Number | Contains Variation to Contract |
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Contractor hereby certifies that (i) Contractor has complied with the requirements of Contract Documents in preparation, review, and submission of designated Submittal and (ii) the Submittal is complete and in accordance with the Contract Documents and requirements of laws and regulations and governing agencies.

By: ___________________________________

Contractor (Authorized Signature)
SECTION 01 42 13  
ABBREVIATIONS AND ACRONYMS  

PART 1  GENERAL  

1.01  REFERENCE TO STANDARDS AND SPECIFICATIONS OF TECHNICAL SOCIETIES  

A. Reference to standards and specifications of technical societies and reporting and resolving discrepancies associated therewith shall be as provided in Article 3 of the General Conditions, and as may otherwise be required herein and in the individual Specification sections.  

B. Work specified by reference to published standard or specification of government agency, technical association, trade association, professional society or institute, testing agency, or other organization shall meet requirements or surpass minimum standards of quality for materials and workmanship established by designated standard or specification.  

C. Where so specified, products or workmanship shall also meet or exceed additional prescriptive or performance requirements included within Contract Documents to establish a higher or more stringent standard of quality than required by referenced standard.  

D. Where two or more standards are specified to establish quality, product and workmanship shall meet or exceed requirements of most stringent.  

E. Where both a standard and a brand name are specified for a product in Contract Documents, proprietary product named shall meet or exceed requirements of specified reference standard.  

F. Copies of standards and specifications of technical societies:  

1. Copies of applicable referenced standards have not been bound in these Contract Documents.  

2. Where copies of standards are needed by Contractor, obtain a copy or copies directly from publication source and maintain in an orderly manner at the Site as Work Site records, available to Contractor’s personnel, Subcontractors, Owner, and Engineer.
1.02 ABBREVIATIONS

A. Abbreviations for trade organizations and government agencies: Following is
   a list of construction industry organizations and government agencies to
   which references may be made in the Contract Documents, with abbreviations
   used.

1. AA Aluminum Association
2. AABC Associated Air Balance Council
3. AAMA American Architectural Manufacturers
   Association
4. AASHTO American Association of State Highway and
   Transportation Officials
5. ABMA American Bearing Manufacturers’ Association
6. ACI American Concrete Institute
7. AEIC Association of Edison Illuminating Companies
8. AGA American Gas Association
9. AGMA American Gear Manufacturers’ Association
10. AI Asphalt Institute
11. AISC American Institute of Steel Construction
12. AISI American Iron and Steel Institute
13. AITC American Institute of Timber Construction
14. ALS American Lumber Standards
15. AMCA Air Movement and Control Association
16. ANSI American National Standards Institute
17. APA APA – The Engineered Wood Association
18. API American Petroleum Institute
19. APWA American Public Works Association
20. AHRI Air-Conditioning, Heating, and Refrigeration
   Institute
21. ASA Acoustical Society of America
22. ASABE American Society of Agricultural and
   Biological Engineers
23. ASCE American Society of Civil Engineers
24. ASHRAE American Society of Heating, Refrigerating and
   Air-Conditioning Engineers, Inc.
25. ASME American Society of Mechanical Engineers
26. ASNT American Society for Nondestructive Testing
27. ASE American Society of Sanitary Engineering
28. ASTM ASTM International
29. AWI Architectural Woodwork Institute
30. AWPA American Wood Preservers’ Association
31. AWPI American Wood Preservers’ Institute
32. AWS  American Welding Society
33. AWWA  American Water Works Association
34. BHMA  Builders Hardware Manufacturers’ Association
35. CBM  Certified Ballast Manufacturer
36. CDA  Copper Development Association
37. CGA  Compressed Gas Association
38. CISPI  Cast Iron Soil Pipe Institute
39. CMAA  Crane Manufacturers’ Association of America
40. CRSI  Concrete Reinforcing Steel Institute
41. CS  Commercial Standard
42. CSA  Canadian Standards Association
43. CSI  Construction Specifications Institute
44. DI  Drop Inlet
45. DIN  Deutsches Institut für Normung e.V.
46. DIPRA  Ductile Iron Pipe Research Association
47. EIA  Electronic Industries Alliance
48. EJCDC  Engineers Joint Contract Documents’ Committee
49. ETL  Electrical Test Laboratories
50. FAA  Federal Aviation Administration
51. FCC  Federal Communications Commission
52. FDA  Food and Drug Administration
53. FEMA  Federal Emergency Management Agency
54. FIPS  Federal Information Processing Standards
55. FM  FM Global
57. FS  Federal Specifications and Standards (Technical Specifications)
58. GA  Gypsum Association
59. GANA  Glass Association of North America
60. HI  Hydraulic Institute
61. HMI  Hoist Manufacturers’ Institute
62. IBC  International Building Code
63. ICBO  International Conference of Building Officials
64. ICC  International Code Council
65. ICEA  Insulated Cable Engineers’ Association
66. IFC  International Fire Code
67. IEEE  Institute of Electrical and Electronics Engineers, Inc.
68. IESNA  Illuminating Engineering Society of North America
69. IFI  Industrial Fasteners Institute
70. IGMA  Insulating Glass Manufacturer’s Alliance
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Acronym</th>
<th>Full Name</th>
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<tbody>
<tr>
<td>IMC</td>
<td>International Mechanical Code</td>
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<tr>
<td>INDA</td>
<td>Association of the Nonwoven Fabrics Industry</td>
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<tr>
<td>IPC</td>
<td>International Plumbing Code</td>
<td></td>
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<tr>
<td>ISA</td>
<td>International Society of Automation</td>
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<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
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<tr>
<td>ITL</td>
<td>Independent Testing Laboratory</td>
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<tr>
<td>JIC</td>
<td>Joint Industry Conferences of Hydraulic Manufacturers</td>
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<tr>
<td>MH</td>
<td>Manhole</td>
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<tr>
<td>MIA</td>
<td>Marble Institute of America</td>
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<tr>
<td>MIL</td>
<td>Military Specifications</td>
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<tr>
<td>MMA</td>
<td>Monorail Manufacturers’ Association</td>
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<tr>
<td>MSS</td>
<td>Manufacturer’s Standardization Society</td>
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<tr>
<td>NAAMM</td>
<td>National Association of Architectural Metal Manufacturers</td>
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<tr>
<td>NACE</td>
<td>NACE International</td>
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<tr>
<td>NBGQA</td>
<td>National Building Granite Quarries Association</td>
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<tr>
<td>NDEP</td>
<td>Nevada Division of Environmental Protection</td>
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<td>NEBB</td>
<td>National Environmental Balancing Bureau</td>
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<tr>
<td>NEC</td>
<td>National Electrical Code</td>
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<tr>
<td>NECA</td>
<td>National Electrical Contractor’s Association</td>
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<tr>
<td>NEMA</td>
<td>National Electrical Manufacturers’ Association</td>
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<td>NESC</td>
<td>National Electrical Safety Code</td>
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<td>NETA</td>
<td>InterNational Electrical Testing Association</td>
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<td>NFPA</td>
<td>National Fire Protection Association</td>
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<td>NHLA</td>
<td>National Hardwood Lumber Association</td>
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<tr>
<td>NICET</td>
<td>National Institute for Certification in Engineering Technologies</td>
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<tr>
<td>NIST</td>
<td>National Institute of Standards and Technology</td>
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<tr>
<td>NRCA</td>
<td>National Roofing Contractors Association</td>
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<tr>
<td>NRTL</td>
<td>Nationally Recognized Testing Laboratories</td>
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<tr>
<td>NSF</td>
<td>NSF International</td>
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<tr>
<td>NSPE</td>
<td>National Society of Professional Engineers</td>
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<tr>
<td>NTMA</td>
<td>National Terrazzo and Mosaic Association</td>
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<tr>
<td>NWWDWA</td>
<td>National Wood Window and Door Association</td>
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<tr>
<td>OSHA</td>
<td>Occupational Safety and Health Act (both Federal and State)</td>
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<tr>
<td>PCI</td>
<td>Precast/Prestressed Concrete Institute</td>
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<td>PEI</td>
<td>Porcelain Enamel Institute</td>
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<td>PPI</td>
<td>Plastic Pipe Institute</td>
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<td>PS</td>
<td>Product Standards Section-U.S. Department of Commerce</td>
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<tr>
<td>RMA</td>
<td>Rubber Manufacturers’ Association</td>
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109. RUS  Rural Utilities Service
110. SAE  SAE International
111. SDI  Steel Deck Institute
112. SDI  Steel Door Institute
113. SJI  Steel Joist Institute
114. SMACNA  Sheet Metal and Air Conditioning Contractors National Association
115. SPI  Society of the Plastics Industry
116. SSPC  The Society for Protective Coatings
117. STI/SPFA  Steel Tank Institute/Steel Plate Fabricators Association
118. SWI  Steel Window Institute
119. TEMA  Tubular Exchanger Manufacturers’ Association
120. TCA  Tile Council of North America
121. TIA  Telecommunications Industry Association
122. TRPA  Tahoe Regional Planning Agency
123. UBC  Uniform Building Code
124. UFC  Uniform Fire Code
125. UL  Underwriters Laboratories Inc.
126. UMC  Uniform Mechanical Code
127. USACE  United States Army Corps of Engineers
128. USBR  U.S. Bureau of Reclamation
129. USFS  United States Forest Service
130. WCLIB  West Coast Lumber Inspection Bureau
131. WI  Wood Institute
132. WWPA  Western Wood Products Association

PART 2  PRODUCTS (NOT USED)

PART 3  EXECUTION (NOT USED)

END OF SECTION
SECTION 01 43 33
MANUFACTURERS’ FIELD SERVICES

PART 1 GENERAL

1.01 QUALIFICATION OF MANUFACTURER’S REPRESENTATIVE

A. Authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, including sliplining using pipe ramming, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified in the individual specification section.

B. Representative subject to acceptance by Engineer. No substitute representatives will be allowed unless prior written approval by such has been given.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FULFILLMENT OF SPECIFIED MINIMUM SERVICES

A. Furnish manufacturers’ services, when required by an individual specification section, to meet the requirements of this section.

B. Schedule manufacturer’ services to avoid conflict with other onsite testing or other manufacturers’ onsite services.

C. Determine, before scheduling services, that conditions necessary to allow successful testing have been met.

D. When specified in individual specification sections, manufacturer’s onsite services shall include:

   1. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor’s assembly, erection, installation or application procedures.
   2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish Manufacturer’s Certificate of Proper Installation.
   3. Providing, on a daily basis, copies of manufacturers’ representatives field notes and data to Engineer.
4. Revisiting the Site as required to correct problems and until installation and operation are acceptable to Engineer.
5. Resolution of assembly or installation problems attributable to or associated with respective manufacturer’s products and systems.
6. Assistance during functional testing.

3.02 MANUFACTURER’S CERTIFICATE OF PROPER INSTALLATION

A. When so specified, a Manufacturer’s Certificate of Proper Installation form, a copy of which is attached to this section, shall be completed and signed by equipment manufacturer’s representative.

B. Such form shall certify signing party is a duly authorized representative of manufacturer, is empowered by manufacturer to inspect, approve, and operate their equipment and is authorized to make recommendations required to ensure equipment is complete and operational.

3.03 SUPPLEMENTS

A. The supplement listed below, following “End of Section,” is part of this Specification.

1. Manufacturer’s Certificate of Proper Installation.

END OF SECTION
MANUFACTURER’S CERTIFICATE OF PROPER INSTALLATION

OWNER ___________________________ EQPT SERIAL NO: ______________
EQPT TAG NO: ______________________ EQPT/SYSTEM: ______________
PROJECT NO: _________________ SPEC. SECTION: ______________

I hereby certify that the above-referenced equipment/system has been:

☐ Installed in accordance with Manufacturer’s recommendations.
☐ Inspected, checked, and adjusted.
☐ Serviced with proper initial lubricants.
☐ Electrical and mechanical connections meet quality and safety standards.
☐ All applicable safety equipment has been properly installed.
☐ Functional tests.
☐ System has been performance tested, and meets or exceeds specified performance
   requirements. (When complete system of one manufacturer)

Note: Attach any performance test documentation from manufacturer.

Comments: ________________________________________________

__________________________________________________________

I, the undersigned Manufacturer’s Representative, hereby certify that I am (i) a duly
authorized representative of the manufacturer, (ii) empowered by the manufacturer to
inspect, approve, and operate their equipment and (iii) authorized to make
recommendations required to ensure equipment furnished by the manufacturer is complete
and operational, except as may be otherwise indicated herein. I further certify that all
information contained herein is true and accurate.

Date: ______________________________, 20___
Manufacturer: ______________________________

By Manufacturer’s Authorized Representative: __________________________
(Authorized Signature)
PART 1 GENERAL

1.01 REFERENCES
A. The following is a list of standards which may be referenced in this section:
   1. ASTM International (ASTM):

1.02 DEFINITIONS
A. Contractor Quality Control (CQC): The means by which Contractor ensures that the construction, to include that performed by subcontractors and suppliers, complies with the requirements of the Contract.

1.03 SUBMITTALS
A. Informational Submittals:
   1. CQC Plan: Submit, not later than 30 days after receipt of Notice to Proceed.
   2. CQC Report: Submit, bi-monthly, an original and one copy in report form.

1.04 OWNER’S QUALITY ASSURANCE
A. All Work is subject to Owner’s quality assurance inspection and testing at all locations and at all reasonable times before acceptance to ensure strict compliance with the terms of the Contract Documents.

B. Owner’s quality assurance inspections and tests are for the sole benefit of Owner and do not:
   1. Relieve Contractor of responsibility for providing adequate quality control measures;
   2. Relieve Contractor of responsibility for damage to or loss of the material before acceptance;
   3. Constitute or imply acceptance; or
4. Affect the continuing rights of Owner after acceptance of the completed Work.

C. The presence or absence of a quality assurance inspector does not relieve Contractor from any Contract requirement.

D. Promptly furnish all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by Engineer.

E. Owner may charge Contractor for any additional cost of inspection or test when Work is not ready at the time specified by Contractor for inspection or test, or when prior rejection makes re-inspection or retest necessary. Quality assurance inspections and tests will be performed in a manner that will not unnecessarily delay the Work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Maintain an adequate inspection system and perform such inspections as will ensure that the Work conforms to the Contract Documents.

B. Maintain complete inspection records and make them available at all times to Owner and Engineer.

C. The quality control system shall consist of plans, procedures, and organization necessary to produce an end product that complies with the Contract Documents. The system shall cover all construction and demolition operations, both onsite and offsite, including Work by subcontractors, fabricators, suppliers and purchasing agents, and shall be keyed to the proposed construction sequence.

3.02 COORDINATION MEETING

A. At the Preconstruction Conference with the Engineer and Owner before start of construction, and prior to acceptance of the CQC Plan, schedule a meeting with Engineer and Owner to discuss the quality control system.

B. Develop a mutual understanding of the system details, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite Work, and the interrelationship of Contractor’s management and control with the Owner’s Quality Assurance.
C. There may be occasions when subsequent conferences may be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures that may require corrective action by Contractor.

3.03 QUALITY CONTROL ORGANIZATION

A. CQC System Manager:

1. Designate an individual within Contractor’s organization who will be responsible for overall management of CQC and have the authority to act in CQC matters for the Contractor.
2. CQC System Manager shall be an experienced construction person, with a minimum of 5 years construction experience on similar type Work.
3. CQC System Manager shall report to the Contractor’s project manager or someone higher in the organization. Project manager in this context shall mean the individual with responsibility for the overall quality and production management of the Project.
4. CQC System Manager shall be onsite during construction; periods of absence may not exceed 2 weeks at any one time.
5. Identify an alternate for CQC System Manager to serve with full authority during the System Manager’s absence. The requirements for the alternate will be the same as for designated CQC System Manager.

B. CQC Staff:

1. Designate a CQC staff, available at the Site at all times during progress, with complete authority to take any action necessary to ensure compliance with the Contract. CQC staff members shall be subject to acceptance by Engineer.
2. CQC staff shall take direction from CQC System Manager in matters pertaining to QC.
3. CQC staff must be of sufficient size to ensure adequate QC coverage of Work phases, work shifts, and work crews involved in the construction. These personnel may perform other duties, but must be fully qualified by experience and technical training to perform their assigned QC responsibilities and must be allowed sufficient time to carry out these responsibilities.
4. The actual strength of the CQC staff may vary during any specific Work period to cover the needs of the Project. Add additional staff when necessary for a proper CQC organization.

C. Organizational Changes: Obtain Engineer’s acceptance before replacing any member of the CQC staff. Requests for changes shall include name, qualifications, duties, and responsibilities of the proposed replacement.
3.04 QUALITY CONTROL PHASING

A. CQC shall include at least three phases of control to be conducted by CQC System Manager for all definable features of Work, as follows:

1. Preparatory Phase:
   a. Notify Owner at least 48 hours in advance of beginning any of the required action of the preparatory phase.
   b. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The CQC System Manager shall instruct applicable CQC staff as to the acceptable level of workmanship required in order to meet Contract requirements.
   c. Document the results of the preparatory phase meeting by separate minutes prepared by the CQC System Manager and attached to the QC report.
   d. Perform prior to beginning Work on each definable feature of Work:
      1) Review applicable Contract Specifications.
      2) Review applicable Contract Drawings.
      3) Verify that all materials and/or equipment have been tested, submitted, and approved.
      4) Verify that provisions have been made to provide required control inspection and testing.
      5) Examine the Work area to verify that all required preliminary Work has been completed and is in compliance with the Contract.
      6) Perform a physical examination of required materials, equipment, and sample Work to verify that they are on hand, conform to approved Shop Drawing or submitted data, and are properly stored.
      7) Review the appropriate activity hazard analysis to verify safety requirements are met.
      8) Review procedures for constructing the Work, including repetitive deficiencies.
      9) Document construction tolerances and workmanship standards for that phase of the Work.
     10) Check to verify that the plan for the Work to be performed, if so required, has been accepted by Engineer.

2. Initial Phase:
   a. Accomplish at the beginning of a definable feature of Work:
      1) Notify Owner at least 48 hours in advance of beginning the initial phase.
2) Perform prior to beginning Work on each definable feature of Work:
   a) Review minutes of the preparatory meeting.
   b) Check preliminary Work to verify compliance with Contract requirements.
   c) Verify required control inspection and testing.
   d) Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Comparison with sample panels is appropriate.
   e) Resolve all differences.
   f) Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

3) Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the QC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

4) The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3. Follow-up Phase:
   a. Perform daily checks to verify continuing compliance with Contract requirements, including control testing, until completion of the particular feature of Work.
   b. Daily checks shall be made a matter of record in the CQC documentation and shall document specific results of inspections for all features of Work for the day or shift.
   c. Conduct final follow-up checks and correct all deficiencies prior to the start of additional features of Work that will be affected by the deficient Work. Constructing upon or concealing nonconforming Work will not be allowed.

4. Additional Preparatory and Initial Phases: Additional preparatory and initial phases may be conducted on the same definable features of Work as determined by Owner if the quality of ongoing Work is unacceptable; or if there are changes in the applicable QC staff or in the onsite production supervision or work crew; or if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.
CONTRACTOR QUALITY CONTROL PLAN

A. General:

1. Plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used.
2. An interim plan for the first 30 days of operation will be considered.
3. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of Work to be started.
4. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of Work to be started.

B. Content:

1. Plan shall cover the intended CQC organization for the entire Contract and shall include the following, as a minimum:
   a. Organization: Description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff will implement the three-phase control system (see Paragraph QC Phasing) for all aspects of the Work specified.
   b. CQC Staff: The name, qualifications, duties, responsibilities, and authorities of each person assigned a QC function.
   c. Letters of Authority: A copy of a letter to the CQC System Manager signed by an authorized official of the firm, describing the responsibilities and delegating sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop Work which is not in compliance with the Contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities and responsibilities. Copies of these letters will also be furnished to Owner.
   d. Submittals: Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers and purchasing agents.
   e. Testing: Control, verification and acceptance testing procedures for each specific test to include the test name, frequency, specification paragraph containing the test requirements, the personnel and laboratory responsible for each type of test, and an estimate of the number of tests required.
f. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests, including documentation.
g. Procedures for tracking deficiencies from identification through acceptable corrective action. These procedures will establish verification that identified deficiencies have been corrected.
h. Reporting procedures, including proposed reporting formats; include a copy of the CQC report form.

C. Acceptance of Plans: Acceptance of the Contractor’s basic and addendum CQC plans is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. Owner reserves the right to require Contractor to make changes in the CQC plan and operations including removal of personnel, as necessary, to obtain the quality specified.

D. Notification of Changes: After acceptance of the CQC plan, Contractor shall notify Engineer, in writing, a minimum of 7 calendar days prior to any proposed change. Proposed changes are subject to acceptance by Engineer.

3.06 CONTRACTOR QUALITY CONTROL REPORT

A. As a minimum, prepare a CQC report for every 14 calendar days. Account for all days throughout the life of the Contract. Reports shall be signed and dated by CQC System Manager. Include copies of test reports and copies of reports prepared by QC staff.

B. Maintain current records of quality control operations, activities, and tests performed, including the Work of subcontractors and suppliers.

C. Records shall be on an acceptable form and shall be a complete description of inspections, the results of inspections, daily activities, tests, and other items, including but not limited to the following:

1. Contractor/subcontractor and their areas of responsibility.
2. Operating plant/equipment with hours worked, idle, or down for repair.
3. Work performed today, giving location, description, and by whom. When a network schedule is used, identify each phase of Work performed each day by activity number.
4. Test and/or control activities performed with results and references to specifications/plan requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
5. Material received with statement as to its acceptability and storage.
6. Identify submittals reviewed, with Contract reference, by whom, and action taken.
7. Offsite surveillance activities, including actions taken.
8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
9. List instructions given/received and conflicts in Drawings and/or Specifications.
10. Contractor’s verification statement.
11. Indicate a description of trades working on the Project; the number of personnel working; weather conditions encountered; and any delays encountered.
12. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in file work and workmanship comply with the Contract.

3.07 SUBMITTAL QUALITY CONTROL

A. Submittals shall be as specified in Section 01 33 00, Submittal Procedures. The CQC organization shall be responsible for certifying that all submittals are in compliance with the Contract requirements. Owner will furnish copies of test report forms upon request by Contractor. Contractor may use other forms as approved.

3.08 TESTING QUALITY CONTROL

A. Testing Procedure:

1. Perform tests specified or required to verify that control measures are adequate to provide a product which conforms to Contract requirements. Perform the following activities and record the following data:
   a. Verify testing procedures comply with contract requirements.
   b. Verify facilities and testing equipment are available and comply with testing standards.
   c. Check test instrument calibration data against certified standards.
   d. Verify recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
   e. Documentation:
      1) Record results of all tests taken, both passing and failing, on the CQC report for the date taken.
      2) Include specification paragraph reference, location where tests were taken, and the sequential control number identifying the test.
3) Actual test reports may be submitted later, if approved by Engineer, with a reference to the test number and date taken.

4) Provide directly to Engineer an information copy of tests performed by an offsite or commercial test facility. Test results shall be signed by an engineer registered in the state where the tests are performed.

5) Failure to submit timely test reports, as stated, may result in nonpayment for related Work performed and disapproval of the test facility for this Contract.

B. Testing Laboratories: Laboratory facilities, including personnel and equipment, utilized for testing soils, concrete, asphalt and steel shall meet criteria detailed in ASTM D3740 and ASTM E329, and be accredited by the American Association of Laboratory Accreditation (AALA), National Institute of Standards and Technology (NIST), National Voluntary Laboratory Accreditation Program (NVLAP), the American Association of State Highway and Transportation Officials (AASHTO), or other approved national accreditation authority. Personnel performing concrete testing shall be certified by the American Concrete Institute (ACI).

3.09 COMPLETION INSPECTION

A. CQC System Manager shall conduct an inspection of the Work at the completion of all Work or any milestone established by a completion time stated in the Contract.

B. Punchlist:

1. CQC System Manager shall develop a punchlist of items which do not conform to the Contract requirements.

2. Include punchlist in the CQC report, indicating the estimated date by which the deficiencies will be corrected.

3. CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected and so notify the Owner.

4. These inspections and any deficiency corrections required will be accomplished within the time stated for completion of the entire Work or any particular increment thereof if the Project is divided into increments by separate completion dates.

END OF SECTION
PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

4. Telecommunications Industry Association (TIA); Electronic Industries Alliance (EIA): 568B, Commercial Building Telecommunications Cabling Standard.

1.02 SUBMITTALS

A. Informational Submittals:

1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
   a. Water Diversion and Bypass Plan:
   b. Incline Creek.
   c. Tributary near Lodgepole Lift.
2. Stormwater Pollution Prevention Plan (SWPPP): In accordance with specified requirements.
3. Temporary Utility Submittals:
   a. Electric power supply and distribution plans.
   b. Water supply and distribution plans.
   c. Trench Dewatering plan.
   d. Sanitary.
4. Temporary Construction Submittals:
   a. Contractor’s field office, and storage/staging area plans.
   b. Fencing and protective barrier locations and details.
5. Temporary Control Submittals:
   a. Noise control plan.
   b. Dust control plan.

