Robert E. Lee & Associates, Inc.
Engineering, Surveying, Environmental Services
4664 Golden Pond Park Court • Oneida, WI 54155
(920) 662-9641 • 800-986-6338 • FAX (920) 662-9141

LETTER OF TRANSMITTAL

DATE	JOB NO.
June 18, 2008	523-018

ATTENTION
BOB KUFRIN, ADMINISTRATOR

RE: LIBERTY GROVE SANITARY DISTRICT NO. 1
SEWER & WATERMAIN CONSTRUCTION&
ROAD/ST, NON-TRAFFIC SURFACE RESTORATION

TO
VILLAGE OF SISTER BAY
421 MAPLE DRIVE; P. O. BOX 769
SISTER BAY, WI 54234

WE ARE SENDING YOU: ☐ Attached ☐ Under separate cover via_____the following items:

☐ Shop drawings ☐ Prints ☒ Plans ☐ Samples ☒ Specifications

☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1	6/18/08		Standard Specifications And Details/Plans For The Above Mentioned Type Of Work

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit _____ copies for approval

☒ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution

☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints

☐ For review and comment ☐ _____

☐ FOR BIDS DUE _____ 20__ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS

Bob:

Today we e-mailed you the Latest Edition Standard Specifications (updated June 2008) and details for Liberty Grove Sanitary District No. 1. Please note that these specifications and details are updated on an ongoing basis and should be reviewed and updated on an annual basis or at the start of a project if more than a year has passed. Please contact our office with any questions. Thank you.

COPY TO Steve Jacobson, Village of Sister Bay
Dean Zanon, PE, Robert E. Lee & Associates, Inc.

SIGNED Paul T. Welter

If the enclosures are not as noted, please contact us immediately. Thank you

LIBERTY GROVE SANITARY DISTRICT NO. 1
DOOR COUNTY, WISCONSIN

STANDARD SPECIFICATIONS AND DETAILS FOR SEWER AND WATERMAIN CONSTRUCTION INCLUDING ROAD, STREET, AND NON-TRAFFIC SURFACE RESTORATION

June 2008

Robert E. Lee & Associates, Inc.
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4664 Golden Pond Park Court
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DIVISION 1

GENERAL REQUIREMENTS

SECTION 01010

SPECIAL PROVISIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Related Sections and Divisions: Applicable provisions of the General Conditions and Supplementary Conditions shall apply to this section.

1.02 CONTRACT DOCUMENTS—INTENT AND USE

A. Intent of Documents:
   1. Singular notations and specifications shall be considered plural where application is reasonably inferred.
   2. Mention or indication of extent of work under any work division or specification section is done only for convenience of Contractor and shall not be construed as describing all work required under that division or section.
   3. Some individual sections may contain a list of related sections. The list of related sections in individual sections is provided for the convenience of Contractor and is not necessarily all-inclusive. Contractor may not rely upon this listing for determination of scope of work. Other sections of the specifications, not referenced in individual sections shall apply as required for proper performance of the work.
   4. Command type sentences may be used in the Contract Documents. These sentences refer to and are directed to Contractor.
   5. Symbols for various elements and systems are shown on the drawings. Should there be any doubt regarding the meaning or intent of the symbols used, a written interpretation shall be obtained from Engineer.

B. Use of Documents:
   1. Contractor shall examine all specifications and drawings for the work, including those that may pertain to work Contractor does not normally perform with its own forces.
   2. Contractor shall use all of the project drawings and specifications:
      a. For a complete understanding of the project.
      b. To determine the type of construction and systems required.
      c. For coordination with other contractors.
      d. To determine what other contractors.
      e. To anticipate and notify others when work by others will be required.
      f. And all other relevant matters related to the project.
   3. Contractor is also bound by all requirements of the Contract Documents which are applicable to, pertain to, or affect its work, as may be shown or inferred by the entire set of project drawings and specifications.

1.03 SPECIAL REQUIREMENTS

THE BELOW SPECIAL REQUIREMENTS ARE COMMONLY USED – PROJECT MANAGER PLEASE CHOOSE

A. Driveways and other access to residences, business, or other commercial properties shall be maintained at all times during construction. ***At the time of the preconstruction meeting, the Contractor shall submit a proposed work sequence for Municipal Engineer/Owner approval.***

B. All utilities aboveground or underground that need to be supported during the prosecution of this contract shall be coordinated with the utilities and the cost thereof shall be the sole responsibility of the Contractor.