1.03 MOBILIZATION

A. Mobilization includes, but is not limited to, these principal items:

   1. Obtaining required permits.
   2. Moving Contractor’s field office and equipment required for first month
      operations onto Site.
   3. Installing temporary construction power, wiring, and lighting facilities.
   4. Providing onsite Internet service.
   5. Providing onsite sanitary facilities and potable water facilities as
      specified and as required by Laws and Regulations, and governing
      agencies.
   6. Arranging for and erection of Contractor’s work and storage yard.
   7. Posting OSHA required notices and establishing safety programs and
      procedures.
   8. Having Contractor’s superintendent at Site full time.

B. Use area designated for Contractor’s temporary facilities as shown on
   Drawings.

1.04 PROTECTION OF WORK AND PROPERTY

A. Comply with Owner’s safety rules while on Owner’s property.

B. Keep Owner informed of serious onsite accidents and related claims.

C. Use of Explosives: No blasting or use of explosives will be allowed onsite.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 TEMPORARY UTILITIES

A. Power:

   1. Electric power will be available at or near Site. Determine type and
      amount available and make arrangements for obtaining temporary
      electric power service, metering equipment, and pay costs for electric
      power used during Contract period, except for portions of the Work
      designated in writing by Engineer as substantially complete.
2. Cost of electric power will be borne by Owner.

B. Lighting: Provide temporary lighting to meet applicable safety requirements to allow erection, application, or installation of materials and equipment, and observation or inspection of the Work.

C. Heating, Cooling, and Ventilating:

1. Provide as required to maintain adequate environmental conditions to facilitate progress of the Work, to meet specified minimum conditions for installation of materials, and to protect materials, equipment, and finishes from damage because of temperature or humidity.
2. Provide adequate forced air ventilation of enclosed areas to cure installed materials, to dispense humidity, and to prevent hazardous accumulations of dust, fumes, vapors, or gases.
3. Pay costs of installation, maintenance, operation, removal, and fuel consumed.
4. Provide portable unit heaters, complete with controls, oil- or gas-fired, and suitably vented to outside as required for protection of health and property.

D. Water:

1. Make arrangements for and bear costs of providing water required for construction purposes and for drinking by construction personnel during construction.

E. Sanitary and Personnel Facilities:

1. Provide and maintain facilities for Contractor’s employees, Subcontractors, and other onsite employers’ employees. Service, clean, and maintain facilities and enclosures.
2. Obtain Owner’s permission before allowing construction personnel to use existing sanitary facilities at Site.

F. Fire Protection: Furnish and maintain on Site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of NFPA 241.
3.02 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. No residence or business shall be cut off from vehicular traffic, unless special arrangements have been made.
3. Maintain in continuous service existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
4. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate activities with owner of said utility and perform work to their satisfaction.
5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
6. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
7. In areas where Contractor’s operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Contractor.
8. Maintain original Site drainage wherever possible.

B. Site Security: Erect a temporary security fence for protection of Work areas. Provide and maintain additional temporary security fences as necessary to protect the Work and Contractor-furnished products not yet installed.

C. Trees and Plantings:

1. Protect from damage and preserve trees, shrubs, and other plants outside limits of the Work and within limits of the Work, which are designated on Drawings to remain undisturbed.
2. Balling and burlapping of trees indicated for replacement shall conform to recommended specifications set forth in the American Standards for Nursery Stock, published by American Association of Nurserymen. Balls shall be firm and intact and made-balls will not be accepted. Handle ball and burlap trees by ball and not by top.
3. Replace each plant that dies as a result of construction activities.
D. Existing Structures:

1. Where Contractor contemplates removal of small structures that interfere with Contractor’s operations, obtain approval of property owner and Engineer.
2. Replace items removed in their original location and a condition equal to or better than original.

E. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

F. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain foundations and parts of the Work free from water.

G. Endangered and Threatened Species:

1. Take precautions necessary and prudent to protect native endangered and threatened flora and fauna.
2. Notify Engineer of construction activities that might threaten endangered and threatened species or their habitats.
3. Engineer will mark areas known as habitats of endangered and threatened species prior to commencement of onsite activities.
4. Additional areas will be marked by Engineer as other habitats of endangered and threatened species become known during construction.

3.03 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning of waste materials, rubbish, or other debris will not be permitted on or adjacent to Site.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.
B. Noise Control:

1. Conduct Work so noise emanating from tools or equipment will not exceed allowable noise levels.
2. Noise Control Plan: Propose plan to mitigate construction noise and to comply with noise control ordinances, including method of construction, equipment to be used, and acoustical treatments.

C. Water Pollution Control:

1. Prior to commencing excavation and construction, obtain Owner’s agreement with detailed plans showing procedures intended to handle and dispose of groundwater and dewatering pump discharges.
2. Comply with an approved SWPPP, and Section 01 57 13, Temporary Erosion and Sediment Control, for stormwater flow and surface runoff.
3. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

D. Erosion, Sediment, and Flood Control: Provide, maintain, and operate temporary facilities as specified in Section 01 57 13, Temporary Erosion and Sediment Control, to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during construction period.

3.04 STORAGE YARDS AND BUILDINGS

A. Coordinate requirements with Section 01 61 00, Common Product Requirements.

B. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.

1. Store combustible materials (paints, solvents, fuels) in a well-ventilated and remote building meeting safety standards.

3.05 ACCESS ROADS

A. Construct access roads as shown and within easements, rights-of-way, or Project limits. Upon completion of construction, restore streambanks, streambed, flood plain, and all surfaces disturbed by Work.
3.06 PARKING AREAS

A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner’s operations, or construction operations.

B. Use area designated on Drawings for parking of Contractor’s and Contractor’s employees’ vehicles.

3.07 VEHICULAR TRAFFIC

A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Ensure the least possible obstruction to traffic and normal commercial pursuits.

B. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.

C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.

D. Road Closures: Maintain satisfactory means of exit for persons residing or having occasion to transact business along route of the Work. If it is necessary to close off roadway or alley providing sole vehicular access to property for periods greater than 2 hours, provide written notice to each owner so affected 3 days prior to such closure. In such cases, closings of up to 4 hours may be allowed. Closures of up to 10 hours may be allowed if a week’s written notice is given and undue hardship does not result.

E. Maintenance of traffic is not required if Contractor obtains written permission from Owner and tenant of private property, or from authority having jurisdiction over public property involved, to obstruct traffic at designated point.

3.08 CLEANING DURING CONSTRUCTION

A. In accordance with General Conditions, as may be specified in other Specification sections, and as required herein.

B. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least weekly, dispose of such waste materials, debris, and rubbish offsite.
C. At least weekly, brush sweep roadways and walkways affected by the Work and where adjacent to the Work.

END OF SECTION
PART 1 GENERAL

1.01 SUMMARY

A. Contractor shall implement structural and nonstructural Best Management Practices (BMP) to control soil erosion by wind or water and keep eroded sediments and other construction-generated pollutants from moving off project sites.

B. National Pollutant Discharge Elimination System: Comply with Federal, state, and local laws, rules and regulations, and the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Discharge Permit or Permits applicable to the project. A copy of the Project’s General Construction Permit, if applicable to the Project, is available from Owner. NPDES General Construction permits are required on projects that involve disturbance of 1 acre or more with potential to discharge stormwater to surface waters.

C. Other Regulations: A local government erosion and sediment control permit may apply and some local agency requirements may be more stringent than this specification. Adequate erosion and sediment control is essential for complying with the federal Endangered Species Act where construction runoff enters waters inhabited by protected species.

1.02 REFERENCES

A. Activities shall conform to the Contractor’s approved SWPPP and all TRPA requirements.

1.03 SYSTEM DESCRIPTION

A. Erosion and Sediment Control: Provide, maintain, and operate temporary facilities to control erosion and sediment releases during construction period.

B. Preventing erosion, and controlling runoff, sedimentation, and non-stormwater pollution, requires Contractor to perform temporary Work items including, but not limited to:

1. Providing ditches, berms, culverts, and other measures to control surface water.
2. Building dams, settling basins, energy dissipaters, and other measures, to control downstream flows.
3. Controlling underground water found during construction.
4. Covering or otherwise protecting slopes until permanent erosion control measures are working.

C. Owner may require additional temporary control measures if it appears pollution or erosion may result from weather, nature of materials, or progress on the Work.

D. Install all sediment control devices including, but not limited to, sediment ponds, perimeter silt fencing, or other sediment trapping BMPs prior to any ground disturbing activity. Do not expose more erodible earth than necessary during clearing, grubbing, excavation, borrow, or fill activities without written approval by Engineer. Engineer may increase or decrease the limits based on project conditions. Erodible earth is defined as any surface where soils, grindings, or other materials may be capable of being displaced and transported by rain, wind, or surface water runoff. Cover inactive areas of erodible earth, whether at final grade or not, within specified time period (see [NPDES] Erosion and Sediment Control Permit), using an approved soil covering practice. Phase clearing and grading to maximum extent practical to prevent exposed inactive areas from becoming a source of erosion.

E. Pollution Control: Use BMPs to prevent or minimize stormwater exposure to pollutants from spills; vehicle and equipment fueling, maintenance, and storage; other cleaning and maintenance activities; and waste handling activities. These pollutants include fuel, hydraulic fluid, and other oils from vehicles and machinery, as well as debris, leftover paints, solvents, and glues from construction operations. Implement the following BMPs when applicable:

1. Written spill prevention and response procedures.
2. Employee training on spill prevention and proper disposal procedures.
3. Spill kits in all vehicles.
4. Regular maintenance schedule for vehicles and machinery.
5. Material delivery and storage controls.
6. Training and signage.
7. Covered storage areas for waste and supplies.

F. If Engineer orders the Work suspended, continue to control erosion, pollution, and runoff during the shutdown.

G. Nothing in this section shall relieve Contractor from complying with other Contract requirements.
PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

A. Include proposed stockpile areas and installation of temporary erosion control devices, ditches, or other facilities in Work phasing plans.

B. Areas designated for Contractor’s use during Project may be temporarily developed as specified to provide working, staging, and administrative areas.

3.02 MAINTENANCE

A. During the construction period, maintain and upgrade stormwater pollution prevention measures as needed to comply with all applicable local, state, and federal erosion and sediment control regulations.

B. Maintain erosion and sediment control BMPs so they properly perform their function until Engineer determines they are no longer needed.

C. Construction activities must avoid or minimize excavation and creation of bare ground during wet weather.

D. The intentional washing of sediment into storm sewers or drainage ways must not occur. Vacuuming or dry sweeping and material pickup must be used to cleanup released sediments.

E. Inspect BMPs in accordance with the schedule in the Construction Stormwater Discharge Permit(s) or as directed by Engineer.

F. Complete an inspection report within 24 hours of an inspection. Each inspection report shall be signed and identify corrective actions. Document that corrective actions are performed within 7 days of identification. Keep a copy of all inspection reports at the Site or at an easily accessible location.

G. Initiate repair or replacement of damaged erosion and sediment control BMPs immediately, and work completed by end of next work day. Significant replacement or repair must be completed within 7 days, unless infeasible.

H. Within 24 hours, remediate any significant sediment that has left construction site. Investigate cause of the sediment release and implement steps to prevent a recurrence of discharge within same 24 hours. Perform in-stream cleanup of sediment according to applicable regulations.
I. At end of each work day, stabilize or cover soil stockpiles or implement other BMPs to prevent discharges to surface waters or conveyance systems leading to surface waters.

J. Temporarily stabilize soils at end of shift before holidays and weekends, if needed. Ensure soils are stable during rain events at all times of year.

K. Initiate stabilization by no later than end of next work day after construction work in an area has stopped permanently or temporarily.

L. Provide permanent erosion control measures on all exposed areas. Do not remove temporary sediment control practices until permanent vegetation or other cover of exposed areas is established. However, do remove all temporary erosion control measures as exposed areas become stabilized, unless doing so conflicts with local requirements. Properly dispose of construction materials and waste, including sediment retained by temporary BMPs.

3.03 REMOVAL

A. When Engineer determines that an erosion control BMP is no longer required, remove BMP and all associated hardware from the Project limits. When materials are biodegradable, Engineer may approve leaving temporary BMP in place.

B. Permanently stabilize all bare and disturbed soil after removal of erosion and sediment control BMPs. Dress sediment deposits remaining after BMPs have been removed to conform to existing grade. Prepare and seed graded area. If installation and use of erosion control BMPs have compacted or otherwise rendered soil inhospitable to plant growth, such as construction entrances, take measures to rehabilitate soil to facilitate plant growth. This may include, but is not limited to, ripping the soil, incorporating soil amendments, or seeding with specified seed.

END OF SECTION
SECTION 01 61 00
COMMON PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 DEFINITIONS
A. Products:
   1. New items for incorporation in the Work, whether purchased by Contractor or Owner for the Project, or taken from previously purchased stock, and may also include existing materials or components required for reuse.
   2. Includes the terms material, equipment, machinery, components, subsystem, system, hardware, software, and terms of similar intent and is not intended to change meaning of such other terms used in Contract Documents, as those terms are self-explanatory and have well recognized meanings in construction industry.
   3. Items identified by manufacturer’s product name, including make or model designation, indicated in manufacturer’s published product literature, that is current as of the date of the Contract Documents.

1.02 DESIGN REQUIREMENTS
A. Where Contractor design is specified, design of installation, systems, equipment, and components, including supports and anchorage, shall be in accordance with provisions of International Building Code (IBC) 2012 by International Code Council.
   1. Snow Load: Basic ground snow load 285 psf.
   2. Seismic: Use mapped maximum considered earthquake, 5 percent damped, spectral response at short periods, $S_S \ 1.81g$, mapped maximum considered earthquake, 5 percent damped, spectral response at a period of 1 second, $S_10.62g$, unless specified otherwise.

1.03 ENVIRONMENTAL REQUIREMENTS
A. Altitude: Provide materials and equipment suitable for installation and operation under rated conditions at 7,000 feet above sea level.
1.04 DELIVERY AND INSPECTION

A. Deliver products in accordance with accepted current Progress Schedule and coordinate to avoid conflict with the Work and conditions at Site. Deliver anchor bolts and templates sufficiently early to permit setting prior to placement of structural concrete.

B. Deliver products in undamaged condition, in manufacturer’s original container or packaging, with identifying labels intact and legible. Include on label, date of manufacture and shelf life, where applicable.

C. Unload products in accordance with manufacturer’s instructions for unloading or as specified. Record receipt of products at Site. Promptly inspect for completeness and evidence of damage during shipment.

D. Remove damaged products from Site and expedite delivery of identical new undamaged products, and remedy incomplete or lost products to provide that specified, so as not to delay progress of the Work.

1.05 HANDLING, STORAGE, AND PROTECTION

A. Handle and store products in accordance with manufacturer’s written instructions and in a manner to prevent damage.

B. Manufacturer’s instructions for material requiring special handling, storage, or protection shall be provided prior to delivery of material.

C. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to ensure that products are maintained under specified conditions, and free from damage or deterioration. Keep running account of products in storage to facilitate inspection and to estimate progress payments for products delivered, but not installed in the Work.

D. After installation, provide coverings to protect products from damage due to traffic and construction operations. Remove coverings when no longer needed.

PART 2  PRODUCTS

2.01  GENERAL

A. Provide manufacturer’s standard materials suitable for service conditions, unless otherwise specified in the individual Specifications.

B. Where product specifications include a named manufacturer and also include performance requirements, named manufacturer’s products must meet the performance specifications.

C. Equipment, Components, Systems, and Subsystems: Design and manufacture with due regard for health and safety of operation, maintenance, and accessibility, durability of parts, and shall comply with applicable OSHA, state, and local health and safety regulations.

D. Regulatory Requirement: Coating materials shall meet federal, state, and local requirements limiting the emission of volatile organic compounds and for worker exposure.

E. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.

   1. Use or reuse of components and materials without a traceable certification is prohibited.

2.02  SOURCE QUALITY CONTROL

A. Factory Tests: Perform in accordance with accepted test procedures and document successful completion.

PART 3  EXECUTION

3.01  INSPECTION

A. Inspect materials and equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install material or equipment showing such effects. Remove damaged material or equipment from the Site and expedite delivery of identical new material or equipment. Delays to the Work
resulting from material or equipment damage that necessitates procurement of new products will be considered delays within Contractor’s control.

3.02 MANUFACTURER’S CERTIFICATE OF COMPLIANCE

A. When so specified, a Manufacturer’s Certificate of Compliance, a copy of which is attached to this section, shall be completed in full, signed by entity supplying the product, material, or service, and submitted prior to shipment of product or material or execution of the services.

B. Such form shall certify proposed product, material, or service complies with that specified. Attach supporting reference data, affidavits, and certifications as appropriate.

3.03 SUPPLEMENTS

A. The supplement listed below, following “End of Section”, is part of this Specification.

1. Form: Manufacturer’s Certificate of Compliance.

END OF SECTION
MANUFACTURER’S CERTIFICATE OF COMPLIANCE

OWNER: ___________________________ PRODUCT, MATERIAL, OR SERVICE SUBMITTED: ___________________________

PROJECT NAME: ____________________ PROJECT NO: ____________________

Comments: ______________________________________________________________________________

I hereby certify that the above-referenced product, material, or service called for by the Contract for the named Project will be furnished in accordance with all applicable requirements. I further certify that the product, material, or service are of the quality specified and conform in all respects with the Contract requirements, and are in the quantity shown.

Date of Execution: ____________________________, 20___

Manufacturer: ____________________________________________________________________________

Manufacturer’s Authorized Representative (print): ____________________________

________________________________________

(Authorized Signature)
SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1    GENERAL

1.01    SUBMITTALS

A.    Informational Submittals:

1.    Submit prior to application for final payment.
   a.    Record Documents: As required in General Conditions.
   b.    Special bonds, Special Guarantees, and Service Agreements.
   c.    Consent of Surety to Final Payment: As required in General Conditions.
   d.    Releases or Waivers of Liens and Claims: As required in General Conditions.
   e.    Releases from Agreements.
   f.    Final Application for Payment.

1.02    RECORD DOCUMENTS

A.    Quality Assurance:

1.    Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.

2.    Accuracy of Records:
   a.    Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.
   b.    Purpose of Project record documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive Site measurement, investigation, and examination.

3.    Make entries within 24 hours after receipt of information that a change in the Work has occurred.

4.    Prior to submitting each request for progress payment, request Engineer’s review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in a deferral by Engineer to recommend whole or any part of Contractor’s Application for Payment, either partial or final.
PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 MAINTENANCE OF RECORD DOCUMENTS

A. General:
   1. Label or stamp each record document with title, “RECORD DOCUMENTS,” in neat large printed letters.
   2. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded.

B. Preservation:
   1. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.
   2. Make documents and Samples available at all times for observation by Owner.

C. Making Entries on Drawings:
   1. Date entries.
   2. Call attention to entry by “cloud” drawn around area or areas affected.
   3. Legibly mark to record actual changes made during construction, including, but not limited to:
      a. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.
      b. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.
      c. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.
      d. Locate existing facilities, piping, utilities, and items critical to the interface between existing physical conditions or construction and new construction.
      e. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, and Engineer’s written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.
3.02 FINAL CLEANING

A. At completion of the Work or of a part thereof and immediately prior to Contractor’s request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor’s notice of completion, clean entire Site or parts thereof, as applicable.

1. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner.
2. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.
3. Broom clean exterior paved driveways and parking areas.
4. Leave water courses, gutters, and ditches open and clean.

B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

END OF SECTION
PART 1   GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this Section:

3. Environmental Protection Agency (EPA), U.S. Code of Federal Regulations (CFR), Title 40:
   b. Part 82—Protection of Stratospheric Ozone.

1.02 DEFINITIONS

A. ACM: Asbestos-containing material.

B. Demolition: Dismantling, razing, destroying, or wrecking of any fixed building or structure or any part thereof. Demolition also includes removal of pipes, manholes tanks, conduit, and other underground facilities, whether as a separate activity or in conjunction with construction of new facilities.

C. Modify: Provide all necessary material and labor to modify an existing item to the condition indicated or specified.

D. Relocate: Remove, protect, clean and reinstall equipment, including electrical, instrumentation, and all ancillary components required to make the equipment fully functional, to the new location identified on the Drawings.

E. Renovation: Altering a facility or one or more facility components in any way.

F. Salvage/Salvageable: Remove and deliver, to the specified location(s), the equipment, building materials, or other items so identified to be saved from destruction, damage, or waste; such property to remain that of Owner. Unless otherwise specified, title to items identified for demolition shall revert to Contractor.
1.03 SUBMITTALS

A. Informational Submittals:
   1. Submit proposed Demolition/Renovation Plan, in accordance with requirements specified herein, for approval before such Work is started.
   2. Submit copies of any notifications, authorizations and permits required to perform the Work.

1.04 REGULATORY AND SAFETY REQUIREMENTS

A. When applicable, demolition Work shall be accomplished in strict accordance with 29 CFR 1926-Subpart T.

B. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the General Conditions, Contractor’s safety requirements shall conform to ANSI A10.6.

1.05 DEMOLITION/RENOVATION PLAN

A. Demolition/Renovation Plan shall provide for safe conduct of the Work and shall include:
   1. Detailed description of methods and equipment to be used for each operation;
   2. The Contractor’s planned sequence of operations, including coordination with other work in progress;
   3. Sequencing requirements including demolition.

1.06 SEQUENCING AND SCHEDULING

A. The Work of this Specification shall not commence until Contractor’s Demolition/Renovation Plan has been approved by Engineer.

B. Include the Work of this Specification in the progress schedule, as specified in Section 01 32 00, Construction Progress Documentation.
PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXISTING FACILITIES TO BE DEMOLISHED OR RENOVATED

A. CMP Pipe and Structures: Demolish existing CMP pipe and inlet structures/manholes as shown on Drawings.

B. Paving and Slabs: Provide neat sawcuts at limits of pavement removal as required to complete the Work.

3.02 PROTECTION

A. Dust and Debris Control:
   1. Prevent the spread of dust and debris to avoid the creation of a nuisance or hazard in the surrounding area.
   2. Sweep pavements as often as necessary to control the spread of debris that may result in foreign object damage potential to vehicular traffic.

B. Existing Work:
   1. Survey the Site and examine the Drawings and Specifications to determine the extent of the Work before beginning any demolition or renovation.
   2. Take necessary precautions to avoid damage to existing items scheduled to remain in place, to be reused, or to remain the property of Owner; any Contractor-damaged items shall be repaired or replaced as directed by Engineer.
   3. Ensure that structural elements are not overloaded as a result of or during performance of the Work. Responsibility for additional structural elements or increasing the strength of existing structural elements as may be required as a result of any Work performed under this Contract shall be that of the Contractor. Repairs, reinforcement, or structural replacement must have Engineer approval.
   4. Do not overload pavements to remain.

C. Facilities:
   1. Protect existing utilities not scheduled for demolition. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades and temporary covering of exposed areas.
   2. Protect all facility elements not scheduled for demolition.
3. Provide interior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities.

D. Protection of Personnel:
   1. During demolition, continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site.
   2. Provide temporary barricades and other forms of protection to protect Owner’s personnel and the general public from injury due to demolition Work.
   3. Provide protective measures as required to provide free and safe passage of Owner’s personnel and the general public to occupied portions of the structure.

3.03 BURNING
   A. The use of burning at the Site for the disposal of refuse and debris will not be permitted.

3.04 RELOCATIONS
   A. Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Clean all items to be relocated prior to reinstallation, to the satisfaction of Owner. Repair items to be relocated which are damaged or replace damaged items with new undamaged items as approved by Owner.

3.05 BACKFILL
   A. Do not use demolition debris as backfill material.

3.06 TITLE TO MATERIALS
   A. All salvaged equipment and materials will remain the property of Owner.
   B. All items designated to be removed or demolished shall become the property of Contractor.

3.07 DISPOSITION OF MATERIAL
   A. Do not remove equipment and materials without approval of Contractor’s Demolition/Renovation Plan by Engineer.
   B. Salvage equipment and material to the maximum extent possible.
3.08  REUSE OF MATERIALS AND EQUIPMENT

A. Remove and store materials to be reused or relocated to prevent damage, and reinstall as the Work progresses.

3.09  CLEANUP

A. Debris and rubbish shall be removed from excavations. Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

END OF SECTION
SECTION 03 30 01
REINFORCED CONCRETE

PART 1  GENERAL

1.01  SUBMITTALS

A.  Action Submittals

       Bending lists and placing drawings.
   2.  Curing compound data.
   3.  Complete data on the concrete mix, including aggregate gradations and
       admixtures, in accordance with ASTM C94.

1.02  QUALITY ASSURANCE

A.  Formwork: Follow the recommendations of ACI 347.

B.  Concrete and Reinforcement: Unless otherwise specified, meet the
    requirements of ACI 301 and ACI 318/318R.

C.  Hot Weather Concreting: Conform to ACI 305R.

D.  Cold Weather Concreting:

   1.  Conform to ACI 306R.
   2.  Do not place concrete against frozen earth or ice, or against forms and
       reinforcement with frost or ice present.
   3.  Provide heated enclosures when air temperatures are below 40 degrees F.
   4.  Maintain surface temperature of concrete above 40 degrees F and cure
       concrete as specified in Article Protection and Curing, for minimum of
       7 days.

1.03  ENVIRONMENTAL REQUIREMENTS

A.  Do not place Concrete when the ambient temperature is below 40 degrees F
    or approaching 40 degrees F and air temperature less than 40 degrees F for the
    first 7 days, without special protection to keep Concrete above 40 degrees F.
PART 2  PRODUCTS

2.01  CONCRETE

A.  Portland Cement: ASTM C150, Type II.

B.  Admixtures:

2.  Water-Reducing: ASTM C494, Type A or Type D.
3.  Superplasticizers: ASTM C494, Type F or Type G.
4.  Fly Ash: ASTM C618, Class C or Class F.

C.  Mix Design:

1.  Class of Concrete: Concrete shall be Class AA.
2.  Minimum Allowable 28-day Compressive Field Strength: 4,000 psi when cured and tested in accordance with ASTM C31 and ASTM C39.
3.  Water-cement Ratio: 0.45, maximum.
4.  Coarse Aggregate Size: 1.5 inch and smaller.
5.  Slump Range: 1 to 4 inches and shall not exceed 8 inches using admixtures.

2.02  REINFORCING STEEL

A.  Deformed Bars: ASTM A615 or A706, Grade 60.

B.  Epoxy Coating for Reinforcing Steel: Coating of bar steel reinforcement shall conform to ASTM A775. Fabrication and handling of coated reinforcing steel shall conform to ASTM D3963. Patching or repair material shall conform to ASTM A775.

2.03  CONCRETE FILL

A.  Concrete Fill shall be provided and installed similar to reinforced concrete except shall not have reinforcing steel.

2.04  ANCILLARY MATERIALS

A.  Nonshrink Grout:

1.  Nonmetallic and nongas-liberating.
2.  Prepackaged natural aggregate grout requiring only the addition of water.
3. Test in accordance with ASTM C1107/C1107M:
   a. Grout shall have flowable consistency.
   b. Flowable for 15 minutes.
4. Grout shall not bleed at maximum allowed water.
5. Minimum strength of flowable grout, 3,000 psi at 3 days, 5,000 psi at 7 days, and 7,000 psi at 28 days.
6. Manufacturers and Products:
   a. BASF Building Systems, Inc., Shakopee, MN; Construction Grout.
   b. Euclid Chemical Co., Cleveland, OH; NS Grout.
   c. Dayton Superior Corp., Kansas City, KS; 1107 Advantage Grout.
   e. L & M Construction Chemicals, Inc., Omaha, NE; Duragروut.

B. Repair Material: MBT P&R Emaco S88CI as manufactured by Degussa Building Systems, Shakopee, MN or approved equal.

C. Curing Compound:
   1. For use upon approval by Engineer only.
   2. Water-based, high solids content nonyellowing curing compound meeting requirements of ASTM C309 and ASTM C1315.
      a. Moisture Loss: 0.40 kg/square meter/72 hours maximum.
      b. Capable of meeting moisture retention at manufacturer’s specified application rate.
   3. Manufacturers and Products:
      a. Chemrex, Inc., Shakopee, MN; Masterkure.
      b. Euclid Chemical Co., Cleveland, OH; Super Diamond Clear VOX.
      c. WR Meadows, Inc., Hampshire, IL; VOCOMP-30.
      d. Vexcon Chemical, Inc.; Philadelphia, PA; Starseal 1315.
      e. Dayton Superior; Safe Cure and Seal 30%.

PART 3 EXECUTION

3.01 FORMWORK

   A. Form Materials:
      1. Use hard plastic finished plywood for exposed areas.
      2. Earth cuts may be used for forming footings.
B. Construction:

1. In accordance with ACI 347.
2. Make joints tight to prevent escape of mortar and to avoid formation of fins.
3. Brace as required to prevent distortion during concrete placement.
4. On exposed surfaces locate form ties in uniform pattern or as shown.
5. Construct so ties remain embedded in the wall with no metal within 1 inch of concrete surface when forms, inserts, and tie ends are removed.
6. All exposed corners shall have a fillet of 3/4 inch unless otherwise shown on Drawings.

C. Form Removal:

1. Remove after concrete has attained 28-day strength, or approval is obtained in writing from Engineer.
2. Remove forms with care to prevent scarring and damaging the surface.

3.02 PLACING REINFORCING STEEL

A. Unless otherwise specified, place reinforcing steel in accordance with CRSI Recommended Practice for Placing Reinforcing Bars.

B. Splices and Laps:

1. Lap all other bars in accordance with ACI 318-11.
2. Tie splices with 18-gauge annealed wire as specified in CRSI Standard.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.

B. Prior to placing concrete, remove water from excavation and debris and foreign material from forms. Check reinforcing steel for proper placement and correct discrepancies.

C. Place concrete as soon as possible after leaving mixer, without segregation or loss of ingredients, without splashing forms or steel above, and in layers not over 2 feet deep. Place within 1-1/2 hours after adding cement to mix.
3.04 COMPACATION

A. Vibrate concrete as follows:

1. Apply approved vibrator at points spaced not farther apart than vibrator’s effective radius.
2. Apply close enough to forms to vibrate surface effectively but not damage form surfaces.
3. Vibrate until concrete becomes uniformly plastic.
4. Vibrator must penetrate fresh placed concrete and into previous layer of fresh concrete below.

3.05 FINISHING

A. Manhole Base Slabs:

1. Screed surfaces to true level planes.
2. After initial water has been absorbed, float with wood float and trowel with steel trowel to smooth finish free from trowel marks.
3. Do not absorb wet spots with neat cement.

3.06 FINISHING AND PATCHING FORMED SURFACES

A. Cut out honeycombed and defective areas.
B. Cut edges perpendicular to surface at least 1-inch deep. Do not feather edges. Soak area with water for 24 hours.
C. Patch with repair material.
D. Finish surfaces to match adjacent concrete.
E. Keep patches damp for minimum 7 days or spray with curing compound to minimize shrinking.

3.07 PROTECTION AND CURING

A. Protect fresh concrete from direct rays of sunlight, drying winds, and wash by rain.
B. Keep concrete slabs continuously wet for a 7-day period. Intermittent wetting is not acceptable.
C. Use curing compound only where approved by Engineer. Cure formed surfaces with curing compound applied in accordance with manufacturer’s directions as soon as forms are removed and finishing is completed.
D. Remove and replace concrete damaged by freezing.

END OF SECTION
SECTION 03 64 00
CONTACT GROUTING

PART 1 GENERAL

1.01 SCOPE

A. This section covers the work necessary for contact grouting including drilling grout holes; furnishing, mixing and placing grout; furnishing all labor, materials, equipment, and incidentals; and all other related work necessary for completing the grouting.

B. Contact grouting is to fill voids, consolidate backfill, and improve the pipe-to-soil interaction between the existing host pipe and the ground surrounding the host pipe on the outside.

C. Contact grouting for invert repairs shall be performed prior to sliplining installation to repair damaged or missing portions of the invert of the existing host pipe, stabilize the bedding support for the existing host pipe, and provide a sound surface for subsequent slipliner installation.

D. Contact grouting besides invert repairs shall be performed after the slipliner installation and annular space grouting, but before the application of the cement mortar lining. In lieu of drilling through hardened annular space grout, the drilling of contact grout ports and placement of guide tubes after sliplining but prior to annular space grouting may be performed at the discretion of and for the convenience of the Contractor.

1.02 REFERENCES

A. The publications and standards listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the abbreviation only. Unless otherwise stated, the most recent version or edition of each publication or standard is implied.

   c. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
1.03 DEFINITIONS

A. Contact Grouting: An injection of portland cement into voids outside of the host pipe to achieve continuous and permanent contact between the host pipe and the ground.

B. Grout Port: A port drilled into the host pipe, fitted with a one-way valve for injection of grout into soil behind host pipe.

C. Host pipe: The existing pipe that is to be rehabilitated.

D. Refusal: The point at which grouting is stopped on a grout hole. It is defined as a grout injection rate of less than one-half cubic feet of grout over a 10 minute interval, at 100 percent of the required pressure.

E. Voids: Spaces within soil or rock masses that filled with air, water, slurry or disturbed ground resulting in void ratios (volume of voids divided by volume of solids) greater than 2.0.

1.04 SUBMITTALS

A. Action Submittals:

1. Grout Mixes:
   a. The Contractor shall submit to the Engineer all proposed grout mixes for contact grouting. The submittal shall be made a minimum of 30 days prior to start of grouting operations. The Contractor shall resubmit as appropriate if the mixes are modified during the course of the work. No contact grouting will be allowed without an accepted submittal.
   b. Submit mix designs for each contact grout mix proposed for use. Each mix design shall show the ingredients of the mix and shall include:
      1) Type, brand, source, and amounts of cement, admixtures, and other additives.
      2) Source and amount of water.
      3) Representative samples of materials for materials testing and mix proportion testing.
      4) Combined grading of each mix design.
      5) Specific gravity of all materials.
      6) Results of required tests.
   c. Submit a certificate of compliance signed by the supplier identifying the type of fly ash (if used) and stating that the fly ash is in accordance with ASTM C618 and these specifications. Supporting test data shall be furnished when requested by the
Engineer. All testing and sampling procedures shall be in accordance with ASTM C311.

d. Submit water quality test results.
e. Submit material specifications and instructions for use of any proposed concrete admixtures.

2. Workplan: The Contractor shall submit prior to the start of any excavation a work plan for the contact grouting. The work plan for placing contact grout shall cover each type of contact grouting required and shall include:

a. Contact grouting methods, procedures and sequences for each segment.
b. Grout hole locations and depth of injection ports.
c. Plans for grout port opening in advance of injection at a port and release of water disturbed soil or slurry.
d. Method of transporting grouting equipment, grout and materials into and within the pipe.
e. Means for measuring grout takes (volume) per foot or segment of pipe.
f. Means for measuring grout pressures and planned grout pressure limits for refusal criteria.
g. Timing of grout injection with respect to advance of the lining.

B. Informational Submittals:

1. Qualifications:
   a. Affidavit of Experience.
   b. Quality Control Plan.

2. Grouting Equipment:
   a. Submit calibration records for all meters and gauges to be used in grouting operations.
   b. Submit the following for the contact grouting equipment proposed:
      1) Manufacturer’s specifications and operation instructions for grout conveyance equipment.
      2) Pump specifications.
      3) Grout hose, valve and port sizes and specifications.
      4) Grout pressure gages and pressure gauge calibration data.

   a. Submit for each pipe:
      1) Mill test reports for portland cement.
      2) Certificates of compliance for each load of portland cement and fly ash (if used).
      3) Certificates of compliance for all admixtures.
4) Proposed contact grout mix designs with mix data for all components, mix properties including admixtures, slump and wet unit weight, and testing results including cured unit weight and compressive strength tests reports from a certified testing laboratory.

5) Submit the following daily reports and records for contact grouting of voids:
   a) Daily logs of grouting operations at all contact grouting locations (station and position) of grout ports, including pressures, volumes, and grout mix pumped, times of injecting, locations where grout samples for test cylinders are taken, and grout slump results.
   b) An analysis of anticipated void volume at the time of grouting. Provide a comparison of anticipated annulus volume with grout volume placed by contact grouting for length of tunnel grouted.
   c) Compressive strength tests reports from a certified testing laboratory.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. The Contractor shall have installed contact grout for rehabilitation of gravity pipes for at least three similar projects involving at least 500 feet of pipe completed within last 5 years. The Contractor shall provide an affidavit attesting to this experience, with references for the cited project experience.

2. The applicator of the grout mix shall have at least 5 years of experience with similar grouting applications.

3. The applicator of the grout mix shall be certified by the grout mix manufacturer. The certified applicator shall be regularly engaged in the placement of grout.

B. Quality Control Plan shall include at a minimum:

1. Methods for ensuring uninterrupted grouting at pressures that do not exceed the maximum specified.

2. Methods for demonstrating that grout mixes meet design criteria.

3. Methods for containing excess or waste grout, cleaning equipment and disposing of excess and wasted grout, water and debris.
PART 2 PRODUCTS

2.01 MATERIALS

A. Cement: Type II or Type V portland cement conforming to ASTM C150. Type II cement shall meet Table 4 false set requirements of ASTM C150.

B. Fly Ash: Comply with ASTM C618; either Type C or Type F shall be used.

C. Water: Use potable water free from deleterious amounts of alkali, acid, and organic materials which would adversely affect the setting time or strength of the grout.

D. Admixtures: Admixtures shall be selected by the grout manufacturer to meet performance requirements, improve pumpability, control set time, and reduce segregation.

E. Grout Mix Design:

1. Contact grout shall be ultrafine grout and consist of a mixture of water and portland cement, with mineral fillers or admixtures as necessary to achieve a non-shrink, non-bleed, flowable grout.

2. One or more mixes shall be developed to stabilize the soil based, but not restricted to, the following requirements:
   a. Type of soil voids.
   b. Size of grouting ports.
   c. Absence or presence of groundwater.
   d. Sufficient strength and durability to prevent movement of the host pipe.
   e. Provide adequate retardation.
   f. Provide less than 1 percent shrinkage by volume.
   g. Factor of Safety: 2.

3. No aggregates shall be used in the grout mix.

4. Compressive Strength: The grout shall have a minimum penetration resistance of 100 psi in 24 hours when tested in accordance with ASTM C403 and a minimum compressive strength of 250 psi in 28 days when tested in accordance of ASTM C495 or C109.

F. Drilled Grout Hole Patches in Reinforced Concrete Pipe:

1. Hole filler: Prepackaged rapid hardening product conforming to ASTM C928 with demonstrated performance sealing potentially leaking overhead grout holes.

2. Hole surface: Structural grade reinforced epoxy.
G. Drilled Grout Hole Couplings and Plugs in Steel Pipe:

1. Piping for grout shall be 2-inch diameter or larger black steel pipe, standard weight (Schedule 40), conforming to the requirements of ASTM A53.
2. Couplings shall be malleable iron.
3. Plugs to be installed in the couplings shall be forced steel.
4. Grout couplings shall be 1 inch as shown on Drawings. Contractor may propose large couplings if needed for the grouting operation and the grout mix selected.

H. No deleterious amounts of toxic or other poisonous substances shall be included in the grout mix nor otherwise injected underground.

2.02 EQUIPMENT, DRILLING

A. Rotary or percussion drilling equipment may be used for drilling grout holes for contact grouting.

2.03 EQUIPMENT, CONTACT GROUTING

A. Mixers shall be colloidal type capable of providing a homogenized mix and shall be capable of an impeller speed of not less than 1,500 rpm. The grout mixer shall pump the grout into a mechanically agitated holding tank. Mixer and mechanical agitator tanks shall be of sufficient capacity to ensure an uninterrupted supply of grout to the grout pump. Means of accurately measuring the separate grout ingredients at the mixer shall be provided. Means shall be provided for increasing or decreasing the water-cement ratio, as required by the ground conditions encountered.

B. Pumping equipment shall deliver grout from the holding tank to the point of injection at a steady pressure without pulsation. Grout pumps shall be capable of delivering grout to the point of injection at a pressure equal to 3.0 psi for every foot of overburden. Pumping equipment shall be capable of handling water-cement ratios varying between 25 to 1 and 0.6 to 1 by weight.

C. Means shall be provided for accurately determining the amount of grout injected. The flowmeter shall be accurate within 10 percent at a flow rate of 2.5 gpm.

D. The grout plant shall be equipped with reliable pressure gauges at point of injection and at the pump. The pressure gauges shall have a working range between 1.5 to 2.0 times the design grout pressure, and have an accuracy within 0.5 percent of full range or 0.5 psi (whichever is more accurate). The gauges shall be protected from grout contamination by an oil or air buffer, and
shall be easily cleaned in the field. All gauges shall be certified and calibrated in accordance with ANSI B40, Grade 2A. Contractor shall have a minimum of two spare pressure gauges available on Site.

E. Flexible hose for pressure grouting shall have an inside diameter not less than 1 inch and shall be capable of withstanding the maximum water and grout pressures to be used. Grout pipes shall have an inside diameter of 1-1/2 inches or larger. A diaphragm valve shall be provided on each grout hose and a straightway valve at each grout pipe to regulate flow. Packers for grouting shall be pneumatic, hydraulic, or mechanical expandable rubber packers.

F. At the point of injection, suitable valves and pressure gauge shall be provided so that the pressure may be monitored and the grout flow regulated by increasing or decreasing the flow in the grout return line. Suitable stop valves shall be provided at the collar of the hole for use in maintaining pressure as required until the grout has set.

G. Grouting equipment shall be of such configuration that flushing can be accomplished with the grout injection valve closed, with the water supply valve open, and with the grout pump running at full speed.

H. All metal pipe, standard plugs and fittings required for grouting operations shall be minimum Schedule 40 pipe conforming to ASTM Designation A53.

PART 3 EXECUTION

3.01 GENERAL

A. The Engineer shall be notified at least 24 hours in advance of the start of grouting operations.

B. If out of visible contact, continuous telephonic communication shall be maintained between the grout plant and the injection point.

C. Grout in the mixer and holding tanks shall be continuously agitated. portland cement grout which is not injected into the hole within 2 hours after mixing shall be removed from the mixer, holding tank and supply line and shall be discarded.

D. Grout shall be maintained at temperatures above 50 degrees F until injected. The temperatures of mixing water shall range from 50 degrees F to 100 degrees F when added to the grout mixer. Grout materials shall be stored at temperatures above freezing. Grouted ground shall be no colder than 40 degrees F when grout is injected and for a period of 5 days thereafter.
E. Grout holes shall be protected from becoming clogged or obstructed prior to grouting by means of a cap or other suitable device on the collar of the hole. Any hole that becomes blocked or otherwise unsuitable for its intended purpose shall be cleaned out in a satisfactory manner or replaced at the expense of the Contractor.

F. All grout hole locations shall be flagged and protected. They shall be clearly labeled for easy identification and shall be clearly visible.

3.02 CONTACT GROUTING

A. General:

1. Contact grouting shall be performed in such a manner as to fill voids, and to provide firm and uniform contact between the host pipe and the ground.

2. Equipment and lines shall be kept clean by constant circulation of grout and periodic flushing with water. Leakage from connections shall not be permitted. Plugs on ends of nearby grout holes or pipes shall be removed to permit escape of air and water and the filling of spaces with grout.

3. Once started, grouting of a hole shall not be interrupted. Grouting of a hole shall not be considered complete until that hole refuses to take grout as defined in this Specification. After grouting of a hole or any stage of a hole has reached refusal, the pressure on the hole shall be maintained by means of a stopcock or other suitable device until the grout has set.

4. Grout progressively from pipe to pipe in the sequence submitted by the Contractor or approved by the Engineer. If necessary to relieve premature stoppage, periodic applications of water under pressure shall be considered. Grout that cannot be placed prior to initial set shall be discarded. Check operating gauges daily to determine that they are in working order. Do not grout without appropriate gauges in place and in working order.

5. Grout shall be injected in continuous progression of the grout holes along the length of the pipe as shown on Drawings. Where grout holes extend around the pipe periphery, connections to higher grout holes shall not be made until the grouting of the lower holes is complete. The Contractor shall exercise particular care to completely fill the voids on each side of any obstruction which interferes with the passage of grout. Vent holes for the release of air and water during grouting of crown or invert cavities shall be provided as necessary.

6. Where grouting in soil, the grouting pressure at the injection point shall not exceed 0.6 psi per foot of depth of soil overburden (or 6 psi total,
whichever is lower), unless otherwise proposed by the Contractor, with the Engineer’s concurrence. In all cases, the grouting pressures shall be limited as necessary to avoid damage to the host pipe.
7. The grouting of any hole shall not be considered complete until all voids have been filled to the maximum extent practicable and at least one of the following criteria are met.
   a. Escape of grout of normal consistency from higher holes is observed while grouting at lower holes.
   b. Less than 1 cubic foot of grout of the accepted mix and consistency can be pumped in 5 minutes under the specified maximum pressure.
8. After the grouting of any hole is finished, the pressure shall be maintained by means of the stop valve until the grout has set to the extent that it will be retained in the hole.
9. Regardless of the pressure, Contractor shall be solely responsible for any damage or distortion to the host pipe due to grouting.

B. Contact Grouting for Deformed Host Pipe Locations:
   1. Perform contact grouting outside of the pipe where the host pipe has deformed as shown on the plans.
   2. Locate grout holes as necessary to accomplish the work and to thoroughly fill the voids outside of the pipe. Drill grout holes for contact grouting through any new liner, annular space, host pipe, and into surrounding ground.
   3. Perform contact grouting to reduce groundwater inflow, to fill voids, to minimize ground movement into the excavation, and to provide firm and uniform contact between the host pipe and the ground.
   4. Volume of contact grout injected shall be measured, recorded and compared with the anticipated volume per foot of initial lining grouted.
   5. The Engineer may periodically request that check holes be drilled to determine if unacceptable voids exist outside of the ground support system. Additional contact grouting shall be completed at no additional cost to the Owner where checking indicates the presence of unacceptable voids.

3.03 GROUT AND DRAINAGE HOLES

A. Holes for injecting grout through the host pipe (or combination of new liner, annular space, and host pipe) shall be installed by drilling or by combination of pre-installed grout ports and drilling. Drilling shall be performed with either rotary or percussion drilling equipment. Grout holes shall extend a minimum of 6 inches into unexcavated adjacent ground prior to grouting unless otherwise indicated on Drawings.
B. Grout pipes shall be fixed in the holes in the host pipe (or combination of new liner, annular space, and host pipe), to prevent grout return around the perimeter of the grout pipe. Grout pipes and fittings shall be thoroughly cleaned before embedment. Grout pipes shall be set so that grout can flow freely to voids behind the host pipe (or combination of new liner, annular space, and host pipe).

C. Suitable stop valves shall be provided at the collar of the grout hole for use in maintaining pressure as required until the grout has set.

3.04 FIELD QUALITY CONTROL

A. Records: The Contractor shall record the stationing and the volume of contact grout pumped and grout pressure behind the host pipe during grouting. The records shall be submitted to the Engineer on a weekly basis unless more frequent submissions are requested.

B. Manufacturer’s Field Services: Grout manufacturer shall provide technical assistance during the design and placing of the grout.

C. Sampling and Testing:
   1. Density/Viscosity: During placement of grout, measure density in accordance with ASTM C138 and C939 at least twice per hour. Adjust the mix as required to obtain the specified cast density.
   2. Collect at least one set of four samples for each 100 cubic feet of grout injected but not less than one set for each grouting shift or every 4 hours of placing (whichever is less), unless directed otherwise by the Engineer.
   3. Prepare samples for 24-hour and 28-day compressive strength tests according to ASTM C31 for cylinders or ASTM C109 for cubes.
   4. Cylinder molds shall be at least 2 inches in diameter and 4 inches long.
   5. Grout cubes shall be either 2 inches or 50 millimeters square.
   6. Obtain grout for the cylinders or cubes from the nozzle of the contact grout injection line.
   7. The Contractor shall engage the services of an approved, nationally accredited, independent testing laboratory to certify that the proposed materials and methods comply with these requirements.
   8. Submit results and soon as practicable after performing tests.

3.05 CLEANUP

A. The Contractor shall prevent the setting of grout which may escape upon finished pipe or structure surfaces, and shall remove such grout and restore the surface to its original condition.
B. On completion of contract grouting, grout pipes shall be removed to a depth of at least 2 inches from the face of final lining. Holes remaining in concrete final lining at the completion of grouting operations shall be completely filled with non-shrink grout to a depth of at least 2 inches. The patching shall be performed so as to provide a surface smoothness at least equal to undisturbed areas of the concrete lining.

END OF SECTION
PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. American Society of Mechanical Engineers (ASME):
   a. BPVC SEC V, Nondestructive Examination.
   b. BPVC SEC IX, Welding and Brazing Qualifications.


   a. A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
   b. A3.0, Standard Welding Terms and Definitions.
   e. D1.3/1.3M, Structural Welding Code - Sheet Steel.
   f. D1.6/D1.6M, Structural Welding Code - Stainless Steel.
   g. QC1, Standard for AWS Certification of Welding Inspectors.

1.02 DEFINITIONS

A. CJP: Complete Joint Penetration.

B. CWI: Certified Welding Inspector.

1. Contractor’s Welding Inspector: Contractor’s CWI acts for, and on behalf of, the Contractor for all inspection and quality matters within the scope of the Contract Documents. The Contractor is required to provide his own welding inspector to oversee welding operations and this inspector is responsible for visual inspection and necessary correction of all deficiencies in materials and workmanship required to meet referenced welding codes. This Inspection is not classified as Special Inspection.