C. The Contractor shall maintain local traffic in areas not under immediate construction. The Contractor will be responsible for immediate local traffic control signage. The signage and traffic control shall be according to the "Manual on Uniform Traffic Control Devices for Streets and Highways", latest edition. The associated cost shall be included in the appropriate bid item of the Contractor's bid.

D. All trenches within existing or proposed paved or graveled roadways, driveways, sidewalks, and other hard surfaces shall be backfilled with Soil Class **G1 or C3/C6 (project manager choose one)** and compacted to 95% of modified proctor.

E. Extreme care shall be taken to protect all trees along the construction route, which are not marked for removal or within the right-of-way and easement areas. For damaged trees and trees that die due to construction, the Contractor shall be responsible for the cost of tree replacement up to $1,000 per tree. The total amount shall be deducted from final contract payment.

F. The Contractor will furnish the municipality and Municipal Engineer with a telephone list, including cell or home phone numbers, of key personnel available for after hours and weekend emergencies.

G. At all times, the Contractor shall see that affected work site areas shall be kept drained and free of groundwater and surface water. The Contractor shall dispose of the water so as not to cause injury to public or private property or to cause a nuisance or menace to the public. Additionally, the Contractor shall prevent excessive dust; and he shall, at his own expense, provide adequate dust control measures acceptable to the Municipal Engineer.

H. The Contractor shall implement all erosion control in conformance with the WDNR Conservation Practice Standards (Latest Edition). All existing and installed inlets shall have erosion protection. These items shall be incidental to the project.

I. Restoration

1. All damaged, disturbed, or removed surfaces, structures, or utilities, whether private or public, shall be repaired, restored, and/or replaced to a condition equal to or better than that which existed prior to the start of the work, including all ditches, culverts, roadways, alleyways, field lawns, walkways, retaining walls, fences, buildings, driveways, mailboxes, and any other items that may exist in the construction area.
2. Following initial soil disturbance, all areas shall be restored within one month, weather permitting.

3. All disturbed areas within the right-of-way and outside the paved streets and all easements shall be topsoiled to provide a minimum depth of 6 inches with salvaged topsoil, fine graded, raked free of lumps and stones, seeded and mulched. Any additional topsoil required to return the site to a condition as good as or better than existing condition shall be the responsibility of the Contractor.
4. All restoration will be considered as incidental to the appropriate construction bid item. Restoration work will not be paid for as a separate item.

J. The owner shall have prior claim to all surplus excavated material. All excess excavate material shall be disposed of on-site as directed by the Owner. The topsoil shall be removed prior to placing the material and replaced when completed. If the Owner does not desire to claim surplus excavated material, the contractor shall be totally responsible for obtaining a disposal site. **NO** material shall be disposed of in a flood plain, wetland, or waterway.

K. Clearing, grubbing, and stripping of the topsoil will be the responsibility of the Contractor, and shall be considered incidental to the appropriate bid item. The topsoil shall be temporarily stockpiled on-site.

L. The subgrade condition and elevation shall be checked by the Municipal Engineer prior to placement of base course material. The base course condition and elevation shall be checked by the Municipal Engineer.

M. Submit list of subcontractors to Municipal Engineer.

N. Removal of concrete sidewalk, bituminous pavements, curb and gutter, and driveway shall include disposal by the Contractor at a site that will accept such material. This work shall be included in the appropriate bid item.

O. Contractor shall not commence work on-site until all materials are approved and are on-site.

1.04 WORK SEQUENCE

A. The Contractor shall submit a construction schedule documenting all phases of construction. The construction schedule shall be submitted in accordance with Section 01300, Submittals.

B. Final work to be completed will include site grading and landscaping.

C. Operation and start-up of all equipment must be approved by the Engineer prior to proceeding. Start-up shall be in accordance with Section 01650, Starting of Systems.

1.05 CONTRACTOR USE OF SITE

A. General:

1. The "area of the site" referred to in these specifications shall be limited to existing rights-of-way or easements as shown on the drawings.