2. Verification Inspector: CWI who acts on behalf of the Owner. This type of independent inspection and testing is the prerogative of the Owner, who may perform this function, or may waive this type of independent verification inspection.
C. MT: Magnetic Particle Testing.
D. NDE: Nondestructive Examination.
E. NDT: Nondestructive Testing.
F. PJP: Partial Joint Penetration.
G. PQR: Procedure Qualification Record.
H. PT: Liquid Penetrant Testing.
I. Special Inspection: Non-destructive examination exclusive of VT. Special inspection includes MT, PT, UT and RT. Special Inspection personnel report to, and are retained by the Owner.
J. RT: Radiographic Testing.
M. WPQ: Welder/Welding Operator Performance Qualification Record.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Shop and field WPSs and PQRs.
   b. NDT procedure specifications prepared in accordance with ASME BPVC SEC V.
   c. Welding Data (Shop and Field): Submit welding data together with Shop Drawings as a complete package.
      1) Show on Shop Drawings, or on a weld map, complete information regarding base metal specification designation, location, type, size, and extent of welds with reference called out for WPS and NDE numbers in tails of combined welding and NDE symbols as indicated in AWS A2.4.
      2) Clearly distinguish between shop and field welds.
      3) Indicate, by welding symbols or sketches, details of welded joints and preparation of base metal. Provide complete joint welding details showing bevels, groove angles, and root openings for welds.
4) Welding and NDE Symbols: In accordance with AWS A2.4.
5) Welding Terms and Definitions: In accordance with AWS A3.0.

B. Informational Submittals:

1. WPQs.
2. CWI credentials.
3. Testing agency personnel credentials.
4. CWI visual inspection (VT) reports.
5. Welding Documentation: Submit on forms in referenced welding codes.

1.04 QUALIFICATIONS

A. WPSs: In accordance with AWS D1.1 (Annex M Forms) for shop or field welding; or ASME BPVC SEC IX (Forms QW-482 and QW-483) for shop welding only.

B. WPQs: In accordance with AWS D1.1 (Annex M Forms); or ASME BPVC SEC IX (Form QW-484).

C. CWI: Certified in accordance with AWS QC1, and having prior experience with specified welding codes. Alternate welding inspector qualifications require prior approval by Engineer.

D. Testing Agency: Personnel performing tests shall be NDT Level II certified in accordance with ASNT SNT-TC-1A.

1.05 SEQUENCING AND SCHEDULING

A. Unless otherwise specified, Submittals required in this section shall be submitted and approved prior to commencement of welding operations.

PART 2 PRODUCTS

2.01 SOURCE QUALITY CONTROL

A. Fabricator’s CWI shall be present whenever shop welding is performed. CWI shall perform inspection at suitable intervals, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1 or referenced welding code and as follows:

1. Verifying conformance of specified job material and proper storage.
2. Monitoring conformance with approved WPS.
3. Monitoring conformance of WPQ.
4. Inspecting weld joint fit-up and performing in-process inspection.
5. Providing 100 percent visual inspection of welds.
6. Coordinating with nondestructive testing personnel and reviewing NDE test results.
7. Maintaining records and preparing reports documenting that results of CWI VT and subsequent NDE testing comply with the Work and referenced welding codes.

PART 3 EXECUTION

3.01 GENERAL

A. Welding and Fabrication by Welding: Conform to governing welding codes.

B. Qualify welding procedures in accordance with referenced welding codes.

3.02 NONDESTRUCTIVE WELD TESTING REQUIREMENTS

A. Quality Control Inspection:

1. All Welds: 100 percent VT by Contractor’s CWI.
2. Acceptance Criteria:
   b. All Other Structural Steel: AWS D1.1, Paragraph 6.9, Visual Inspection, Statically Loaded Nontubular Connections.

B. Nondestructive Testing Requirements:

1. NDT frequency shall be as specified below, as required by referenced welding codes, or as specified in the attached table. In case there is a conflict, the higher frequency level of NDT shall apply.
   a. Nontubular Connections:
      1) Fillet Welds and PJP Groove Welds: 10 percent random PT or MT.
   b. Tubular Connections:
      1) CJP butt joint groove welds made from one side without backing: 100 percent RT or UT in accordance with AWS D1.1, Paragraph 9.26.2 requirements.
      2) CJP Butt Joint Groove Welds made without backing or back-gouging: 10 percent random RT for each butt joint.
      3) Fillet Welds and PJP Groove Welds: 10 percent random PT or MT.
2. NDT Procedures and Acceptance Criteria:
   a. Nontubular Connections:
      1) RT: Perform in accordance with AWS D1.1, Clause 6, Part E. Acceptance criteria per AWS D1.1, Paragraph 6.12.1.
      2) UT: Perform in accordance with AWS D1.1, Clause 6, Part F. Acceptance criteria per AWS D1.1, Paragraph 6.13.1.
      3) PT and MT:
         b) Acceptance criteria per AWS D1.1, Paragraph 6.9, Visual Inspection, Statically Loaded Nontubular Connections.
   b. Tubular Connections:
      1) RT: Comply with requirements for Nontubular Connections and additional requirements of AWS D1.1, Clause 9, Paragraph 9.28 and Paragraph 9.29.
      2) UT: Comply with requirements for Nontubular Connections and additional requirements of AWS D1.1, Clause 9, Paragraph 9.27.
      3) PT and MT:
         b) Acceptance criteria per AWS D1.1, Paragraph 9.25.

3.03 FIELD QUALITY CONTROL

A. Contractor’s CWI shall be present whenever field welding is performed. CWI shall perform inspection, at suitable intervals, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1 or referenced welding code and as follows:

1. Verify conformance of specified job material and proper storage.
2. Monitor conformance with approved WPS.
3. Monitor conformance of WPQ.
4. Inspect weld joint fit-up and perform in-process inspection.
5. Provide 100 percent visual inspection of all welds in accordance with Subparagraph Quality Control Inspection.
6. Supervise nondestructive testing personnel and evaluating test results.
7. Maintain records and prepare report confirming results of inspection and testing comply with the Work.
3.04 WELD DEFECT REPAIR

A. Repair and retest rejectable weld defects until sound weld metal has been deposited in accordance with appropriate welding codes.

3.05 SUPPLEMENTS

A. The supplement listed below, following “End of Section,” is a part of this Specification.

1. Welding and Nondestructive Testing Table.

END OF SECTION
### Welding and Nondestructive Testing

<table>
<thead>
<tr>
<th>Specification Section</th>
<th>Governing Welding Codes or Standards</th>
<th>Submit WPS</th>
<th>Submit WPQ</th>
<th>Onsite CWI Req’d</th>
<th>Submit Written NDT Procedure Specifications</th>
<th>NDT Requirements</th>
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<tr>
<td>33 05 01.01 Welded Steel Pipe and Fittings</td>
<td>ASME BPV Code, Section IX; and AWS D1.1, Structural Welding Code - Steel</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>100% VT; also see Section 33 05 01.01</td>
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</table>
PART 1 GENERAL

1.01 DEFINITIONS

A. Interfering or Objectionable Material: Trash, rubbish, and junk; vegetation and other organic matter, whether alive, dead, or decaying; topsoil.

B. Clearing: Removal of interfering or objectionable material lying on or protruding above ground surface.

C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots greater than 1-inch caliper to a depth of 6 inches below subgrade.

D. Stripping: Removal of topsoil, if present.

E. Project Limits: Areas, as shown or specified, within which Work is to be performed.

1.02 QUALITY ASSURANCE

A. Obtain Engineer’s approval of staked clearing, grubbing, and stripping limits, prior to commencing clearing, grubbing, and stripping.

1.03 SCHEDULING AND SEQUENCING

A. Prepare Site only after adequate erosion and sediment controls are in place. Limit areas exposed uncontrolled to erosion during installation of temporary erosion and sediment controls to maximum of 1 acre.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Clear, grub, and strip areas actually needed for Site improvements within limits shown or specified.

B. Do not injure or deface vegetation that is not designated for removal.
3.02 LIMITS

A. As follows, but not to extend beyond Project limits.
   1. Excavation Excluding Trenches: 5 feet beyond top of cut slopes.
   2. Trench Excavation: 3 feet from edge of trench, unless otherwise shown on the Drawings.

B. Remove rubbish, trash, and junk from entire area within Project limits.

3.03 CLEARING

A. Clear areas within limits shown or specified.

B. Fell trees so that they fall away from facilities and vegetation not designated for removal.

C. Cut stumps not designated for grubbing flush with ground surface.

D. Cut off shrubs, brush, weeds, and grasses to within 2 inches of ground surface.

3.04 GRUBBING

A. Grub areas within limits shown or specified.

3.05 STRIPPING

A. Strip areas within limits to minimum depths shown or specified. Do not remove subsoil with topsoil.

3.06 DISPOSAL

A. Clearing, Stripping, and Grubbing Debris:
   1. Dispose of debris offsite.
   2. Burning of debris onsite will not be allowed.
   3. Limit offsite disposal of clearing and grubbing debris to locations that are approved by federal, state, and local authorities, and that will not be visible from Project.

END OF SECTION
SECTION 31 23 16
EXCAVATION

PART 1  GENERAL

1.01  QUALITY ASSURANCE

A.  Provide adequate survey control to avoid unauthorized overexcavation.

1.02  WEATHER LIMITATIONS

A.  Material excavated when frozen or when air temperature is less than 32 degrees F shall not be used as fill or backfill until material completely thaws.

B.  Material excavated during inclement weather shall not be used as fill or backfill until after material drains and dries sufficiently for proper compaction.

1.03  SEQUENCING AND SCHEDULING

A.  Clearing, Grubbing, and Stripping: Complete applicable Work specified in Section 31 10 00, Site Clearing, prior to excavating.

B.  Excavation Support: Design, install and maintain shoring as necessary to support sides of excavations and prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work, as well as in accordance with local and national regulations.

PART 2  PRODUCTS (NOT USED)

PART 3  EXECUTION

3.01  GENERAL

A.  The Contractor shall expect to encounter rocks, cobbles, and boulders in its excavations. No additional payment will be made for rocks, boulders, cobbles, or other deleterious materials.

B.  Excavate to lines, grades, and dimensions shown and as necessary to accomplish Work. Excavate to within tolerance of plus or minus 0.1 foot, except where dimensions or grades are shown or specified as maximum or minimum. Allow for forms, working space, granular base, topsoil, and similar items, wherever applicable. Trim to neat lines where concrete is to be deposited against earth.
C. Do not overexcavate without written authorization of Engineer, except where cobbles and boulders must be removed.

D. Design, provide, and maintain shoring, sheeting, and bracing as necessary to support the sides of excavations and to prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work.

E. Provide adequate safety system meeting requirements of Subpart P of 29 CFR 1926, and any applicable local or state construction safety orders.

F. During excavation, protect all existing utilities from damage.

3.02 UNCLASSIFIED EXCAVATION

A. Excavation is unclassified. Complete all excavation regardless of the type, nature, or condition of the materials encountered.

3.03 CONTROL OF WATER IN EXCAVATION

A. Remove water entering open excavation. Control water to prevent ponded water in excavation during periods when necessary to properly accomplish Work.

B. Overexcavate, grade bottom of excavation to drain to sumps from which water can be pumped, and backfill with Trench Stabilization Material as specified in Section 31 23 23.15, Trench Backfill. Dewater as necessary to maintain water level below top of trench stabilization material.

C. Provide surface drainage away from open excavation to prevent surface water flow into excavation.

D. Store and dispose of water removed from excavation in accordance with state and local requirements.

3.04 TRENCH WIDTH

A. Minimum Width of Trenches: As shown on the Drawings.

   1. Increase trench widths by thicknesses of sheeting.

B. Maximum Trench Width: No more than 1 foot greater than shown on the Drawings, unless otherwise approved in writing.
3.05 REMOVAL OF EXCAVATION SUPPORT

A. Remove excavation support in a manner that will maintain support as excavation is backfilled.

B. Do not begin to remove excavation support until support can be removed without damage to existing facilities, completed Work, or adjacent property.

C. Remove excavation support in a manner that does not leave voids in the backfill.

3.06 STOCKPILING EXCAVATED MATERIAL

A. Stockpile excavated material that is suitable for use as fill or backfill until material is needed.

B. Confine stockpiles to within easements, rights-of-way, and approved work areas. Do not obstruct roads, streets, or trails.

C. Do not stockpile excavated material adjacent to trenches and other excavations, unless excavation side slopes and excavation support systems are designed, constructed, and maintained for stockpile loads.

D. Do not stockpile excavated materials near or over existing facilities, adjacent property, or completed Work, if weight of stockpiled material could damage existing facilities or induce excessive settlement.

3.07 DISPOSAL OF SPOIL

A. Dispose of excavated materials, which are unsuitable or exceed quantity needed for fill or backfill, offsite.

B. Dispose of debris resulting from removal of organic matter, trash, refuse, and junk as specified in Section 31 10 00, Site Clearing, for clearing and grubbing debris.

END OF SECTION
PART 1 GENERAL

1.01 DEFINITIONS

A. Base Rock: Granular material upon which manhole bases and other structures are placed.

B. Bedding Material: Granular material upon which pipes, conduits, cables, or duct banks are placed.

C. Imported Material: Material obtained by Contractor from source(s) offsite.

D. Lift: Loose (uncompacted) layer of material.

E. Pipe Zone: Backfill zone that includes full trench width and extends from prepared trench bottom to an upper limit above top outside surface of pipe, conduit, cable or duct bank.

F. Prepared Trench Bottom: Graded trench bottom after excavation and installation of stabilization material, if required, but before installation of bedding material.

G. Relative Compaction: The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D1557. Corrections for oversize material may be applied to either as-compacted field dry density or maximum dry density, as determined by Engineer.

H. Selected Backfill Material: Material available onsite that Engineer determines to be suitable for a specific use.

I. Well-Graded:

1. A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes.

2. Does not define numerical value that must be placed on Coefficient of Curvature, Coefficient of Uniformity, or other specific grain size distribution parameters.

3. A material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids.
1.02 SUBMITTALS

A. Action Submittals:
   1. Shop Drawings: Manufacturer’s descriptive literature for marking tapes.

B. Informational Submittals:
   1. Catalog and manufacturer’s data sheets for compaction equipment.
   2. Certified Gradation Analysis: Submit not less than 30 days prior to delivery for imported materials or anticipated use for excavated materials, except for trench stabilization material that will be submitted prior to material delivery to Site.
   3. Controlled Low Strength Material: Certified mix design and test results. Include material types and weight per cubic yard for each component of mix, and 28-day compressive strength.

PART 2 PRODUCTS

2.01 GEOTEXTILE, IN TRENCHES

A. Pervious sheet of polyester, polypropylene, or polyethylene fabricated into a stable network of fibers that retain their relative position with respect to each other. Geotextile shall be nonwoven, composed of continuous or discontinuous (staple) fibers held together through needle-punching, spun-bonding, thermal-bonding, or resin-bonding.

B. Geotextile Edges: Selvaged or otherwise finished to prevent outer material from pulling away from geotextile.

C. Physical Properties: Conform to requirements in following Table 1:

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<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
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<tr>
<td>Nominal Weight</td>
<td>8 ounces/sq. yard</td>
<td>ASTM D5261</td>
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<tr>
<td>Water Permittivity</td>
<td>1.4 sec.(^{-1}), MinARV</td>
<td>ASTM D4491 (Falling Head)</td>
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<td>Apparent Opening Size (AOS)</td>
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<td>Grab Tensile Strength, Machine Direction</td>
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<td>CBR Puncture Strength</td>
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<td>Trapezoid Tear Strength</td>
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2.02 MARKING TAPE

A. Detectable:

1. Solid aluminum foil, visible on unprinted side, encased in protective high visibility, inert polyethylene plastic jacket.
2. Foil Thickness: Minimum 0.35 mils.
3. Laminate Thickness: Minimum 5 mils.
5. Identifying Lettering: Minimum 1-inch high, permanent black lettering imprinted continuously over entire length.
6. Joining Clips: Tin or nickel-coated furnished by tape manufacturer.
7. Manufacturers and Products:
   a. Reef Industries; Terra Tape, Sentry Line Detectable.
   b. Mutual Industries; Detectable Tape.
   c. Presco; Detectable Tape.
   d. Christy’s: Detectable Tape.

B. Color: In accordance with APWA Uniform Color Code.

<table>
<thead>
<tr>
<th>Color*</th>
<th>Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Electric power lines, cables, conduit, and lightning cables</td>
</tr>
<tr>
<td>Orange</td>
<td>Communicating alarm or signal lines, cables, or conduit</td>
</tr>
<tr>
<td>Yellow</td>
<td>Gas, oil, steam, petroleum, or gaseous materials</td>
</tr>
<tr>
<td>Green</td>
<td>Sewers and drain lines</td>
</tr>
<tr>
<td>Blue</td>
<td>Potable water</td>
</tr>
<tr>
<td>Purple</td>
<td>Reclaimed water, irrigation, and slurry lines</td>
</tr>
</tbody>
</table>

*As specified in NEMA Z535.1, Safety Color Code.
2.03 TRENCH STABILIZATION MATERIAL

A. Clean crushed rock, angular, and not from river run or bank run, reasonably well-graded from coarse to fine, free from clay balls, organic materials, or debris.

B. Maximum 15 percent passing the No. 40 sieve.

C. Maximum 5 percent by weight passing No. 200 sieve.

D. Maximum Particle Size: 3 inches.

2.04 BEDDING MATERIAL AND PIPE ZONE MATERIAL

A. Unfrozen, friable, and no clay balls, roots, or other organic material.

B. Clean or gravelly sand with less than 12 percent passing No. 200 sieve, as determined in accordance with ASTM D1140, CLSM, or gravel or crushed rock with maximum particle size, of 1-1/2 inches.

1. Contractor may use native material. Contractor shall screen, as needed, native material to meet specified requirements.

2.05 TRENCH BACKFILL

A. Excavated material, screened and suitable for use as backfill.

B. Free from roots or organic matter, refuse, boulders and cobbles that would be retained on a 4-inch sieve, or other deleterious materials.

2.06 AGGREGATE BASE

A. Crushed rock material conforming to the following gradation requirements:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percentage Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-inch</td>
<td>100</td>
</tr>
<tr>
<td>3/4-inch</td>
<td>90 – 100</td>
</tr>
<tr>
<td>No. 4</td>
<td>35 – 65</td>
</tr>
<tr>
<td>No. 16</td>
<td>15 – 40</td>
</tr>
<tr>
<td>No. 200</td>
<td>2 – 10</td>
</tr>
</tbody>
</table>
2.07 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

A. A fluid, workable mixture of aggregate, cement, admixtures, and water.

B. Select and proportion ingredients to obtain compressive strength between 50 psi and 150 psi at 28 days in accordance with ASTM D4832.

C. Materials:

1. Cement: ASTM C150/C150M, Type I or Type II.
2. Aggregate: ASTM C33/C33M, Size 8 to 9, or fine aggregate.
3. Fly Ash (Pozzolan): Class F or Class C fly ash in accordance with ASTM C618.
4. Water: Clean, potable, containing less than 500 ppm of chlorides.

2.08 SOURCE QUALITY CONTROL

A. Perform gradation analysis in accordance with ASTM C136 for:

1. Trench stabilization material.
2. Bedding and pipe zone material.

B. Certify Laboratory Performance of Mix Designs: Controlled low strength material.

PART 3 EXECUTION

3.01 TRENCH PREPARATION

A. Water Control:

1. Promptly remove and dispose of water entering trench excavations as necessary to grade trench bottom and to compact backfill and install manholes/drop inlet structures and pipe in the dry. Do not place CLSM or lay pipe in water.
2. Remove water in a manner that minimizes soil erosion from trench sides and bottom and in accordance with approved Trench Dewatering Plan and SWPPP.
3. Control water as specified in Section 31 23 16, Excavation, Article Control of Water in Excavation.
4. Provide continuous water control until trench backfill is at least 2 feet above the level of water entering the trench.

B. Remove foreign material that falls into trench.
3.02 TRENCH BOTTOM

A. Firm Dry Subgrade: Grade with hand tools, remove loose and disturbed material, and trim off high areas and ridges left by excavating bucket teeth. Allow space for bedding material if shown or specified.

B. Soft Subgrade: If subgrade is encountered that may require removal to prevent pipe settlement, notify Engineer. Engineer will determine depth of overexcavation, if any required.

C. Saturated Subgrade: Control water as specified in Section 31 23 16, Excavation.

3.03 TRENCH STABILIZATION MATERIAL INSTALLATION

A. Extend geotextile for full width of trench bottom and anchor geotextile to trench walls.

B. Rebuild trench bottom with trench stabilization material placed on geotextile.

C. Place material over full width of trench in 6-inch lifts to required grade, providing allowance for bedding thickness.

D. Compact each lift so as to provide a firm, unyielding support for the bedding material prior to placing succeeding lifts.

E. Wrap geotextile over top of trench stabilization material with minimum 24-inch overlap.

3.04 BEDDING

A. Furnish bedding material.

B. Place over full width of prepared trench bottom.

C. Hand grade and compact bedding to provide a firm, unyielding surface.

D. Minimum Thickness As follows:
   1. Pipe 18 Inches to 36 Inches: 6 inches.
   2. Pipe 42 Inches and Larger: 8 inches.

E. Check grade and correct irregularities in bedding material. Loosen top 1 inch to 2 inches of compacted bedding material with a rake or by other means to provide a cushion before laying each section of pipe, conduit, direct-buried cable, or duct bank.
3.05 BACKFILL PIPE ZONE

A. Upper limit of pipe zone shall not be less than the following:
   1. Pipe: 12 inches, unless shown otherwise.
   2. Conduit: 3 inches, unless shown otherwise.

B. Restrain pipe as necessary to prevent their movement during backfill operations.

C. Moisture condition bedding and pipe zone material to within 2 percent of optimum moisture content as determined by ASTM D1557, prior to placement in trench.

D. Place material simultaneously in lifts on both sides of pipe and, if applicable, between pipes installed in same trench.
   1. Pipe Over 10-Inch Diameter: Maximum 6-inch lifts.

E. Thoroughly tamp each lift, including area under haunches, with handheld tamping bars supplemented by “walking in” and slicing material under haunches with a shovel to ensure voids are completely filled before placing each succeeding lift.

F. Compact each lift with a minimum of three passes by a vibratory plate compactor weighing at least 200 pounds, or to a minimum relative compaction of 90 percent in accordance with ASTM D1557. Take care to not damage pipe during compaction.

G. CLSM (Alternative Bedding and Pipe Zone Material):
   1. Where CLSM is used as backfill in pipe zone, bedding is not required. Support pipe at proper grade on sandbags placed at two locations between each pipe joint. Place support pads at a distance of approximately 1/5 the length of the pipe away from each joint. Support pipe in a manner to prevent rolling.
   2. Discharge from truck mounted drum type mixer into trench.
3. Place in lifts as necessary to prevent uplift (flotation) of pipe or manhole structure.
4. Use sufficient shores or other supports to prevent soil from caving onto pipe. Remove soil fallen into trench or onto pipe before placing CLSM.
5. Pour CLSM in horizontal lifts.
6. Where installing CLSM backfill on slopes, construct bulkheads within the trench to prevent CLSM from flowing more than 50 feet laterally from the point at which it is discharged into the trench. Construct maximum 3-foot wide bulkheads using sandbags.
7. Place CLSM in uniform lifts that will not float the pipe. Place on one side until material can be seen flowing beneath the pipe and filling the other side. Continue this action until subsequent placement on the other side will result in CLSM fully supporting the bottom of the pipe. Place CLSM alternately on both sides of the pipe for the remainder of the CLSM placement.
8. No backfill, equipment, or other loads shall be placed atop CLSM until it has attained sufficient strength to withstand loading without displacement or damage.
9. Prior to placing backfill over CLSM, CLSM shall achieve an indentation diameter less than or equal to 75 mm (3 inches) as determined in accordance with ASTM D6024.

3.06 MARKING TAPE INSTALLATION

A. Continuously install marking tape along centerline of buried piping, on top of last lift of pipe zone material. Coordinate with piping installation drawings.

1. Detectable Marking Tape: Install with nonmetallic piping and waterlines.

3.07 BACKFILL ABOVE PIPE ZONE

A. General:

1. Process excavated material to meet specified gradation requirements for Trench Backfill.
2. Adjust moisture content as necessary to obtain specified compaction.
3. Do not allow backfill to free fall into trench or allow heavy, sharp pieces of material to be placed as backfill until after at least 2 feet of backfill has been provided over top of pipe.
4. Do not use power driven impact type compactors for compaction until at least 4 feet of backfill is placed over top of pipe.
5. Backfill to grade with proper allowances for topsoil and crushed rocksurfacing thicknesses, wherever applicable.
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INCLINE CREEK CMP CULVERT REHABILITATION FINAL DESIGN PROJECT

6. Backfill around structures with same class backfill as specified for adjacent trench, unless otherwise shown or specified.
7. Place in lifts not exceeding thickness of 9 inches.
8. Mechanically compact each lift to a minimum of 90 percent relative compaction prior to placing succeeding lifts.

3.08 QUALITY CONTROL

A. The Contractor shall retain, at his own expense, the services of an approved, independent materials testing firm to perform the following tests:

1. Moisture-Density Relations: The pipe bedding, pipe zone material, and trench backfill materials shall be tested for moisture density relations per ASTM D1557. A minimum of one test shall be performed for each material type, or when it is suspected that the material has changed.
2. Density Tests: The pipe zone and trench backfill materials shall be tested for density per ASTM D6938. A minimum of one density test per lift per 100 lineal feet of trench shall be performed for each material.

B. If any density test fails to meet the specified compaction requirements, the area shall be recompacted and an additional three density tests shall be performed, including tests approximately 50 feet upstream and downstream of the failed location.

3.09 MAINTENANCE OF TRENCH BACKFILL

A. After each section of trench is backfilled, maintain surface of backfilled trench even with adjacent ground surface until final surface restoration is completed.

B. Gravel Surfacing Rock: Add gravel surfacing rock where applicable and as necessary to keep surface of backfilled trench even with adjacent ground surface, and grade and compact as necessary to keep surface of backfilled trenches smooth, free from ruts and potholes, and suitable for normal traffic flow.

C. Other Areas: Add excavated material where applicable and keep surface of backfilled trench level with adjacent ground surface.

3.10 SETTLEMENT OF BACKFILL

A. Settlement of trench backfill, or of fill, or facilities constructed over trench backfill will be considered a result of defective compaction of trench backfill.

END OF SECTION
SECTION 33 01 30.16
TELEVISION INSPECTION OF SEWER PIPELINES

PART 1    GENERAL

1.01    REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. National Association of Sewer Service Companies (NASSCO): Pipeline Assessment Certification Program (PACP).
2. Occupational Safety and Health Act (OSHA).

1.02    SUBMITTALS

A. Action Submittals:

1. Catalog and manufacturer’s data sheets for television equipment.
2. Acceptance Standard closed-circuit television (CCTV) video; two copies.

B. Informational Submittals:

1. References: Contact names and telephone numbers.
2. List of staff and equipment to be used on Project.
3. Crew chief qualifications.
4. Crew chief contact information: name, mobile telephone number.
5. Certification that staff to be used for the Work is properly trained in confined space entry and hazardous atmospheres.
6. Training and inspection plan, 7 days prior to manual inspection.
7. Traffic control plan.
8. Confined space entry procedures.
10. Schedule: 7-day look-ahead; weekly.
11. CCTV Inspection:
   a. Initial first day’s CCTV inspection external hard drives (HD) within 24 hours after first day’s work is completed.
   b. Subsequent work products/documentation must be submitted and reviewed prior to rehabilitation work.
   c. Include the following with each inspection submitted:
      1) Inspection media.
      2) Inspection database.
      3) Inspection reports.
12. Log of cable footage counter calibration checks.
13. Listing of actual measured flow depth and times.

1.03 QUALITY ASSURANCE

A. Qualifications:

1. Contractor: Performed work successfully for at least three other projects, within last 5 years, with pipe lengths and pipe diameters similar to this Project.
2. Crew Chief: Minimum of 5 years’ experience on projects similar to this Project and experienced using proposed equipment for this Project. If experience level cannot be met because of new equipment or technology proposed for Project, submit training and experience information for Owner’s consideration.
3. CCTV Operator: Minimum of 5 years’ experience on projects similar to this Project and experienced using proposed equipment for this Project. If experience level cannot be met because of new equipment or technology proposed for Project, submit training and experience information for Owner’s consideration.

B. Prestartup Meeting: At least 5 days prior to beginning CCTV inspection work, schedule with Owner and Engineer to review proposed temporary sewer flow diversion plan, traffic control plans, cleaning and inspection methods.

C. Acceptance Standard CCTV Video:

1. HD format showing example quality of work that Contractor proposes for Project.
2. Submittal shall also include examples that demonstrate camera advancement speeds, picture clarity, environment condition, lighting, panning as well as focus on defects, title frame, and screen labels for images, and sample stills.
3. Examples shall include a minimum of four manhole to manhole segments and combinations of sizes with a least one 72-inch diameter or greater.
4. Picture quality and definition shall be to satisfaction of Engineer.
PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Complete closed-circuit television (CCTV) inspection for pipe segments as indicated on Drawings.
   1. Label assets and structures in their inspection records using same identification nomenclature as Drawings.
   2. If pipe or structure is not shown or listed, identify by downstream structure with letter designation added starting with “A” for each unidentified structure on each pipe segment. Subsequent upstream structures will be identified by adding “B”, “C”, and so on; include revisions on corrected field map.

B. Complete applicable Work specified in Section 33 01 33, Pipeline Cleaning, prior to starting CCTV inspection work.


D. Record GPS latitude and longitude (decimal degrees) coordinates using portable global positioning system (GPS) device in field for manholes and pipeline access locations used during inspection; include them in inspection information in database and summary report.

E. Contractor’s Project Manager and Crew Chief shall attended regular progress meetings as scheduled by Owner.

F. Look-Ahead Schedule: Prepare and submit at least 7 days in advance, identifying areas to be investigated during coming week. Schedules shall include structure numbers, street locations, and dates.

G. Traffic Control:
   1. Conform to requirements of Section 01 50 00, Temporary Facilities and Controls
   2. Notify Owner and Engineer at least 7 days in advance of Work starting, of areas where Work will be conducted, and submit traffic control plan
H. Inspection Equipment:

1. Inspection equipment that fails to produce satisfactory inspection quality shall be removed from the Work.

2. Monitoring Studio:
   a. Equipped with independent power source.
   b. Equipped with lights.
   c. Temperature controlled.
   d. Size: Sufficient to allow seating for a minimum of two people in addition to operating technician.
   e. Television Monitor:
      1) Locate in monitoring studio.
      2) Capable of producing high quality color picture.
      3) Resolution: No less than 500 lines.
      4) Continuous display during survey.

3. Transport Platform:
   a. Self-propelled, mounted on skid, or mounted on float.
   b. Sized for each pipe diameter in accordance with manufacturer’s recommendations.
   c. Cables: 1,000 feet long, minimum.
   d. Equipped with tag line suitable for pulling camera backwards.
   e. Equipped with winch, power winch, TV cable, powered rewind, or other devices used to move camera through pipe.
      1) When powered and controlled winches are used to pull television camera through line, provide telephones, radios, or other means of communication between the two manholes to ensure communications exist between crewmembers.
   f. Remote Reading Footage Counter:
      1) Accuracy: Plus or minus 2 percent on a manhole by manhole basis.
      2) Counter display located in monitoring studio.
      3) Marking on cable will not be allowed.
      4) Calibration: Perform each day prior to setup.
   g. Secure cable, chains, and other devices used with camera so as not to obstruct camera view or otherwise interfere with proper documentation of sewer conditions.

4. Television Camera:
   a. Closed-circuit color television camera(s).
   b. Sufficient for 36-inch through 72-inch diameters and in accordance with manufacturer’s recommendations.
   c. Mounted on transport platform.
   d. Operative in 100 percent humidity conditions without lens fogging.
e. Operative in hazardous and corrosive environment and specifically designed for pipeline inspection.

f. Camera Lighting:
   1) Mounted on and turned in direction of camera head.
   2) Light Sensitivity: Greater than 1.5 lux minimum.
   3) Minimize reflective glare.
   4) Remote variable intensity control.
   5) Provide clear, in-focus picture of entire inside periphery of pipe.
   6) Ability to achieve proper balance of tint and brightness.

g. Resolution:
   1) Horizontal Resolution: 460 lines minimum.
   2) Vertical Resolution: 400 lines minimum.
   3) Meet or exceed monitor resolution.

h. Rotation: 360 degrees.

i. Pan and Tilt: 270 degrees, with adjustable supports designed for operation in connection with pipe inspection.


k. Focus and Iris Controls:
   1) Automatic or remote.
   2) Remote control adjustment for focus and iris shall be located in monitoring studio.

l. Focal Distance: Adjustable through range from 6 inches to infinity.

m. Zoom: Capable of 40:1 (10x optical, 4 times digital).

I. Inspection Software:
   1. Inspection equipment shall utilize software capable of providing complete survey reports, inspection database, and linked media files.
   2. Coding system shall be certified by NASSCO in accordance with their Pipeline Assessment and Certification Program (PACP).

3.02 INSPECTION

A. Video Recording:
   1. CCTV inspection is represented by one manhole-to-manhole pipe segment or other access-to-access point; not multiple manhole-to-manhole segments.
   2. Prior to beginning CCTV inspection, complete initial screen text step and position camera at center of manhole and with axis at centerline of pipe.
3. Before camera enters pipe, inspection shall provide internal video of manhole. Video recording shall begin by facing pipe segment to be televised and then pan/tilt/zoom as necessary to point camera up towards manhole opening.
4. Show continuous footage reading on inspection image. Place on screen where it is clearly visible (if black font, do not place on dark background, if white font, do not place on light background).
5. Viewing shall be in direction of flow, except while camera is being used in a reverse setup. Inspection shall proceed from upstream to downstream, unless prohibited by obstruction.
6. If during inspection operation television camera will not pass through entire line segment due to obstruction, set up equipment so inspection can be performed from opposite manhole.
7. If upstream( reverse) setup, is required, establish new inspection run separate from downstream (normal) setup.
8. Keep camera lens clean and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.
9. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags or vertical misalignments. If flow exceeds 25 percent of diameter, such that camera lens becomes obscured, stop inspection until flow subsides. If necessary, reschedule CCTV operation. Surcharging and flooding of camera lens is not an excusable condition if it has been artificially created upstream (for example, placement of flow plugs or freshwater flushing in pipe).
10. Record inside of each lateral and connection of lateral to pipeline.
11. Recordings shall clearly show defects and observations, and their severity, in addition to obvious features (such as, laterals and joints).
12. Immediately report to Engineer obstructions that restrict flow and cause inspection to be interrupted. Document condition with still photographs, and begin inspections of other pipelines.
13. Camera Operation:
   a. Speed: 30 feet per minute, maximum, during inspection.
   b. Stop, for a minimum of 5 seconds, at every lateral, or other defect or adversity.
   c. Pan entire diameter or area of pipe at each defect and lateral connection.
   d. Readjust lens, lighting, and focus in order to ensure clear, distinct, and properly lighted image of defect.
14. Loss of color or severe red or green color will be cause for rejection of inspection.
15. Recordings shall be without distortion or outside interference.
16. Televise line segments from structure-to-structure on same HD in continuous run.
   a. Video shall clearly show camera starting and ending at structure, unless defects do not allow it.
   b. Do not perform partial televising on one HD and then complete run on another HD.
   c. If line is partially televised, as a result of an excusable condition, (for example, collapsed line), televised length shall be viewed by Engineer for acceptability.
   d. If portion of line is unacceptable, entire segment shall be deemed unacceptable and shall be retelevised.

17. Engineer may accept physical inspection that does not adhere to minimum standards if adverse conditions are encountered and reinspection is not advised. In such a case, enough data shall be provided to permit accurate assessment.

B. Measurement:
   1. Record in English units.
   2. Obtain pipe diameter by physical measurement in upstream and downstream access structure.
   3. Verify pipe material (such as, RCP, VCP, CMP) and surface lengths between manholes.
   4. Use calipers or measuring rod to determine diameter of inlet and outlet pipe.
   5. Footage measurements shall begin at centerline of upstream manhole, unless Engineer approves otherwise.
   6. Continuous Footage Readings:
      a. Use to identify location of defects.
      b. Accurate to within plus or minus 2 percent on a manhole by manhole basis tolerance.
      c. Defect identifications are to be called out and recorded to nearest 0.10 foot.
      d. Line segment recording will be unacceptable if continuous footage meter is inaccurate, or identified defects or features leave doubt as to accuracy of locations or total length.
   7. Measurement shall be zeroed after each segment inspected.
   8. Check accuracy of measurement meters daily by use of walking meter, roll-a-tape, or other suitable device.
C. Manual Inspections:

1. Perform for pipes 60 inches and larger where conditions allow inspection crew to safely walk through pipe. Provide specific reasons if manual inspections are impractical or unsafe. Use remote inspection methods for those lines.

2. Personnel shall be trained in confined space entry and hazardous atmospheres in accordance with current OSHA requirements.
   a. Provide Site-specific training for personnel working on Project prior to starting manual inspections. Provide Site-specific training for Engineer.
   b. Submit training and inspection plan at least 7 days prior to starting manual inspections.

3. Develop confined space entry procedure. Confined space entry procedure shall address hazards associated with space and control measures that shall be implemented in order to protect employees during inspection activities.

4. Transmit video signal to aboveground monitoring studio to permit Engineer to watch inspection work live on color monitor. In addition, maintain direct voice communication between Engineer, in-pipe inspection personnel, and recording technician in aboveground unit during inspection work. Video recording equipment shall be located in inspection truck.

5. Display footage readings in video either manually in frame or superimposed on recording.

6. Camcorders shall not be permitted for use as sole means of obtaining video records.

7. Use video camera to inspect connection point and immediate footage down centerline of laterals that are connected to main line being inspected. Conditions noted in laterals shall be noted on inspection log and HD.

8. Take digital color photographs as instructed by Engineer, or as deemed necessary by in-pipe technician.

3.03 RECORDING OF DOCUMENTATION

A. Upon completion of CCTV inspection, transfer inspection data to external hard drive (HD) of sufficient capacity and compatibility with Owner’s equipment; include code required for proper playback of video file.

1. Labeling:
   a. Provide printed label on outside of HD that indicates the following:
      1) Name of Owner.

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2) Project title.
3) Date of inspection.
4) Inspection company.
5) Deliverable number.
6) Range of pipe structure identification numbers included.

B. Media:

1. Video:
   a. Inspections completed, with a unique filename per inspection.
   b. Encoded in .WMV, .MPG, or .AVI format.
   c. Opening Screen: The following is an example of required on-screen text display fields:
      1) Date and Time: (YYYY/MM/DD), (military time hh:mm).
      2) Surveyor’s Name/Company: John Doe/ABC Company.
      3) Project Name: XYZ project.
      4) Location: 1 Example Street.
      5) Location Code: B – Example Highway.
      6) Upstream MH No: ### (Feature_ID or Facility_ID).
      7) Upstream MH Invert depth: ##.## (nearest tenth of a foot).
      8) Downstream MH No: ### (Feature_ID or Facility_ID).
      9) Pipe Segment Ref. ###### (Feature_IDs).
     10) Starting Footage: ### (nearest tenth of foot).
     11) Inspection Direction: Downstream or upstream.
     12) Pipe Material: Example, ductile iron.
     13) Pipe Diameter/Height/Width: Diameter: ##/Height: ##/Width: ## (as measured in field).
     15) Precleaning: Example, jetting.
     16) Additional Information: Additional important information/comments.
   d. Continuous View: Following is list of required on-screen text display fields:
      1) Inspection date and time.
      2) Continuous forward and reverse readout of cameral distance from center of manhole reference (tape counter footage).
      3) Pipe structure identification number.
      4) Defect/observation code(s) (when encountered).

2. Audio:
   a. Embedded in video file.
   b. Operator shall include description of inspection setup, including related information from log form and unusual conditions.
   c. Operation changes (for example, remove roots and restart inspection at footage prior to root removal).
d. Verbal description and location of each defect.
e. Verbal description and location of each service connection.

3. Still Photographs:
   a. Provide digital photographs showing inspection image whenever observation or defect is recorded.
   b. Each with unique filename.
   c. Encoded in .JPEG format.
   d. Minimum 640 by 480 resolution.
   e. Provide label on front of photograph with structure identification number, footage (if not visible on photograph), and defect code.

C. Database:
   1. Include all inspections. Creating a database per inspection is not acceptable.
   2. Provide database of collected data including:
      a. Asset information.
      b. Inspection information, where each inspection includes no more than one manhole-to-manhole segment.
      c. Defect codes and scores.
      d. Start and stop footages for continuous defects.
   3. File Type: MSAccess, .MDB, .ACCDB.
   4. Database Format: NASSCO PACP data shall be exported into standard PACP Exchange database
   5. List inspection media names in corresponding asset/inspection/defect information field within database.

D. Inspection Reports:
   1. Provide PDF inspection reports including:
      a. Summary of inspections completed.
      b. Pipe graphs of each inspection showing asset information and defects/observations.
   2. Field Maps:
      a. Corrected to reflect actual field conditions.
      b. Illustrate changes in pipe routing that differ from anticipated network. Are not necessary for pipe segments whose routing is as indicated on Drawing.
      c. Neatly strike out wrong data using green pencil and clearly mark in correct data, using red pencil. Show notes that clarify changes in blue pencil.
3.04 FIELD QUALITY CONTROL

A. Review videos and reports to resolve inconsistent and conflicting data and to improve accuracy of data prior to submittal.

B. If minimum level of accuracy is not met between videos and reports after review by Engineer, perform reinspection of pipes that do not meet requirements.

END OF SECTION
SECTION 33 01 30.72
SLIPLINING

PART 1  GENERAL

1.01  SCOPE OF WORK

A. This section presents requirements for installing steel liner pipe in an existing conduit by use of a pipe jacking frame, pipe ram, or other approved liner advancing machine method.

B. The steel liner pipe shall conform to Section 33 05 01.01, Welded Steel Pipe and Fittings, and be fabricated, furnished, and installed with all end connections, back-up bars, butt straps, make-up sections required, and other special items as required to complete the installation of the steel liner as shown on Drawings and as specified herein.

C. The Contractor shall determine the means, methods and equipment, as necessary, to achieve the final installation and product shown and specified.

1.02  REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. ASTM International (ASTM):
2. Occupational Safety and Health Administration (OSHA).

1.03  SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Product data for slipliner pipe, fittings, and other specified materials.
   b. Calculations showing anticipated loading, jacking forces, ramming forces, or pulling forces, are within strength and deformation limits, capabilities of proposed pipe, it’s joints, any attachments, and equipment.
   c. Maximum joint deflection and bending radius.
   d. Drawings of specific connection details.
B. Informational Submittals:

1. Qualifications: Reference list of completed projects with name, date, and location of each project, name and contact information of owner, and a brief description of work performed.

2. Installation Access Plan:
   a. Proposed installation pit locations.
   b. Site plan sketch showing:
      1) Dimensions of installation pits.
      2) Pipe storage areas.
      3) Temporary work areas.
      4) Lay down area for pipe joining process.
      5) Equipment/material ingress and egress from installation pit or receiving location.
   c. Method of installing sliplined pipe and continuously monitoring of pulling or jacking forces and any lubrication used.
   d. Project schedule with an approximate installation rate in feet per day.
   e. Annular Space Grout, in accordance with Section 33 05 23.50, Annular Space Grout.
   f. Provisions for removing obstructions and debris within the host pipe.

3. Manufacturer’s Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements.

4. Pipe cleaning and waste disposal plan, in accordance with Section 33 01 33, Pipeline Cleaning.

5. Record of forces used to push, pull, and join sliplined pipe during installation, in tabularized electronic format and hardcopy.

6. Manufacturer’s Certificate of Proper Installation, in accordance with Section 01 43 33, Manufacturers’ Field Services.

7. Preinstallation internal CCTV inspection and data documentation, in accordance with Section 33 01 30.16, Television Inspection of Pipelines.

8. Post-installation internal CCTV inspection and data documentation, in accordance with Section 33 01 30.16, Television Inspection of Pipelines.

9. Proof of proper disposal of material cleaned from host pipe, in accordance with Section 33 01 33, Pipeline Cleaning.

10. Certifications, experience and training record of persons to be welding pipe ends, in accordance with Section 33 05 01.01, Welded Steel Pipe and Fittings.

11. Records for each welded joint, in accordance with Section 33 05 01.01, Welded Steel Pipe and Fittings.

12. Post-installation deformation measurements.
13. Certification verifying grout has filled annular space.
17. Trench Dewatering Plan.

1.04 QUALITY ASSURANCE

A. Qualifications:

1. Within the last 5 years, the installation company shall have completed:
   a. Three steel pipe projects of 48-inch diameter or larger.
   b. At least one project using pipe ramming, 42-inch diameter or larger.
   c. At least one project using sliplining or pipe jacking, 42-inch diameter or larger.
   d. At least one project using hand-mining, or man-entry underground work at the leading edge of the tunnel face (e.g. clearing, repairs, shoring, etc.).
   e. At least one project with a sliplining, jacking, or ramming drive of 200 linear feet or longer, with pipe 42-inch diameter of larger.

2. Personal experience of the Contractor’s person in charge onsite (construction manager, superintendent, foreman, etc.), with other construction companies may be substituted in lieu of current company experience as approved by Engineer and Owner.

3. Personnel Performing Welding Activities: In accordance with Section 33 05 01.01, Welded Steel Pipe and Fittings.

4. The Contractor’s person in charge onsite shall be present at all times during the preparation, installation, and testing of the slipliner.

1.05 SAFETY

A. Worker safety is the responsibility of the Contractor.

B. Conduct operations in accordance with OSHA Standards; pay particular attention to safety requirements involving entry into a confined space.

C. Where the work involves entry into a confined space, it shall be performed such a manner as to protect the workers at all times through the use of (but not limited to) pole-mounted tools to remove obstructions in the host pipe from within the relative safety of the slipliner pipe, robotic equipment, or other tactics.
1.06 DELIVERY, STORAGE, AND, HANDLING

A. Shipping:
   1. Do not cut, kink, or otherwise damage pipe during transportation or during loading and unloading.
   2. Provide internal pipe bracing as required to prevent deformation and excessive ovality.

B. Storage:
   1. Limit stacking of pipe to a height that will not cause excessive deformation of bottom layers of pipes under anticipated temperature conditions.
   2. Where necessary because of ground conditions, store pipe on wooden sleepers, spaced suitably and of such widths as not to allow deformation of pipe at point of contact with sleeper or between supports.
   3. Store pipe lengths in location and manner as to eliminate possibility of scoring, gouging, or otherwise damaging pipe.

1.07 SPECIAL GUARANTEE

A. Material Warranty: A written guarantee of 1 year shall be provided by manufacturer against breakdown of material effectiveness of structural repair elements.

B. Workmanship Warranty: A written guarantee of 1 year minimum shall be provided by Contractor against defects of workmanship.

C. Where defects or unsatisfactory conditions are observed after the post installation CCTV inspection, additional special warranty terms may be negotiated to monitor the performance of the slipliner.

D. Warranty Inspection: A warranty inspection shall be conducted in the 11th month following final acceptance of the Work. Contractor and liner manufacturer representative shall participate in inspection. Deficiencies related to material and workmanship shall be repaired by Contractor to satisfaction of Owner at no cost to the Owner. Inspection shall be conducted by Owner or designated representative of Owner.
PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. Pipe material used for sliplining shall be welded steel pipe in accordance with Section 33 05 01.01, Welded Steel Pipe and Fittings.

2.02 SLIPLINER PIPE GUIDE

A. Outside Host Pipe: Steel rails integrated with the jacking or ramming frames.
B. Inside Host Pipe: Wood skids or abrasion resistant polymers with low coefficient of friction.

2.03 PIPE RAMMING LUBRICANT

A. Compatible with the annular space grout, and its ability to pacify the underlying steel for the long-term, as certified by the lubricant manufacturer.

2.04 SADDLES AND OTHER FITTINGS

A. Saddles and other fittings shall be as recommended by pipe manufacturer.

2.05 ANNULAR SPACE GROUT

A. In accordance with Section 33 05 23.50, Annular Space Grout.

2.06 TRENCH BACKFILL OF INSERTION PITS

A. In accordance with Section 31 23 23.15, Trench Backfill.

PART 3 EXECUTION

3.01 GENERAL

A. Temporary Flow Bypass and Diversion Pumping: In accordance with approved submittals.
B. Overflows or Spills: Schedule and perform the Work in a manner that does not cause or contribute to incidence of overflows or spills.
C. Traffic Control: As specified in Section 01 50 00, Temporary Facilities and Controls.
D. Erosion and Sediment Control: As specified in Section 01 57 13, Temporary Erosion and Sediment Control, and in accordance with approved submittals.
E. Excavation Activities: As specified in Section 31 23 16, Excavation.

F. Insertion Pit and Other Excavation Dewatering: In accordance with approved submittals.

G. Provide water for cleaning, installation, and other process related work items requiring water as specified in Section 01 50 00, Temporary Facilities and Controls.

3.02 PREPARATION

A. Locate and mark existing utilities in areas where excavation is to be performed prior to beginning excavation.

B. Locate and designate insertion pits taking into consideration conditions of existing pipe, directional changes, surface conditions, existing utilities, maintenance of traffic, pipe lay down areas, and pulling or pushing distances.

3.03 PRELINING CLEANING, INSPECTION, AND TESTING

A. Prelining Cleaning:

1. Wash, clean, and CCTV existing pipe prior to sliplining as described in Section 30 01 33, Pipeline Cleaning, and Section 33 01 30.16, Television Inspection of Pipelines.

2. At a minimum, remove debris and settled material in existing pipe such that solids and debris have been removed from the pipe following cleaning operations.

B. Test material cleaned from existing pipe to determine if it is hazardous waste as defined by federal, state, and local jurisdictions.

C. Dispose of material removed from pipe in accordance with federal, state, and local regulations. Provide documentation of proper disposal in accordance with Article Submittals.