OR

1. The "area of the site" referred to in these specifications shall be as shown on the drawings.

2. Construction activities shall be confined within the area of the site limits.

3. From the start of work to completion Contractor is responsible for the care of the site and the premises which are affected by operations of work of this Contract.
4. Except for permanent site improvements provided under the Contract, Contractor shall restore property disturbed during the work, to the conditions which previously existed.
5. Work in occupied spaces shall be restricted to specified work and essential activities, such as making necessary connections and extending services or constructing temporary access ways. Such work shall be scheduled in advance with Owner.

B. Parking and Deliveries:
1. Contractor is responsible for control of traffic by vehicles and persons within the limits of its operations.
2. Parking for employees, subcontractors, and agents of Contractor shall be in areas subject to approval of Owner.
3. Access to the site for delivery of construction material or equipment shall be subject to approval of Owner.

C. Work in Private Right-of-Way
1. Whenever the work is to be prosecuted through property for which the Owner has obtained a license, permit, or easement, the Contractor shall abide fully with the terms of the license, permit, or easement, a copy of which is on file with the Owner.
2. Prior to final payment, the Contractor shall send a notice to all easement grantors by certified mail, return receipt requested, a copy of which shall be filed with the Owner. Said notice to be similar to the following:

The undersigned Contractor has completed the restoration of the construction site on which you have granted an easement for installation of certain utilities and improvements. If said site restoration is not completed to your satisfaction, please contact the easement grantee in writing, and arrangements will be made immediately to view the site and restore the site in conformance with our contract obligations.

If the easement grantee does not hear from you in writing within 10 days from the above date, site restoration of your property will be deemed completed and approved by you.

_____
(Name of Contractor)

_____
(Address of Contractor)

Owner shall furnish contractor with names and addresses of easement grantors.

1.06 OWNER OCCUPANCY

A. The Owner will occupy the site during construction.

B. Provide access for state and local review agencies.

1.07 EXISTING SERVICES AND STRUCTURES

A. Interruption of existing services shall be kept to a minimum and shall be limited to times approved by the Owner.

B. The Contractor shall coordinate with Owner and local utility companies in keeping the services in operation and repair any damages to the satisfaction of the Owner and local utility.

C. Contractor shall not interrupt any existing services until written approval is received from the Owner.

D. In accordance with Wisconsin Statute 182, the Contractor shall contact Diggers Hotline prior to beginning any excavations. A call to Diggers Hotline does not absolve the Contractor of the requirements of this statute.

E. Contractor shall proceed with caution in excavating and preparing the site so that the location of existing structures can be determined. Contractor shall keep an accurate record of existing services and structures and provide a copy to the Owner. The record shall include adequate measurements, depths, and conditions.

1.08 PROTECTION OF WORK

A. Contractor shall protect the Owner's property from damage, dust, debris and other resulting construction activities.

B. Contractor shall keep property free from dirt, dust and fumes from construction activities at all times.

C. Property damaged by the Contractor shall be repaired or replaced by the Contractor to the satisfaction of the Owner.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

- END OF SECTION -

SECTION 01050

FIELD ENGINEERING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Work under this section is associated with:
   1. Staking.
   2. Profile and topography.
   3. Records and markers.

1.02 STAKING PROVIDED BY OWNER'S REPRESENTATIVE

A. Staking for utility construction shall include:
   1. Location of construction limits.
   2. Original staking of line and grade and location off all structures.
   3. Benchmarks on site.

B. Staking for building construction.
   1. Two construction baselines
   2. Establish benchmarks onsite.
   3. Location of construction limits.

1.03 STAKING TO BE PROVIDED BY CONTRACTOR

A. Any staking work required to complete the work and not specifically provided by the Owner's representative.

B. Contractor shall establish grade from stakes or benchmarks established by the Owner's representative.

1.04 CONSTRUCTION STAKING

A. The Contractor shall provide the Owner's representative an advance notification of three working days when requesting construction staking.

B. All construction shall be completed by the Contractor according to the alignments, grades, and baselines as established and set by the Owner's representative.

C. The Contractor shall be responsible for the cost of restaking baselines, line & grade, structures & benchmarks unnecessarily destroyed or altered as a result of his negligence during the construction period.

1.05 PROFILE AND TOPOGRAPHY

A. Contours or profiles of the ground are shown on the drawings. These profiles and contours are reasonably correct, but are not guaranteed to be absolutely so, and together with any schedule of quantities are presented only as an approximation.