D. Notify Engineer when host pipe has been cleaned.

3.04 INVERT REPAIR

A. Prior to sliplining, repair the invert as indicated on Drawings.

B. The invert shall be fully repaired and capable of withstanding the slipliner pipe weight and installation forces prior to sliplining.
C. Where needed, rails, skids, or other guides shall be installed on the invert to facilitate the sliplining installation.

3.05 LINE OBSTRUCTIONS

A. Prior to sliplining, Clear line of obstructions that will prevent insertion of slipliner pipe.

B. Prior to sliplining, perform point repairs on collapsed pipe sections as indicated on Drawings.

C. After obstruction removal, demonstrate by survey that sufficient clearance for the slipliner pipe to pass the obstruction area has been created. Account for survey and installation tolerances when determining the available clearance.

3.06 SLIPLINER INSTALLATION

A. General:

1. Install slipliner pipe in accordance with manufacturer’s recommendations.
2. Handle pipe with textile slings. Chains or cable are not allowed.
3. Assemble and join sections of pipe together above ground prior to insertion of pipe.
4. If liner is to be dragged when inserted, furnish sleds, rollers or other similar devices to protect pipe wall from damage as a result of cuts, gouges, or scrapes.
5. If sections of inserted pipe are damaged, or deformed more than 3.75 percent (percent of inner diameter reduction) during installation, stop the insertion and notify the Engineer and Owner.

B. Joints:

1. Perform welding in accordance with manufacturer’s recommendations and with with Section 33 05 01.01, Welded Steel Pipe and Fittings.
2. Joints between pipe sections shall be smooth on the inside and internal projection beads shall not be greater than 3/16 inch.
3. Completed joints shall be watertight at rated pressure for pipe and have strength characteristics equal to or greater than pipe itself.
4. Improperly made or damaged joints shall be repaired or replaced as approved by Engineer.
5. Upon request, provide Engineer samples of welded joints for testing.
C. Liner Insertion: Push or pull method, or combination thereof, in accordance with slipliner manufacturer’s recommendations.

1. Slipliner pipe shall be equipped with any fittings necessary at the leading edge, including but not limited to conical reducer heads (aka “bullet nose fittings”), in order to facilitate the slipliner pipe riding atop the corrugations of the host pipe, and avoid imparting direct axial pressure on the host pipe.

2. Length of liner pipe to be inserted at any one time shall be governed by jacking equipment capacity, and consideration of size and condition of host pipe.

3. Scoring Protection: As liner is inserted provide protection to prevent scoring of liner by existing pipe.

4. Welded Joints: Do not pull until set time recommended by manufacturer has elapsed.

5. Do not exceed forces recommended by manufacturer while pushing, pulling, or joining pipe.


7. Slipliner Length and Pulling Speed: In accordance with slipliner manufacturer’s recommendations.

8. Monitor and record pushing or pulling forces during installation.

D. Pipe Ramming:

1. In the event that conventional jacking, pushing, or pulling equipment ceases to advance the liner in locations where the conical reduce head has encountered a deformed portion of the culvert, or friction forces along the slipliner pipe wall exceed the equipment capacity, then pipe ramming may be used to attempt to force the conical reducer head forward and to overcome the friction forces acting upon the slipliner.

2. Lubrication to reduce friction may be used as long as the lubricant does not interfere with the annular space grouting operation or prevent the grout from pacifying the underlying steel upon completion.

3. This method shall be performed in a manner that will minimize the movement of the ground in front of, above, and surrounding the operation; and will minimize subsidence of the surface above and in the vicinity of the ramming. The ground shall be supported in a manner to prevent loss of ground and keep the perimeter and face of the slipliner opening stable at all times, including shutdown periods.

4. Potential settlement shall be monitored at each edge of right of way, each shoulder point, each edge of pavement, the edge of each lane, and otherwise at 50-foot intervals along the pipe centerline.
5. A survey shall be performed 1 day prior to initiating this operation at each required monitoring location. A similar survey shall then be performed at each location, on a daily basis, until the permitted activity has received a final inspection. This survey establishes the preexisting and post construction conditions, and the amount of settlement. All survey readings shall be recorded to the nearest 0.25 inch. Digital photographs of the pavement conditions shall also be taken prior and after the pipe installation.

6. All operations shall stop immediately whenever monitored points indicate a vertical change in elevation of 0.5 inches or more, or any surface disruption is observed. The Contractor shall then immediately report the amount of settlement to the Owner's Engineer/Inspector.

7. Monitor and record the advance rate, and slipliner pipe condition continuously during installation. All operations should stop immediately if the slipliner pipe begins to deform more than 3.75 percent (percent of inner diameter reduction), or if the host culvert pipe begins to move and eject from the opposite end. In such cases, notify the Engineer and Owner immediately.

8. If the pipe ramming operation is unable to advance the slipliner pipe, man-entry point repairs may be performed to remove the obstruction prior to reinitiating the ramming operation. Man-entry point repairs shall be constructed by methods proposed by the Contractor and approved by the Engineer and Owner.

E. Tolerances:

1. Pipe bending radius shall not be less than 125 percent of manufacturer’s recommended minimum.

2. Vertical cross section deflection (flattening) of sliplined pipe shall not exceed 5 percent.

3.07 ABANDONED MANHOLE CONNECTIONS

A. Where indicated on Drawings, select manholes may be abandoned in place upon completion of the sliplining operation.

B. The complete annular space at the manhole connection shall be grouted to the crown of the host pipe in accordance with Section 33 05 23.50, Annular Space Grout.

C. The vertical riser of each abandoned manhole shall be grouted with either controlled low strength material or cellular concrete.
3.08 ANNULAR SPACE GROUTING
A. In accordance with Section 33 05 23.50, Annular Space Grout.

3.09 CONTACT GROUTING
A. After annular space grouting, but prior to cement mortar lining, perform contact grouting to fill voids and stabilize the surrounding soil at the locations shown on Drawings.
B. Perform contact grouting in accordance with Section 03 64 00, Contact Grouting.

3.10 CEMENT MORTAR LINING
A. After contact grouting, perform in-situ cement mortar lining on the slipliner pipe.
B. Perform cement mortar lining in accordance with Section 33 01 30.78, Cement-Mortar Lining of Pipelines in Place.

3.11 BACKFILL AT EXPOSED PORTIONS OF SLIPLINED PIPE
A. Preparation: At points where host pipe has been removed and slipliner pipe is exposed, remove debris and create a void around slipliner pipe in preparation for imported pipe zone material.
B. Imported Pipe Zone Material: Place and compact imported pipe zone material in accordance with Section 31 23 23.15, Trench Backfill.

3.12 MANHOLE CONNECTIONS AND ACCESS
A. In locations where insertion pit is excavated at an existing manhole, replace with new manhole conforming to these Contract Documents.
B. After sliplining is complete, re-establish connections at manholes with watertight seal. When complete, slipliner shall extend from manhole to manhole as indicated on Drawings.
C. Repair and grout invert of manhole to provide a smooth transition between inlet and outlet and to prevent ponding, unless otherwise indicated on Drawings. At manholes where slipliner size changes or where lateral connections enter, mate and cut liner in such a manner as to provide a smooth transition.
3.13 FIELD QUALITY CONTROL

A. Deformation Testing:

1. Verify pipe is not excessively out-of-round by collecting internal dimension measurements through inserted slipliner.
2. Collect deformation measurements at 20-foot intervals. Measurements shall include four internal dimensions measured from the crown to invert, across the springline, and from the 10:30 to 4:30 clock positions, and 1:30 to 7:30 clock positions.
3. Measurements shall be summarized in tabular form, listed by station, and submitted to the Engineer and Owner.

B. CCTV Video Inspection: Perform on inserted slipliner in accordance with requirements of Section 33 01 30.16, Television Inspection of Sewer Pipelines.

3.14 MANUFACTURER’S SERVICES

A. Provide pipe manufacturer’s representative at Site in accordance with Section 01 43 33, Manufacturers’ Field Services, for installation assistance during pipe insertion and joining operations.

B. Provide a Certificate of Proper Installation in accordance with Section 01 43 33, Manufacturers’ Field Services.

3.15 WARRANTY INSPECTION

A. Conduct according to the schedule requirements in Part 1 General.

B. Perform television survey in accordance with Section 33 01 30.16, Television Inspection of Pipelines.

C. Conduct finished inspections continuous over entire length of pipeline between manholes.

END OF SECTION
SECTION 30 01 30.78
CEMENT-MORTAR LINING OF PIPELINES IN PLACE

PART 1  GENERAL

1.01  SCOPE OF WORK

A. This section includes materials, placement, and testing of cement-mortar lining within new pipes in place in accordance with AWWA C602, except as modified herein.

B. Cement-mortar lining shall be performed after the sliplining installation, annular space grouting, and contact grouting has been completed.

1.02  REFERENCES SPECIFICATIONS, CODES, AND STANDARDS

A. American Water Works Association (AWWA):

1. C602, Cement Mortar Lining of Water Pipelines in Place – 4 inch and Larger.

1.03  SUBMITTALS

A. Action Submittals:

1. Cement-mortar mix design including admixtures and pozzolanic materials.
2. Mortar strength testing results.
3. Written procedures for pipe surface preparations.
4. Shop Drawings in accordance with Section 01 33 00, Submittal Procedures.
5. Methods of protecting mortar lining from precipitation, and freezing temperatures during mixing, pumping, placing, and curing.
6. Lining application and curing method.

B. Informational Submittals:

1. Qualifications: Include description of lining equipment and personnel to be used on the Project.
2. Provide certificate that cement complies with ASTM C150 and these Specifications.
4. Submit affidavit of compliance with AWWA C602 and this Specification.
5. Field Quality Control Submittals.
6. Inspection Submittals.
7. Testing Submittals.
8. Special Guarantee and Warranties.

1.04 QUALITY ASSURANCE

A. Qualifications:
   1. Installation Company:
      a. Minimum of 5 years’ experience in field application of cement-mortar lining.
      b. Completed a minimum of three cement-mortar lining projects on pipe 54-inch diameter or larger in the last 5 years.
      c. Experience shall include installation of a minimum of 50,000 linear feet of cement-mortar lining.
      d. Personal Experience of the Contractor’s person in charge onsite (construction manager, superintendent, foreman, etc.), with other construction companies may be substituted in lieu of current company experience as approved by Engineer and Owner.
   2. The Contractor’s person in charge onsite shall be present at all times during the preparation, installation, and testing of the cement-mortar lining.

B. Mortar Strength Testing: Test cement-mortar lining compressive strength for compliance with strength requirements in accordance with AWWA C205.

1.05 SPECIAL GUARANTEE

A. Material Warranty: A written guarantee of 1 year shall be provided by manufacturer against breakdown of material effectiveness of structural repair elements.

B. Workmanship Warranty: A written guarantee of 1 year minimum shall be provided by Contractor against defects of workmanship.

C. Where defects or unsatisfactory conditions are observed after the post installation CCTV inspection, additional special warranty terms may be negotiated to monitor the performance of the cement-mortar lining.
D. Warranty Inspection: A warranty inspection shall be conducted in the 11th month following final acceptance of the Work. Contractor and liner manufacturer representative shall participate in inspection. Deficiencies related to material and workmanship shall be repaired by Contractor to satisfaction of Owner at no cost to the Owner. Inspection shall be conducted by Owner or designated representative of Owner.

PART 2 MATERIALS

2.01 CEMENT

A. Use portland cement, Type II, low alkali, conforming to ASTM C150.

B. Use natural cement conforming to ASTM C10, Type N.

2.02 POZZOLANIC MATERIALS

A. Pozzolanic material shall conform to the requirements of ASTM C618, Class N, with the following exceptions:

1. Sulfur trioxide (SO3), maximum 4 percent.
2. Pozzolanic activity index:
   a. With portland cement, at 28 days, minimum 85 percent of control.
   b. With lime, at 7 days, minimum, 950 psi.
   c. Water requirement, maximum, 110 percentage of control.
3. Reactivity with cement alkalies: Reduction of mortar expansion at 14 days, minimum 85 percent.

2.03 SAND

A. Sand shall consist of inert granular material having uncoated grains produced from hard crystalline rock. Deleterious amounts of dust, clay lumps, shale, soft or flaky particles, mica, loam, oil, alkali, and other foreign materials shall not exceed the following limits:

<table>
<thead>
<tr>
<th>Substances</th>
<th>% By Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shale</td>
<td>1</td>
</tr>
<tr>
<td>Clay lumps</td>
<td>1</td>
</tr>
<tr>
<td>Mica and other deleterious substances</td>
<td>2</td>
</tr>
<tr>
<td>Sum of all deleterious substances</td>
<td>3</td>
</tr>
</tbody>
</table>

1. The color of the supernatant liquid shall not be darker than the standard specified therein when tested in accordance with the methods in ASTM C40.
B. The grading of the sand shall be within the following limits:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. 16</td>
<td>100</td>
</tr>
<tr>
<td>No. 20</td>
<td>95 to 100</td>
</tr>
<tr>
<td>No. 30</td>
<td>70 to 90</td>
</tr>
<tr>
<td>No. 50</td>
<td>15 to 60</td>
</tr>
<tr>
<td>No. 100</td>
<td>1.5 to 5</td>
</tr>
<tr>
<td>No. 200</td>
<td>1 to 3</td>
</tr>
<tr>
<td>No. 400</td>
<td>0</td>
</tr>
</tbody>
</table>

C. Allow washed or saturated sand to drain at least 24 hours to a uniform moisture content before batching. Moisten dry sand before handling to prevent segregation.

D. Processing shall include sorting, crushing, screening, blending, washing, separating out, and wasting part of the natural materials, and other operations to make the available material conform to the requirements. In case the finer particles from the crushed coarse aggregate are mixed with sand from natural deposits, uniformly blend the two products before washing or screening to ensure a combined product of constant composition.

E. Sand as prepared for use shall be of such quality that mortar cylinders made with a mixture of cement and the sand under test shall develop compressive strengths at 7 and 28 days of not less than 90 percent of those developed by a mortar prepared in the same manner with the same cement and graded Ottawa testing sand, all in accordance with the method prescribed by ASTM C87.

2.04 WATER

A. The water shall be clean and free from organic matter, alkali, salts, and other impurities which might reduce the strength, durability, or other quality of the mortar.

PART 3 EXECUTION

3.01 COLD WEATHER MIXING, PLACING AND CURING OF MORTAR

A. Submit a cold weather mixing, placing and curing plan. Obtain Construction Manager favorable review of plan before proceeding with any field mortar lining of pipelines. The plan shall address as a minimum:

1. Protection of sand, cement, and other supplies from precipitation, blowing snow, and freezing. Plan shall identify how aggregate, water,
and other mix components shall be maintained heated to minimum temperature of 45 degrees F. Perform all work while maintaining materials above this temperature. Work done outside this temperature limit is subject to rejection, removal and replacement.

2. Protection of mixing and pumping operations and equipment from precipitation and freezing and from temperatures below 45 degrees F. Depending on the time of year mortar lining is proposed, the Construction Manager may require a heated and partially enclosed tent (or other shelter) for all materials stored onsite and for mortar mixing and pumping operations.

3. Heating pipe interior, and protection and curing of placed lining from freezing and from temperatures below 45 degrees F.

4. Allowing sufficient temperature and cure time for completed lining before hydrotesting pipeline.

5. Protect the lining in segments of pipe that have already been lined from drying out or cracking. Do not heat these sections of pipe unless authorized by the Construction Manager.

6. External Heating Units:
   a. Vent heating units to atmosphere and do not locally heat or dry mortar lining. If drying begins to occur, wet linings and maintain them in a wet or moist condition.
   b. Do not exhaust heater flue gases, (causes concrete carbonation due to concentrated carbon dioxide,) directly into enclosed area.

3.02 CEMENT-MORTAR MIXING FOR FIELD-PLACED LINING

A. Mortar for the lining shall be composed of cement, processed sand, and water; well mixed; and of proportions and consistency to obtain a dense, homogenous lining that will adhere firmly to the pipe surface. The proportions of cement and sand in the mortar for the lining shall be one part cement to not less than one part, nor more than one and one-half parts of processed sand by volume.

B. When the mixture ratio for sand and cement has been determined, measurement of the dry material shall be by volume and shall be controlled accurately throughout the course of the Work, preferably by means of a box of known volume into which materials may be emptied and struck off.

C. Control the water-cement ratio and keep to a minimum, with an allowance being made as necessary for moisture which may collect on interior pipe surfaces, and as required for most effective machine operation and adhesion of mortar to the pipe.
D. Where premixed mortar is to be applied with a lining machine, premixing shall be for a sufficient length of time, approximately 3 minutes, to obtain maximum plasticity. Apply such premixed mortar before initial set has taken place.

E. Provide a 1/2-inch max opening screen at hopper inlet to mortar pump to screen out oversized aggregate and hardened lumps of cement.

3.03 EQUIPMENT

A. The lining machine shall be of a type that has been used successfully for similar Work over a period of at least 3 years. The Constructor may be required to present evidence that his organization, or designated Subcontractor, has successfully performed similar Work by the use of a machine of the type proposed to be used hereunder.

B. Provide an adequate catchment facility under the motor to contain fuel and oil leaks.

3.04 ACCESS TO PIPELINES

A. Obtain access to existing pipe to be relined at locations shown on Drawings, and as coordinated with the Owner.

3.05 PREPARING STEEL PIPE INTERIOR BEFORE LINING

A. Before commencing mortar lining on pipes, clean the interior surfaces of the steel to remove any materials including rust, mud, sediment, slime, biomass, and/or other debris.

B. Clean with High Pressure Water:

1. 10,000 psi minimum.
2. Nozzles shall be placed not more than 2 inches away from the pipe wall.

C. Remove and properly dispose of any and all debris cleaned from the pipe.

D. Repeat cleaning process until any and all debris that would interfere with the proper application of the cement-mortar lining has been removed.

E. Confirm that all welded steel connections, disconnections and repairs to the existing pipe have been completed.

F. Thoroughly dewater the existing pipe so that no puddles are evident at the pipe invert. The pipe interior surface shall be free from oil, grease, and accumulations of water.
3.06 LINING THICKNESS

A. The cement-mortar lining shall be continuous, dense, and without variation in quality, and shall adhere to the wall of the pipe at all points.

B. The minimum lining thickness and tolerance shall conform to AWWA C602, Table 1, and shall be 9/16 inches for pipes 36-inches and larger in diameter and have a tolerance of plus 3/16 inch minus 1/16 inch.

3.07 OPENINGS

A. Temporarily close openings in the pipeline for manholes, outlets, and blowoffs. Cover with removable stoppers, coverings, or other devices to prevent the intrusion of cement-mortar. Upon completion of the lining, remove stoppers, coverings, and other devices from openings and repair any lining damaged in the process. Trim, smooth, and point outlet openings.

3.08 FIELD APPLY LINING

A. One-course application that is dense, smooth, without variation in quality, and of consistency to assure efficient machine operation and uniform lining on pipe wall. A two-course application will not be allowed.

B. Foreign material, including sand and loose mortar that has accumulated since surface preparation was completed shall be removed prior to placing lining.

C. Machine Features:

1. Applicator head that is centered within pipe shall centrifugally project mortar at high velocity, in such a manner as to produce dense mortar and to equally distribute mortar on wall surface of pipe.
2. No compressed air shall be utilized in the process of mixing or application.
3. Mechanically driven rotating steel trowels that will immediately follow applicator and provide smooth hard surface of uniform thickness on wall surfaces.
4. Care shall be taken to compensate for torque so that machine will sit true in pipe and trowel faces will not vary in angle with mortar face during complete 360-degree cycle.
5. Trowels shall be cleaned at frequent intervals to prevent accumulated mortar from obtaining initial set and drawing sanded or unglazed finish.
6. Operation of trowels shall be continuous at all times during application and forward progress of machine.
D. Progression of machine ahead of lining shall be such that nothing comes in contact with troweled surface until it has attained its initial set.

E. Control of mechanical placing of mortar shall be provided to assure uniform thickness of lining is not less than that specified.

3.09 LINING FINISH:

A. Surface shall be smooth and shall not have a sand nor orange peel finish.

B. At no point shall there be space greater than 1/16 inch between the lined surface and a 12-inch straight edge placed on the liner and parallel to the pipe axis.

3.10 LINING OF BENDS AND SPECIALS

A. Use at sharp bends, specials, areas where machine placing is impossible or impractical and for correcting defective areas.

B. Wire Mesh:
   1. Place wire mesh in accordance with AWWA C205.
   2. Welded to inside of pipe prior to application of lining.

C. Coat with pneumatically applied mortar the interior surfaces of bends and special sections 36 inches or more in diameter, which cannot satisfactorily be lined by machine placing, and the interior surfaces of any short sections or closing courses of pipe temporarily omitted and subsequently placed after completion of the machine-placed mortar lining. Line steel fittings of a diameter less than 36 inches with mortar by hand plastering, provided that the methods used shall be such as to produce a lining substantially equivalent in quality to the machine-placed mortar lining.

D. Finish cement-mortar to a smooth surface by troweling with steel finishing trowels.

E. Complete hand-finished work within 24 hours after machine-applied mortar lining has been completed for a given section of pipeline. Slow or stop machine application of mortar lining to assure time for hand patching of defective machine-lined areas in accordance with such schedule.

3.11 FIELD QUALITY CONTROL

A. Prepare and test two standard mortar Samples for each worker shift in accordance with AWWA C602.
B. Conduct 3-day, 7-day, and 28-day strength tests.

C. Submit the 3-day test to the Engineer within 5 working days after the Sample was collected.

D. The final Work will not be approved or accepted if 28-day test does not meet minimum requirement of Specifications.

E. Remove and reapply cementitious liner that does not satisfy compressive strength requirements of Specification.

3.12 CURING

A. Curing operations shall begin immediately after completion of the mortar lining and surface finishing of each section of the pipeline. Close the pipe and maintain a moist atmosphere in each section of the pipeline to keep the lining continuously damp until the pipeline is filled with water for testing. See cold weather placement and curing requirements earlier in this Specification.

3.13 PROTECTION:

A. For 10 days after cement-mortar lining is placed, do not work or drive equipment within 20 feet of centerline of pipe.

3.14 INSPECTION:

A. Schedule final inspection with Construction Manager at a mutually acceptable time after lining has set and outlet openings unplugged.

B. Provide lighting acceptable to Construction Manager along with labor and materials required to assist Construction Manager in final inspection.

C. Perform inspection and submit statement of conformance to AWWA C602.

3.15 REPAIR DEFECTIVE LINING:

A. Repair defects in cement-mortar lining in accordance with AWWA C602, except Construction Manager will determine if full circumference repair of lining shall be by machine or hand.

B. Repair mortar cracks wider than 1/16 inch that cannot be repaired by autogenously healing under continuous soaking water.

3.16 WARRANTY INSPECTION

A. Conduct according to the schedule requirements in Part 1 General.
B. Perform television survey in accordance with Section 33 01 30.16, Television Inspection of Pipelines.

C. Conduct finished inspections continuous over entire length of pipeline between manholes.

3.17 TESTING

A. Surface Finish Test:

1. Surface of machine-placed and hand-troweled linings at locations selected by Construction Manager.
2. Test shall involve laying a 12-inch straight edge parallel to axis of pipe along surface of straight section of machine-placed or hand-troweled lining and shall at no point have space between lined surface and straight edge greater than 1/16 inch.
3. 9 out of 10 shall conform to tolerance for finished surfaces.
4. Submit summary of surface finish testing results.

B. Summary of certified copies of test reports on cementitious liner specimens obtained during actual installation.

END OF SECTION
SECTION 33 01 33
PIPELINE CLEANING

PART 1    GENERAL

1.01    SUBMITTALS

A.    Action Submittals:

1.    Catalog and manufacturer’s data sheets for cleaning equipment.
2.    Root Herbicide: Product data.

B.    Informational Submittals:

1.    Root Herbicide: Material Safety Data Sheet and application method.

PART 2    PRODUCTS

2.01    CLEANING EQUIPMENT

A.    Equipment shall be capable of removing dirt, grease, rocks, sand, roots, and obstructions from lines and manholes.

B.    High-Velocity, Hydro Cleaning Equipment:

1.    High-Pressure Hose: 700 feet, minimum.
2.    Hydraulically driven hose reel.
3.    High-Velocity Nozzle:
   a.    Two, minimum.
   b.    Capable of producing scouring action from 10 degrees to 45 degrees in lines to be cleaned.
4.    High-Velocity Gun: Capable of producing flows ranging from fine spray to long distance solid stream.
5.    Water Tank: 1,000-gallon, minimum.
7.    Equipment Operating Controls: Locate above ground.
8.    Working Pressure: 2,000 pounds per square inch at 65 gpm, minimum.

C.    Mechanically Powered Cleaning Equipment:

1.    Use either power bucket or power rodder.
   a.    Bucket Machine:
      1)    Furnish with buckets in pairs, and with sufficient dragging power to perform Work efficiently.
2) Use V-belts for power transmission or have overload device. No direct drive machines permitted.
3) Equip with take-up drum, and minimum 500 feet of cable.
   b. Rodding Machine:
      1) Fully enclosed, and with automatic safety throwout clutch or relief valve.
      2) Either sectional or continuous.
      3) 750 feet of rod, minimum.
      4) Rod shall be heat-treated steel.

2.02 ROOT REMOVAL EQUIPMENT
   A. Use tools and accessories designed for removing roots, such as hydraulic root cutters, porcupines, or high-velocity hydro cleaners.

2.03 ROOT HERBICIDE
   A. Herbicide with foaming agent similar or equal to:
      1. RootX® supplied by General Chemical Company; Salem, Oregon.
      2. Vapororooter® supplied by Douglas Products; Rancho Cordova, California.

PART 3 EXECUTION
3.01 PREPARATION
   A. When hydraulically propelled cleaning tools that depend upon water pressure to provide cleaning force or tools that retard flow are used, take precautions to ensure water pressure created does not damage or cause flooding of public or private property.

3.02 PIPELINE CLEANING
   A. Perform cleaning prior to closed-circuit television (CCTV) inspection.
   B. Cleaning shall restore pipe to a minimum of 95 percent of original carrying capacity. No more than 5 percent debris, based on visual observation provided by CCTV inspection, shall remain in pipe.
   C. Clean using hydraulically propelled, high-velocity hydro, or mechanically powered equipment supplemented with additional equipment as required based on conditions of lines at time Work commences and suitable to obtain a clean sewer line free from dirt, sand, rocks, gravel, grease, sludge, roots, and other debris.
D. If using high velocity hydro-cleaning equipment, make minimum of two passes through pipe segment.

E. Begin cleaning at upstream end of system and proceed in downstream direction. Unless otherwise permitted by Engineer, cleaning of pipeline segments upstream of a section of pipe already cleaned will not be allowed. If entire section cannot be cleaned from upstream manhole, it will be assumed that a major blockage exists. Contractor shall contact Owner for removal of obstruction, with Engineer’s approval, abandon effort and document what was completed to point of blockage.

F. Supply water for performing high-velocity hydro cleaning or flushing. Water may be obtained from public water system. Obtain approval from public water system authority prior to commencement of Work.

3.03 ROOT REMOVAL AND TREATMENT

A. Remove roots from pipe being cleaned.

B. Treat pipeline segments that have root intrusion with herbicide. Apply herbicide to roots within one hour of root removal and in accordance with manufacturer’s recommendations and in such a manner to preclude damage to surrounding vegetation.

3.04 MATERIAL REMOVAL AND DISPOSAL

A. Sludge, dirt, sand, rocks, grease, and other solid or semisolid material resulting from cleaning operation shall be removed at adjoining downstream manhole. Passing material to downstream pipe will not be permitted.

B. Solids or semisolids resulting from cleaning operations shall be removed from site and disposed of in accordance with provisions of local, state, and federal requirements. Do not accumulate debris onsite beyond a single workday, except in totally enclosed containers and as approved by Engineer.

3.05 VERIFICATION OF CLEANING AND ROOT REMOVAL

A. Inspect cleaned pipe segment by CCTV inspection, as specified in Section 33 01 30.16, Television Inspection of Sewer Pipelines, to verify results of cleaning and root removal and treatment effort. Reclean and remove and retreat roots in pipe segment if Engineer determines section has not been adequately cleaned or roots properly removed and treated.

END OF SECTION
PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section presents the requirements for removing and repairing sections of the existing corrugated metal pipe culvert wall that may obstruct, hinder, or otherwise interfere with the subsequent installation of the steel liner pipe.

B. Anticipated locations of the repairs are indicated on Drawings; however, the Contractor is responsible for removing and repairing any additional sections of bent, crumpled, or protruding corrugated metal pipe that may occur as a result of the installation operations.

C. The repairs shown on Drawings, and any others the Contractor may encounter during preconstruction inspections, should be performed in advance of the sliplining operation.

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Map or stations of repair locations.
   b. Written repair procedure.
   c. Drawings of proposed repairs (if site conditions or obstructions created during installation require methods different than those shown on Drawings).

2. Samples:
   a. Soil test results from internal drilled cores.
   b. Description of drill cuttings from each core.

3. Action submittals in accordance with other referenced specification sections.

B. Informational Submittals:

1. Final locations and type of all repairs.
2. Informational submittals in accordance with other referenced specification sections.
1.03 QUALITY ASSURANCE

A. Qualifications: In accordance with all other referenced specification sections.

1.04 SEQUENCING AND SCHEDULING

A. Existing obstructions identified on Drawings and others not identified on Drawings but encountered during field work shall be removed prior to advancing the steel slipliner through the effected locations.

B. Prior to cutting or removing any portion of the existing corrugated metal culvert, the surround soil shall be tested by sequenced probe-drilling to verify its stability, or stabilized with contact grouting to prevent collapse.

C. Soil cuttings shall be described by a trained geotechnical technician.

D. It is the Contractor’s responsibility to maintain adequate worker safety throughout the duration of the installation. This may include (but is not limited to) installation of temporary rib bracing frames, and/or advancing the steel slipliner up to the edge of the obstacle and having the workers operate from within the relative safety confines of jacked steel pipe.

PART 2 PRODUCTS

2.01 MATERIALS

A. Soil stabilization permeation grout:

1. As per Section 03 64 00, Contact Grouting.
2. “Or-equal.”

B. Temporary Bracing and Lagging: Timber, steel, or composite material framing adequate to resist the loads during installation.

PART 3 EXECUTION

3.01 GENERAL

A. Specific requirements relative to execution of the Work of this section is located on Drawings.

B. In addition to the locations shown on Drawings or identified during preconstruction inspection, the Contractor is responsible for removing and repairing any additional sections of bent, crumpled, or protruding
corrugated metal pipe that may occur as a result of the installation operations.

3.02 PRECONSTRUCTION INSPECTION

A. As per Section 33 01 30.16, Television Inspection of Pipelines.

B. Contractor shall identify any additional locations that may obstruct, hinder, or otherwise interfere with the sliplining installation and submit these locations to the Engineer.

3.03 SOIL STABILITY TESTING AT EXISTING OBSTRUCTION

A. Prior to cutting or removing any portion of the existing corrugated metal pipe, Contractor shall delineate the section of the pipe that is proposed for removal and core a 4-inch hole into the most overhead position within the section to test the stability of the surrounding soil.

B. Soil cuttings obtained by probe-drilling shall be described using the USCS soil classification system, and where possible Pocket penetrometer and torvane tests shall be conducted on the exposed soil body through the 4-inch hole to test the unconfined compressive strength and shear strength of the soil. Results of the tests shall be labeled by station number, type of test, and submitted to the Engineer.

C. After the probe drilling is complete, the Contractor shall record the time that elapses before the begins to flow through the 4-inch hole. Results of the tests shall be labeled by station number, type of test, and submitted to the Engineer.

D. The Contractor may proceed with cutting, removal, and testing of a larger 1-foot by 1-foot test window if the following soil stability criteria are met:
   1. No apparent groundwater seepage.
   2. Soil is firm and exhibits the behavior such that the temporary bracing and lagging can be installed without additional initial support and the final slipliner can be constructed before the ground starts to move.

E. The Contractor may proceed with cutting and removal of the remainder of obstruction if the 1-foot by 1-foot window appears stable and meets the above soil stability criteria.
F. If any of the above conditions are not satisfied, Contractor shall stabilize the surrounding soil by permeation grouting or other suitable approved grouting methods.

G. Upon completion of permeation grouting, and after a sufficient cure and hardening time has elapsed, the Contractor shall probe drill an additional 4-inch hole into the most overhead position within the section, followed by a subsequent 1-foot by 1-foot window, to test the stability of the surrounding soil in accordance with the above paragraphs. Once the soil stability criteria are met, the Contractor may proceed with the cutting and removal of the obstruction.

3.04 PERMEATION GROUTING

A. Injection ports may be drilled directly into the existing corrugated metal pipe as long as all provisions for worker safety are satisfied.

B. Fastened grout plugs or other permanent couplings are not required after grouting.

C. Contractor shall be responsible for, and exercise an abundance of caution relating to, maintaining a safe grouting pressure that does not cause collapse of the host pipe.

3.05 OBSTRUCTION REMOVAL

A. After confirmation of a stable soil condition, cut and remove the section of the existing corrugated metal pipe that occludes the passage of the sliliner pipe.

B. Remove and dispose of the soil body that occludes the passage of the sliliner pipe.

C. Overcut the existing pipe and remove the soil body to such an extent that at least an additional 1.0 inches of annular space exist to allow for construction tolerances and the free passage of grouting materials during subsequent annular space grouting.

3.06 INSTALL TEMPORARY BRACING SUPPORT AND/OR LAGGING

A. Install temporary bracing, lagging, or other support across the full extent of the removed pipe section in order to retain the surrounding soil outside of the host pipe conduit during sliliner installation.
B. Temporary bracing shall not extend into the clear opening of the slipliner path.

3.07 INVERT OBSTRUCTIONS

A. If any obstructions extend into the lower third of the pipe (measured as the arc between a horizontal plane one-third above the pipe invert), where the slipliner pipe may reasonably be expected to slide against, Contractor shall repair the area in accordance with the details shown for Invert Repair on Drawings.

3.08 TESTS AND INSPECTION

A. Following obstruction removal and bracing installation, clear this site of any loose debris or materials that may interfere with the sliplining operation.

B. Document all locations where obstructions were removed and submit to the Engineer.

C. Proceed with sliplining as per Section 33 01 30.72, Sliplining.

END OF SECTION
PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI): 301, Specifications for Structural Concrete.
2. American Water Works Association (AWWA):
   a. C207, Steel Pipe Flanges for Waterworks Service - Sizes 4 in. Through 144 in. (100 mm Through 3,600 mm).
   e. C219, Bolted, Sleeve-Type Couplings for Plain-End Pipe.
   f. C221, Fabricated Steel Mechanical Slip-Type Expansion Joints.
   g. C606, Grooved and Shouldered Joints.
3. ASTM International (ASTM):
   b. A615/A615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

1.02 DESIGN REQUIREMENTS

A. Where pipe class or wall thickness is not indicated, design piping system for maximum stress based on the following earth and traffic loads.

1.03 SUBMITTALS

A. Action Submittals:

1. Detailed pipe fabrication drawings showing pipe details, special fittings and bends, dimensions, coatings, and other pertinent information.
2. Layout drawing showing location of each pipe section and each special length.
3. Pipe class.
4. Wall thickness, reinforcing, and strength calculations.
5. Product Data: Manufacturer’s data for couplings, saddles, gaskets, and other pipe accessories. Indicate maximum rated working pressure and test pressure for each item.

B. Informational Submittals: Manufacturer’s Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements.

1.04 DELIVERY, STORAGE, AND HANDLING

A. In accordance with manufacturer’s recommendations and as specified herein.

B. Marking at Plant: Mark each pipe and fitting at plant. Include date of manufacture, manufacturer’s identification, specification standard, diameter of pipe, pipe number for laying purposes, and other information required for type of pipe.

C. Pipe, specials, and fittings received at Project Site in damaged condition will not be accepted.

D. Gasket Storage: Store rubber gaskets in cool, well ventilated place, and do not expose to direct rays of sun. Do not allow contact with oils, fuels, petroleum, or solvents.

E. Store and support pipe securely to prevent accidental rolling and to avoid contact with mud, water, or other deleterious materials.

F. Handling:

1. Pipe shall be handled with proper equipment in a manner to prevent distortion or damage. Use of hooks, chains, wire ropes, or clamps that could damage pipe, damage coating or lining, or kink and bend pipe ends is not permitted.
2. Use heavy canvas, or nylon slings of suitable strength for lifting and supporting materials.
3. Lifting pipe during unloading or lifting into trench shall be done using two slings placed at quarter point of pipe section. Pipe may be lifted using one sling near center of pipe, provided pipe is guided to prevent uncontrolled swinging and no damage will result to pipe or harm to workers. Slings shall bear uniformly against pipe.
4. Pipe and fittings shall not be stored on rocks or gravel, or other hard material that might damage pipe. This includes storage area and along pipe trench.

PART 2 PRODUCTS

2.01 GENERAL

A. Components and Materials in Contact with Water for Human Consumption: Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.

1. Use or reuse of components and materials without a traceable certification is prohibited.

2.02 PIPE

A. As specified in the individual specification(s) following this section.

2.03 JOINTS

A. As specified in the individual specification(s) following this section.

2.04 COUPLINGS

A. General:

1. Coupling linings for use in potable water systems shall be in conformance with NSF/ANSI 61.
2. Couplings shall be rated for appropriate operating pressure and hydrostatic test pressure.

B. For Pipe with Plain-Ends:

1. Bolted, sleeve-type coupling, in accordance with AWWA C219.
   a. Manufacturer of couplings shall observe same quality control requirements as specified in AWWA C221 for fabrication of pipe expansion joints.
b. Unless thrust restraint is provided by other means, bolted, sleeve-type couplings shall be harnessed. Harness details shall be in accordance with requirements of appropriate reference standard or as shown on Drawings.

2. Fabricated steel, mechanical slip-type expansion joints, in accordance with AWWA C221.

C. For Pipe with Grooved Ends:
   1. Grooved couplings, in accordance with AWWA C606.
   2. Buried couplings shall be lined and coated with coal tar epoxy in accordance with AWWA C210.

D. For Pipe with Flanged Ends: Flanged coupling adapters, in accordance with AWWA C219.

E. Bolting Materials for Couplings: In accordance with the applicable AWWA standard.

2.05 PIPE LOCATING TAPE

A. As specified in Section 31 23 23.15, Trench Backfill.

2.06 PIPE BEDDING AND PIPE ZONE MATERIAL

A. Granular material as specified in Section 31 23 23.15, Trench Backfill.

2.07 TRENCH STABILIZATION MATERIAL

A. As specified in Section 31 23 23.15, Trench Backfill.

PART 3 EXECUTION

3.01 GENERAL

A. Notify Engineer at least 2 weeks prior to field fabrication of pipe or fittings.

B. Furnish feeler gauges of proper size, type, and shape for use during installation for each type of pipe furnished.

C. Distributing Materials: Place materials along trench only as will be used each day, unless otherwise approved by Engineer. Placement of materials shall not be hazardous to traffic or to general public, obstruct access to adjacent property, or obstruct others working in area.
3.02 EXAMINATION

A. Verify size, material, joint types, elevation, and horizontal location of existing pipeline to be connected to new pipeline or new equipment.

B. Inspect size and location of structure penetrations to verify adequacy of wall pipes, sleeves, and other openings.

C. Damaged Coatings and Linings: Repair using coating and lining materials in accordance with manufacturer’s instructions.

3.03 PREPARATION OF TRENCH

A. Prepare trench as specified in Section 31 23 16, Excavation.

B. Unless otherwise permitted by Engineer, maximum length of open trench shall not exceed 200 feet.

3.04 INSTALLATION

A. General:

1. Join pipe and fittings in accordance with manufacturer’s instructions, unless otherwise shown or specified.

2. Install individual pipe lengths in accordance with approved lay diagram. Misplaced pipe shall be removed and replaced.

3. Inspect pipe and fittings before installation, clean ends thoroughly, remove foreign matter and dirt from inside.

3.05 CORROSION PROTECTION

A. Sliplined Pipe: As detailed on Drawings.

3.06 PLACEMENT OF PIPE LOCATING TAPE

A. Place pipe locating tape in accordance with Section 31 23 23.15, Trench Backfill.

3.07 PIPE BEDDING AND ZONE MATERIAL

A. Place pipe bedding and pipe zone material in accordance with Section 31 23 23.15, Trench Backfill.

END OF SECTION
SECTION 33 05 01.01
WELDED STEEL PIPE AND FITTINGS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Society of Mechanical Engineers (ASME):
   b. B36.10M, Welded and Seamless Wrought Steel Pipe.
   c. BPVC SEC VIII, Div. 1, Rules for Construction of Pressure Vessels.
   d. BPVC SEC IX, Welding and Brazing Qualifications.

   SNT-TC-1A, Recommended Practice for Personnel Qualification and Certification in Nondestructive Testing.

3. American Water Works Association (AWWA):
   a. C200, Steel Water Pipe - 6 In. (150 mm) and Larger.
   b. C205, Cement-Mortar Protective Lining and Coating for Steel Water Pipe - 4 In. (100 mm) and Larger - Shop Applied.
   c. C206, Field Welding of Steel Water Pipe.
   d. C207, Steel Pipe Flanges for Waterworks Service - Sizes 4 In. Through 144 In. (100 mm Through 3,600 mm.
   e. C208, Dimensions for Fabricated Steel Water Pipe Fittings.
   f. C602, Cement-Mortar Lining of Water Pipelines in Place - 4 In. (100 mm) and Larger.

   a. A2.4, Standard Symbols for Welding, Brazing, and Nondestructive Examination.
   d. QC 1, Standard for AWS Certification of Welding Inspectors.

5. ASTM International (ASTM):
e. A370, Standard Test Methods and Definitions for Mechanical Testing of Steel Products.
g. A516/A516M, Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate- and Lower-Temperature Service.
k. E1255, Standard Practice for Radioscopy.


7. Lloyd’s Registry.

8. Steel Pipe Fabricators Association (SFPA).

1.02 DEFINITIONS

A. Fittings: Including, but not limited to fittings, closure pieces, bends, reducers, tees, wyes, bifurcations, crosses, outlets, manifolds, nozzles, wall sleeves, bulkheads, and other piping and appurtenances fabricated from steel plate, sheet, or coils as required to provide the Work, complete. Fittings shall include piping above ground or inside structures.

B. Acronyms:

1. CJP: Complete Joint Penetration.
2. CWI: Certified Welding Inspector.
3. MT: Magnetic Particle Testing.
4. NDE: Nondestructive Examination.
5. NDT: Nondestructive Testing.
6. PJP: Partial Joint Penetration.
7. PQR: Procedure Qualification Record.
8. PT: Liquid Penetrant Testing.

1.03 DESIGN REQUIREMENTS

A. Pipe Layout: Design in accordance with AWWA M11:

1. General:
   a. Base stationing and elevation convention as shown on Drawings.
   b. Maximum Laying Lengths:
      1) Not limited, unless specifically shown on Drawings.
      2) Select lengths to accommodate installation operation.

2. Include, as minimum:
   a. Location of closures, cutoff sections for length adjustment, temporary access manways, vents, and weld lead outlets for construction convenience.
      1) Provide for adjustment in pipe laying headings and to conform to indicated stationing.
      2) Changes in location or number will require Engineer approval.

B. Welding Procedure Specification (WPS):

1. Qualified by testing in accordance with ASME BPVC SEC IX for shop welds and AWS D1.1 for field welds.
2. Unassigned base metals to be production welded shall include PQRs which are traceable to heat lots, as required by ASME BPVC SEC IX.
3. Written WPS required for all shop and field welds.
4. Notch-tough welding procedures with heat input control are required.
   a. AWS D1.1 prequalified welding procedures and AWS SWPS are not allowed.
   b. WPS used to shop fabricate pipe shall be qualified in accordance with ASME BPVC SEC IX and shall include Supplementary Essential Variables.
   c. WPS used to field install pipe shall be qualified for heat input control in accordance with AWS D1.1.
   d. PQRs shall be qualified for notch tough welding with consideration for thickness of steel, test temperature, and Charpy V-notch CVN values. Refer to AWS D1.1, Table 4.6 PQR Supplementary Essential Variable Changes for CVN Testing Applications Requiring WPS Requalification for SMAW, SAW, GMAW, FCAW, and GTAW and Section 4, Part D Requirements.
C. Stulling (Strutting): Design for pipe and fittings such that over-deflection and damage is avoided during handling, storage, and installation, including backfill and compaction.

1.04 SUBMITTALS

A. Action Submittals:

1. Wall thickness design calculations prepared by a licensed professional engineer in the State of Nevada, or by a licensed professional engineer directly employed by the pipe manufacturer, for pipe and fittings.
2. Shop Drawings showing pipe layout.
3. Fabrication Information:
   a. Pipe and fitting details for temporary and permanent facilities indicating:
      1) Cylinder thickness.
      2) Manufacturing tolerances.
      3) Stulling size, spacing, and layout.
   b. Welded joint details including:
      1) CJP butt joint groove welds (for any jacked or rammed pipe sections).
      2) Lap welded joints (for point repairs only).
      3) Butt strap joints (for point repairs only).
4. Product data for the following:
   a. Welded Steel Pipe and Fittings:
      1) Material data.
      2) Chemical and physical test reports showing data consistent with specified requirements for each heat of steel proposed for use.
   b. Material list and steel reinforcement schedules for materials specified.

B. Informational Submittals:

1. Certificates: Manufacturer’s Certificate of Compliance, in accordance with Section 01 61 00, Common Product Requirements.
2. Pipe Manufacturer’s written Quality Assurance/Control Plan.
3. Statements of Qualification:
   a. Pipe manufacturer.
   b. Fittings fabricator.
c. Contractor’s Shop Inspector.
d. Contractor’s Field Inspector.
e. NDT Quality Control Personnel.

4. Procedures:
   a. Shop and field welding information; at a minimum include complete welding code paper trail with linkage to Shop Drawings.
   b. Welder Qualifications and Welding Procedure Specifications in accordance with Section 05 05 23, Welding, and as specified below:
      1) Notch-tough welding procedures are required:
      2) For shop welding, address supplementary essential variables in addition to essential variables as indicated in ASME Section IX, QW-251.2.
      3) For field welding, address supplementary essential variables listed in AWS D1.1, Table 4.6 and essential variables listed in AWS D1.1, Table 4.5.
      4) For shop and field welding, provide heat-input table on WPS for welder guidance.
      5) PQRs for notch-tough welding shall document heat-input control by monitoring volts, amps, and travel speed or time-rate of change of weld metal volume as calculated by measuring change in electrode length over a period of time. Charpy V-notch tests shall be conducted on weld metal and heat affected zone. Test coupons shall be oriented transverse to final direction of rolling. Full size Charpy specimen test acceptance shall be same as base metal specified herein.
   c. Written NDT procedures.
   d. Written description of proposed sequencing of events or special techniques such as:
      1) Controlling pipe wall temperature stress during installation.
      2) Minimizing distortion of steel.
      3) Monitoring pipeline temperatures during installation.
   e. Written weld repair procedures for the Work.
   f. Field lining application and repair.

5. Quality Control Test Reports:
   a. CWI reports and results of nondestructive examination.
   b. Steel impact tests using Charpy V-notch method.

6. Certification from Pipe Manufacturer’s Design Engineer documenting successful training of Contractor’s pipe installation crews.
1.05 QUALITY ASSURANCE

A. Qualifications:

1. Pipe Manufacturer:
   a. Experienced in fabricating pipe of similar diameters, lengths, and wall thickness as required for the Project.
   c. Demonstrate current production capability for volume of work required for Project.
   d. Experience shall include successful fabrication to AWWA C200 standards of at least 5,000 linear feet of 54-inch diameter or larger pipe, with wall thickness of 0.75 inches or greater, within past 5-year period.
   e. Experience shall be applicable to fabrication plant facilities and personnel, not company or corporation that currently owns fabrication facility or employs personnel.
   f. Experience shall be applicable to fabrication shop facilities and personnel, not company or corporation that currently owns fabrication facility or employs personnel.

2. Welders and Welding Operators:
   a. Shop Welders: In accordance with ASME BPVC SEC IX.
   b. Field Welders: In accordance with AWS D1.1.

3. Contractor's Inspector for Shop and Field Welding:
   a. In accordance with AWS QC 1, with knowledge of welding code for the Work.
   b. After receiving CWI qualification, at least one Shop CWI and one Field CWI shall have 5 years’ minimum professional experience related to welding inspection similar to the Work. Other CWIs may work under the supervision of 5-year CWI, provided they have 1 year of related professional experience after receiving CWI qualification.

4. NDT Quality Control Personnel:
   a. SNT-TC-1A, Level II certified for the types of NDT required.
   b. At least one NDT inspector shall have 5 years minimum professional experience using the NDT methods required for this Project.

5. Pipe Manufacturer’s Design Engineer: Professional Engineer licensed in the State of Nevada and directly employed by the pipe manufacturer.
B. Contractor’s Shop Inspector:

1. In accordance with AWWA C200.
2. Responsibilities:
   a. Verify conformance to use of specified materials and their proper storage.
   b. Monitor conformance to approved WPS.
   c. Monitor conformance of WPQ.
   d. Provide 100 percent visual inspection at suitable intervals before, during, and after shop welding.
   e. Coordinate NDT work and review test results.
   f. Maintain records and prepare report confirming results of inspection and testing.

C. Contractor’s Field Inspector:

1. In accordance with AWWA C206 and AWS D1.1.
2. Responsibilities:
   a. Verify conformance to use of specified materials and their proper storage.
   b. Monitor conformance to approved WPS.
   c. Monitor conformance of WPQ.
   d. Provide 100 percent VT at suitable intervals before, during, and after field welding.
   e. Coordinate NDT work and review test results.
   f. Maintain records and prepare report confirming results of inspection and testing.

1.06 DELIVERY, HANDLING, AND STORAGE

A. Delivery:

1. Securely bulkhead or otherwise seal ends of pipe and fittings prior to loading at manufacturing site.
2. Pipe ends shall remain sealed until installation.
3. Damage to pipe and fittings, including linings and coatings, found upon delivery to Site shall be repaired to Engineer’s satisfaction or removed from Site and replaced.

B. Storage:

1. Support pipe securely to prevent accidental rolling and to avoid contact with mud, water, or other deleterious materials.
2. Support on sand or earth berms free of rock exceeding 3 inches in diameter.
PART 2 PRODUCTS

2.01 GENERAL

A. Pipe Manufacturer:
   1. Manufacturing of steel pipe and fittings shall be under direction of one
      pipe Supplier.
   2. Responsibility shall include, at minimum, coordinating work of other
      suppliers for fittings.

B. Pipe Size:
   1. Nominal Inside Diameter: 60 inches.

C. Steel pipe and fittings shall be manufactured, tested, inspected, and marked to
   comply with AWWA C200 and additional requirements of these Contract
   Documents.

2.02 PIPE BARREL

A. Steel: Provide steel plate for straight seam welded pipe per AWWA C200 and
   as follows:
   1. Base Metal:
      a. ASTM A36 or ASTM A516/A516M, Grade 70.
      b. Plate thicker than 3/4-inch thick and greater shall be normalized.
   2. Toughness:
      a. Charpy V-notch Acceptance Criteria: Transverse specimen
         orientation, full size specimens, 25 foot-pounds energy at test
         temperature of 30 degrees F.
      b. Frequency: See Paragraph Steel Toughness Testing for Thickness
         Equal to or Greater than 7/16 Inches.
   3. Minimum nominal wall thickness shall meet the following criteria:
      a. Sufficient to resist the anticipated loading, jacking or pulling
         forces on the pipe during installation, as calculated by the Pipe
         Manufacturer’s Design Engineer.
         1) The installation loading capacity of the pipe shall be three
            times greater than the maximum forces imposed by the
            installation as identified by theoretical calculations.
      b. Meet the recommendations of the jacking, pipe ramming, and any
         other installation equipment manufacturers for the loads
         anticipated during installation.
2.03 JOINTS

A. Shop Welded:

1. Fabricate in accordance with AWWA C200 as modified herein.
2. Complete joint penetration (CJP) butt joint groove welds.
3. Lengths of pipe shall not be shop-joined using lap joints.

B. Preparation of Joints for Field Welding:

1. Butt Joint Welded:
   a. Plain ends beveled as required by AWWA C200 and Contractor’s field WPS.
   b. Provide protection for factory beveled pipe ends so ends are not damaged during transport.

2.04 REPAIR WELDS

A. Lap Joint Welded: Single fillet lap joints in preparation for field welding shall be in accordance with AWWA C206, AWWA C604 and AWS D1.1.

2.05 STULLING (STRUTTING)

A. Materials:

2. Unlined Pipe: Steel or wood.

B. Install stulling for pipe and fittings in accordance with approved submittal and as soon as practical after pipe is fabricated or, for shop-lined pipe, after lining has been applied.

C. Install stulling in manner that will not harm lining.

2.06 CEMENT-MORTAR LINING

A. As required in Section 33 01 30.78, Cement-Mortar Lining of Pipelines in Place.

2.07 CATHODIC PROTECTION

A. Provide as shown on Drawings.
2.08 SOURCE QUALITY CONTROL

A. Steel Toughness Testing for Thickness Equal to or Greater than 7/16 Inches:
   1. Include three impact specimens; conduct test in direction transverse to final direction of the coil rolling.
   2. Plate:
      a. Conduct Charpy Tests on each plate in accordance with ASTM A20/A20M.
      b. Conduct on full-size (10 mm by 10 mm) specimens from each plate in accordance with ASTM A20/A20M.
      c. Do not use plates that do not qualify in production of pipe.

B. Shop Nondestructive Testing:
   1. Welds: 100 percent visually examined by Contractor’s Shop Inspector to criteria in ASME BPVC SEC VIII, Division 1.
   2. CJP Butt Joint Groove Welds: Randomly radiographically or radioscopically examine 5 percent of each weld in accordance with ASME BPVC SEC VIII, Div. 1, Paragraph UW-51.
   3. All Other Groove Welds: 100 percent ultrasonically examine in accordance with ASME BPVC SEC VIII, Div. 1, paragraph UW-53.
   4. Hydrostatic testing in accordance with AWWA C200 is not required.

PART 3 EXECUTION

3.01 INSTALLATION

A. Pipe shall be installed in accordance with this specification, and as per Section 33 01 30.72, Sliplining.

B. General:
   1. Joints and related work for field assembly of fittings shall conform to requirements for straight pipe, unless otherwise shown.
   2. Inspect pipe and fittings before installation. Clean ends thoroughly, remove foreign matter and dirt from inside.
   3. Stulling:
      a. Maintain stulling in place until pipe is completely backfilled and compacted.
      b. Reinstall stulls that were temporarily removed to facilitate interior welding prior to backfilling.
3.02 WELDING

A. Perform welding in accordance with this Specification and Section 05 05 23, Welding.

B. Perform welding only in presence of Contractor’s Field Inspector.

C. Conform to AWS D1.1, AWWA C206, approved welding procedures, and referenced welding codes. In case of conflict AWS D1.1 shall govern.

D. Rejectable weld defects shall be repaired or redone, and retested until sound weld metal has been deposited in accordance with appropriate welding codes.

E. Complete joint penetration (CJP) butt joints shall be used for pipe segment welds.

F. Lap and fillet welds may be used for point repair welds.

3.03 FIELD-APPLIED CEMENT-MORTAR LINING

A. As per Section 33 01 30.78, Cement-Mortar Lining for Pipelines in Place.

3.04 CATHODIC PROTECTION

A. Apply to pipe as shown on Drawings.

3.05 FIELD QUALITY CONTROL

A. Field Welding:

1. All welds, 100 percent VT by Contractor’s Field Inspector and marked to indicate acceptance or rejection.

2. Test butt-strap or double-welded lap joint welds by pressurizing connection between the two fillet welds in accordance with AWWA C206.
   a. Apply air or other Engineer-approved gas into connection between the two fillet welds.
   b. Paint welds with soap solution.
   c. Mark leaks indicated by escaping gas bubbles.
   d. Close threaded openings with flush pipe plugs or by welding them.

3. CJP welds:
   a. Inspect 10 percent of each butt joint groove weld with RT.
   b. Inspect 100 percent of all other groove welds with UT.

4. Fillet welds: Inspect 100 percent of each fillet weld with MT.
5. **Weld Acceptance:**
   a. If, in the opinion of Engineer, inspections indicate inadequate quality of welds, percentage of welds inspected shall be increased.
   b. Welds to be inspected, if less than 100 percent rate, shall be selected at random by CWI.
   c. VT: Perform VT per AWS D1.1 Paragraph 6.9, Visual Inspection, Statically Loaded Nontubular Connections.
   d. RT: Perform RT of CJP butt joint welds in accordance with AWS D1.1, Paragraph 6.12.1.
   e. MT:
      1) Perform on fillet and PJP groove welds in accordance with AWS D1.1, Paragraph 6.10.
      2) Acceptance shall be in accordance with VT standards specified above.
   f. Remove in manner that permits proper and complete repair by welding.
   g. Caulking or peening of defective welds is not permitted.
   h. Retest unsatisfactory welds.

**END OF SECTION**
PART 1        GENERAL

1.01       SCOPE

   A. Furnish labor, equipment, and materials necessary to install grout and completely fill the annular space between the existing host pipe and the slipliner pipe without deflecting the pipe.

   B. Annular space grouting shall be performed after installation of the slipliner pipe, but before contact grouting or final slipliner pipe cement mortar lining.

1.02       REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

   A. The publications listed below form a part of this Specification to the extent referenced. Where conflicts between these Specifications and the referenced Specification, code, or standard occur, the more restrictive specification shall govern. The publications are referenced in the text by basic designation only. Where a date is given for referenced standards, that edition shall be used. Where no date is given for referenced standards, the latest edition available on the date of issue of Contract Documents shall be used.

      e. C138, Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
      g. C403, Standard Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance.
      j. C618, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
C821, Standard Test Method for Change in height at Early Ages of Cylindrical Specimens of Cementitious Mixes.


D4262, Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces.

2. American Concrete Institute (ACI):
   a. Protection of Metals in Concrete Against Corrosion, R222R-01.

1.03 DEFINITIONS

A. Annular Space: The space between the outside surface of the slipliner pipe and the inner diameter of the host pipe.

B. Host Pipe: The existing pipe that is to be rehabilitated with slipliner pipe.

C. Grout Port: A port located within the slipliner pipe, fitted with a one-way valve for injection of grout into the annular space between the slipliner pipe and the host pipe.

D. Work: The entire construction or separately identifiable parts thereof required to be furnished under Contract Documents.

1.04 SUBMITTALS

A. Action Submittals:
   1. Statement of Qualifications.
   2. Work plan for each type of annular space grouting required, including methods and details of equipment, grouting procedures and sequences, injection pressures, monitoring and recording equipment, pressure gauge calibration procedures and data, methods of measuring and controlling grout pressure, method of transporting grouting equipment and materials within the pipe, grout port sealing, provisions to protect interior of slipliner pipe, means and methods for collecting and disposing of excess and waste material, collecting and disposing of water from grouting operations and cleaning of the tunnel liner.
   3. Schedule for Installation.
   4. Grout Design Calculations:
      a. Calculations shall show sufficient pressure to fill the annular space and any voids without excessive ground heave, settlement, floating, buckling, excessive deformation, or damage to the slipliner.
      b. Calculations shall be prepared by a professional engineer licensed in the State of Nevada, who shall stamp and sign calculations.
5. Grout Mix Details:
   a. Mix proportions: Standard physical and chemical analysis.
   b. Admixtures.
      1) Documentation showing history of demonstrable satisfactory performance.
      2) Documentation showing compatibility with adjacent materials.
   c. Manufacturer’s Product Data Sheets.
      1) Mixing, handling, storage and waste disposal requirements.
      2) Personal Safety Equipment and First Aid Measures
      3) Source of supply for each grout ingredient.
   d. Laboratory test data verifying the strength of the proposed grout mix.
   e. Laboratory test data verifying the pH and the resistivity of a cured sample of the proposed grout mix.

B. Information Submittals:

1. Annular Space Grout Reports and Records: Maintain and submit daily logs of grouting operations, including:
   a. Grouting locations.
   b. Pressures.
   c. Volumes.
   d. Grout mix pumped.
   e. Time of pumping.
   f. Note any problems or unusual observations on logs.
   g. Submit samples of the daily records at least 14 days prior to the start of Work. Samples shall include electronic data and any necessary programs to interpret data, and the manual logs or records to be used.

2. Certified Independent Testing Laboratory Submittals:

3. Certificates:
   a. Manufacturer’s Certificate of Proper Installation, in accordance with Sections 01 43 33, Manufacturers’ Field Services.
   b. Calibration certificates for gauges and meters to be used in grouting operations.


5. Field Quality Control Submittals, including post-installation void testing.
1.05 QUALITY ASSURANCE

A. Qualifications:

1. Installation Company:
   a. Minimum 5 years of experience with similar grouting applications.
   b. Completed annular space grout for rehabilitation of pipelines for at least three similar projects within last 5 years.
   c. Experience shall include installation of a minimum of 50,000 linear feet of annular space grouting with pipe of 54-inch diameter or larger.

2. Personal experience of the Contractor’s person in charge onsite (construction manager, superintendent, foreman, etc.), with other construction companies may be substituted in lieu of current company experience as approved by Engineer and Owner.

3. The applicator of the grout mix shall be certified by the grout mix manufacturer and approved by the Engineer. The certified applicator shall be regularly engaged in the placement of grout.

4. The Contractor’s person in charge onsite shall be present at all times during the preparation, installation, and testing of the grouting.

B. Quality Control Plan:

1. Methods for ensuring uninterrupted grouting at pressures that do not exceed the maximum specified.
2. Methods for demonstrating that grout mixes meet design criteria.
3. Methods for containing excess or waste grout, cleaning equipment and disposing of excess and wasted grout, water and debris.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cement: Type II or Type V portland cement conforming to ASTM C150. Type II cement shall meet Table 4 false set requirements of ASTM C150.

B. Fly Ash: Comply with ASTM C618; either Type C or Type F shall be used.
C. Sand, if provided, shall be kept to a minimum. If used, sand shall conform to ASTM C144, except as modified below:

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<th>U.S. Standard Sieve Size</th>
<th>Percent Passing By Weight</th>
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<tr>
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<tr>
<td>No. 100</td>
<td>5-25</td>
</tr>
<tr>
<td>No. 200</td>
<td>-10</td>
</tr>
</tbody>
</table>

D. Water: Use potable water free from deleterious amounts of alkali, acid, and organic materials which would adversely affect the setting time or strength of the grout.

E. Admixtures: Admixtures shall be selected by the grout manufacturer to meet performance requirements, improve pumpability, control set time, and reduce segregation.

2.02 GROUT MIX DESIGN

A. Mix Designs: One or more mixes shall be developed to completely fill the annular space based, but not restricted to, the following requirements:

1. Size of grouting ports.
2. Size of annular void.
3. Absence or presence of groundwater.
4. Sufficient strength and durability to prevent movement of the liner pipe.
5. Provide adequate retardation.
6. Provide less than 1 percent shrinkage by volume.

B. Compressive Strength: The grout shall have a minimum penetration resistance of 100 psi in 24 hours when tested in accordance with ASTM C403 and a minimum compressive strength of 300 psi in 28 days, and 500 psi in 56 days, when tested in accordance of ASTM C495 or C109.

C. Cast Density: 55 pcf +/- 5 pcf.

D. Density/Viscosity: The Contractor shall design a grout mix with a density to prevent floating of the liner. The apparent viscosity shall not exceed 20 seconds in accordance with ASTM C939, unless otherwise approved by the Engineer.
E. Foaming agents used in the production of cellular grouts shall be acceptable upon approval of the Engineer.

F. No aggregates shall be used in the grout mix.

G. No deleterious amounts of toxic or other poisonous substances shall be included in the grout mix nor otherwise injected underground.

H. Mortar must keep its pumpability for a duration compatible with the work schedule.

I. Final cured grout shall have minimum pH of 12.5 per ASTM D4262.

J. Final cured grout shall have a minimum resistivity of 10 kΩ-cm per ACI 222R (2001).

2.03 EQUIPMENT

A. Grouting System: The grouting system shall have sufficient gauges, monitoring devices, and tests to determine the effectiveness of the grouting operation and to ensure compliance with the liner pipe specifications and design parameters. System requirements include, but are not limited to, the following:

1. Equipment of sufficient size and capacity to provide the desired amount of grout material for each stage in a single operation.
2. Capable of mixing the grout to a homogeneous consistency.
3. Deliver grout to the injection point at a steady pressure with a nonpulsating centrifugal or triplex pump at the mix tank.
4. Provide ways to increase or decrease the water-cement ratio and accurately measure grout components quantities, pumping pressures, and volumes pumped.
5. Provide a means of accurately determining the amount of grout injected to the nearest one-tenth of a cubic foot.
6. Water connection to facilitate flushing the system and provide for continuous circulation of grout within the system.
7. Packers capable of sealing grout holes without leakage when grouting at the maximum specified pressure.

B. Pressure Gauges:

1. Pressure gauges shall be instrument oil filled and attached to a saddle-type diaphragm seal (gauge saver) to prevent clogging with grout.
2. Pressure gauges shall have a working range between 1.5 to 2.0 times the design grout pressure, and have an accuracy within 0.5 percent of full range or 0.5 psi (whichever is more accurate).
3. The range of the gauge should not be more than 100 percent greater than the design grout pressure.
4. All gauges shall be certified and calibrated in accordance with ANSI B40, Grade 2A.
5. Have a minimum of two spare pressure gauges available on Site.

C. Grout Couplings and Plugs:
   1. Piping for grout shall be 2-inch diameter or larger black steel pipe, standard weight (Schedule 40), conforming to the requirements of ASTM A53. Couplings shall be malleable iron. Plugs to be installed in the couplings shall be forged steel.
   2. Grout couplings shall be 1 inch as shown on Drawings. The Contractor may propose larger size couplings if needed for the grouting operation and the grout mix selected.

PART 3 EXECUTION

3.01 GROUT PLAN

A. Grout shall be introduced under pressure into the annulus. Grout can be injected into the annular space in a variety of ways, such as through openings in the end seals, or at a reconnected service connection, or through grout holes drilled in the liner pipe at appropriate points. The grouting operation can take place either in a continuous stage or in lifts, depending on the loads involved and the strength of the host and liner pipe. The grout plan shall be designed with a factor of safety of 2.

B. At least 7 days prior to grouting, submit information on equipment, grout mixes and procedures. Shop Drawings and product data shall include, but not be limited to, the following:
   1. Detailed descriptions of equipment and operational procedures to accomplish the annular grouting operation, including mixing and pumping schedule. Grouting pressures, rates of pumping, and methods for monitoring the effectiveness of the grouting.
   2. Detailed descriptions and Drawings indicating proposed locations, of surface mixing equipment, subsurface injection points, flow lines, waste grout recovery, grout pressure limiting equipment, bulkheads, and venting system. Show details of bulkhead design.
   3. Qualifications and experience of grout mix applicator.
4. Grout mix design and trial mix tests, with set time, compressive strength, viscosity, and density test results.
5. Initial set time of the grout.
6. The 24-hour, 28-day, and 56-day minimum grout compressive strengths.
7. The pH test of the final cured grout product.
8. The resistivity values of the final cured grout product.
9. The grout working time before a 15 percent change in density or viscosity occurs.
10. The proposed grouting method and resume of successful uses on previous projects.
11. The maximum injection pressures.
12. Proposed grout stage volumes.
14. Buoyant force calculations during grouting and procedures to prevent pipe flotation during the grouting process.
15. Flow control.
17. Pressure gauge and recorder certifications.
18. Vent location plans.
19. Grout port/bushing sealing plans.
20. Written concurrence that the Contractor had coordinated this work with the grout installer and the liner pipe manufacturer.
21. For each different type of grout or variations on procedure of installation, a complete package shall be submitted. The submittal shall include each of the above items and the sewer locations of conditions to which it applies. The Contractor shall notify the Engineer of any changes to be made in grout, mix, grouting procedures, or installation.

3.02 PREPARATION

A. Notify the Engineer at least 48 hours in advance of grouting operations.

B. Select and operate grouting equipment and carry out procedures with sufficient safety and care to avoid damage to existing underground utilities and structures.

3.03 PROCEDURE

A. General:

1. Install grout by methods that prevent flotation of liner including, but not limited to, restraining braces filling the pipe with water, and/or placing in lifts.
2. Place grout for a given pipeline segment between vented bulkheads. Place vented bulkheads at the ends of each pipeline segment to seal the annular space from pipe flow. Do not remove bulkheads until after grout has set.

3. Remove or control standing or running water in annular spaces to maintain the correct water ratio of the grout mixtures. Grout the annular space by injecting grout from one end of the liner segment, allowing it to flow toward the other end. Vent the annular space to assure uniform filling of the space.

4. Provide one pressure gauge and recorder at the point of injection and one pressure gauge and recorder at the grout pump.

5. Grouting shall not proceed without appropriate gauges and recorders in place in working order.

6. During grouting operations, the recorder shall continuously record the actual grouting pressure versus time on paper with ink. The grout pressure recordings shall be identified as a minimum, with date, batch, and time of day grouting was performed and shall be submitted to the Engineer at the end of the work day that grouting was performed.

7. Limit pressure on the annular space to prevent damage to the liner; do not exceed 5 psi grouting pressure when measured at the point of injection through the lining through the holes provided.

8. Regardless of the pressure, Contractor shall be solely responsible for any damage or distortion to the liner due to grouting. At the bulkhead opposite to the point of grouting, provide and monitor an open-ended high point tap or equivalent vent.

9. Provide materials free of lumps when put into the mixer. Continuously agitate the grout mix. Do not use grout not injected after 90 minutes of mixing.

10. Operate and control the grouting process so that the grout will be delivered uniformly and steadily. Drilling grout holes through pipe is not permitted.

11. Recirculate grout mixes when new mix is batched or after adding water, fluidifier, or sand to mix. Recirculate mix for at least 2 minutes prior to pumping grout into grout hole.

12. In general, grouting will be considered completed when the entire annulus has been filled with grout of the specified consistency.

13. After the grouting of any hole is finished, the pressure shall be maintained by means of the stop valve until the grout has set to the extent that it will be retained in the hole.

14. An attempt shall be made to hook-up and pump grout at every grout port or coupling unless approval is granted by the Engineer in writing to omit grouting of selected ports.
15. Grouting shall generally progress sequentially in a constant upgradient direction from one grout port to the next grout port in the sequence indicated in the approved submittals.

16. Contractor shall be prepared to modify the operation should grouting not perform as proposed. Such modifications and changes shall be done in a timely manner to avoid unnecessary delay in completion of the Project.

17. No hardened grout will be permitted in the pipe invert after completion of grouting operations.

18. Any grout bushings or ports must be closed, sealed, and coated over to prevent corrosion or abrasion damage to the liner pipe.

3.04 FIELD QUALITY CONTROL

A. Manufacturer’s Field Services: Grout manufacturer shall provide technical assistance during the design and placing of the annual space grout.

B. Grout Sampling and Testing:

1. Density/Viscosity: During placement of grout, measure density in accordance with ASTM C138 and C939 at least twice per hour. Adjust the mix as required to obtain the specified cast density.

2. Collect at least one set of four samples for each 100 cubic feet of grout injected but not less than one set for each grouting shift or every 4 hours of placing (whichever is less), unless directed otherwise by the Engineer.

3. Prepare samples for 24-hour, 28-day, and 56-day compressive strength tests according to ASTM C31 for cylinders or ASTM C109 for cubes.

4. Cylinder molds shall be at least 2 inches in diameter and 4 inches long.

5. Grout cubes shall be either 2 inches or 50 millimeters square.

6. Obtain grout for the cylinders or cubes from the nozzle of the contact grout injection line.

7. Conduct and submit pH tests of the final cured grout samples per ASTM D4262.

8. Conduct and submit resistivity tests of the final cured grout samples per ACI 222R (2001).

9. The Contractor shall engage the services of an approved, nationally accredited, independent testing laboratory to certify that the proposed materials and methods comply with these requirements.

10. Submit results and soon as practicable after performing tests.
C. Test for Voids:

1. Test the grout between the steel liner and the existing host pipe for voids during grouting operations and after grout has set for 24 hours by sounding, or other approved methods. If voids are found during grouting operations, modify the materials, mix, equipment, or procedures to obtain complete filling of the annular space between the slipliner and existing pipe. If incomplete grouting is revealed after the grout is set, drill out grout holes and inject additional grout to ensure that all voids are completely filled.

2. Drill holes through the set grout into the void. Drill grout holes through nipples threaded onto each grout coupling to avoid damage in the threads of the grout couplings. Redrill grout holes to be used for air release or for return prior to grouting.

3.05 FINAL ACCEPTANCE

A. Finished annular space grouting shall be accepted upon review and approval of the submittals and quality control test results.

END OF SECTION
SECTION 33 41 01
STORM DRAIN AND DRAINAGE PIPING

PART 1 GENERAL

1.01 SUBMITTALS

A. Manufacturer’s product literature.

PART 2 PRODUCTS

2.01 PIPE AND FITTINGS

A. HDPE profile wall pipe as specified in the Data Sheet following “End of Section.”

PART 3 EXECUTION

3.01 INSTALLATION OF PIPE, FITTINGS, AND APPURTENANCES

A. General:

1. Pipe laying shall proceed upgrade with spigot ends pointing in direction of flow.
2. Excavate bell holes at each joint to permit correct assembly and inspection of entire joint.
3. Pipe invert may deviate from line or grade provided that finished pipe line will present a uniform bore, and such variation does not result in a level or reverse sloping invert, or less than minimum slope shown.
4. Pipe bedding shall form continuous and uniform bearing and support for pipe barrel between joints. Pipe shall not rest directly on bell or pipe joint.
5. Prevent entry of foreign material into gasketed joints.
6. Plug or close off pipes that are stubbed off for manhole, concrete structure, or for connection by others, with temporary watertight plugs.

B. Concrete Closure Collars: Only use concrete closure collars where shown or authorized by Engineer.
3.02 SUPPLEMENTS

A. Data Sheet.

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<th>Title</th>
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END OF SECTION
### SECTION 33 41 01.07
POLYETHYLENE (PE) PROFILE WALL

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<td>Ring Stiffness Constant (RSC)</td>
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<tr>
<td>Profile</td>
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<tr>
<td>Joints</td>
<td>Watertight bell and spigot, gasketed type per ASTM D3212.</td>
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<td>Gaskets</td>
<td>ASTM F477.</td>
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<td>Fittings</td>
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<td>Source Quality Control</td>
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<tr>
<td>Factory Testing</td>
<td>Pipe lengths used for deflection testing shall be destroyed after testing.</td>
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END OF SECTION
DRAWINGS
(BOUND SEPARATELY)