1.06 CONTRACTORS RECORDS AND MARKERS

A. In addition to submittals and records required in other parts of the Contract Documents, Contractor shall record the following in such a manner that the Owner can locate same in the future by reference to recorded measurements:
   1. Any deviations of underground covered work from contract drawings.
   2. On pipeline construction, the exact location and depth below grade of all:
      a. Valves and pipelines.
      b. Changes in direction.
      c. or "T" branches on sewers.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

- END OF SECTION -

SECTION 01060

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This section includes regulatory requirements in regard to the project. Regulatory agency's requirements supersede this section.

B. Related Sections and Divisions: Applicable provisions of the General Conditions shall govern the work in this section.

1.02 OSHA REQUIREMENTS

A. All work including site safety, equipment, materials and fabricated items provided by the Contractor shall comply with all OSHA requirements.

1.03 PERMITS

A. The Contractor shall obtain all permits required for this project. Where the permit requirements of any permit are more restrictive than the plans and specifications, the permit requirements shall govern.

B. Contractor shall obtain required permits from all regulatory governmental agencies governing dewatering. Contractor shall be responsible to maintain existing private wells affected by dewatering activities. It shall be the responsibility of the Contractor to provide a water supply to the affected resident at no cost to the Owner. The Contractor shall be required to drill and close wells in accordance with WDNR requirement.

The governing agency in Wisconsin is:

Wisconsin Department of Natural Resources
Private Water Supply Section
P.O. Box 7921
Madison, Wisconsin 53707

C. Contractor shall comply with the WDNR requirements regulating the discharge of effluent from construction trenches. These provisions provide for the removal of suspended solids prior to direct discharge to surface water or wetlands. Contractor shall be responsible for obtaining any necessary permits.

1.04 UNDERGROUND UTILITIES

A. Under the provisions of Wisconsin Statutes, Section 182.0175, all contractors, subcontractors, and any firm or individual intending to do work on this contract shall contact all utility firms in the affected area of construction a minimum of three (3) working days prior to beginning construction so that affected utilities will be located and marked.

1.05 WASTEWATER TREATMENT DURING CONSTRUCTION

A. Maintain wastewater treatment during the construction period beginning with the effective date of the Agreement and ending at substantial completion. Wastewater treatment must achieve as a minimum the requirement of the Owner's WPDES Permit or be consistent with treatment plant performance within the previous 24 months, whichever is least stringent. Any damages assessed against the Owner as a result of the violation of these requirements and shown to be a result of the Contractor's failure to utilize accepted wastewater treatment plant operation and maintenance practices shall be paid in full by the Contractor.

B. The Owner's operating personnel are on site intermittently. The contractor shall maintain sufficient plant operating automation to ensure that required wastewater treatment is maintained continuously. The contractor shall also maintain sufficient alarm condition monitoring equipment and response personnel to ensure that emergency conditions that may develop at the plant during construction do not result in damage, flooding or reduced treatment efficiency.

C. The Contractor shall assume responsibility for any additional costs incurred by the owner as a result of the Contractor's failure to satisfactorily meet the requirements of the WPDES permit.

1.06 PROPERTY MONUMENTS

A. It shall be the responsibility of the Contractor to protect iron pipe and survey monuments from movement where possible. The cost of replacement of any monuments moved or destroyed by the Contractor shall be assessed to him.

1.07 WAGE RATES

A. State Wage Rates are not required. Section 66.293 Wisconsin Statutes will prevail on the contracts in this project.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

- END OF SECTION -

SECTION 01200

PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This section includes all project meetings required during construction.

B. Related Sections and Divisions:
   1. Applicable provisions of the General Conditions shall govern the work in this section.
   2. Section 01300 – Submittals.
   3. All related equipment specifications.

1.02 MEETINGS

A. Project meetings will be held throughout the project at intervals agreed to by the Engineer, Owner and Contractor.

B. Contractor's project manager, job superintendent, subcontractors and necessary equipment suppiers shall attend the project meetings, as appropriate. Contractor's representative shall have the authority to bind the Contractor to decisions at the meeting.

C. The following meetings, at a minimum shall be attended by the Contractor representatives, Engineer, and Owner:
   1. Preconstruction Meeting
   2. Monthly Progress Meeting
   3. Project Close-Out Meeting

D. Notice of meetings shall be mailed to those required to attend and copies to interested parties such as suppliers and governmental agencies.

E. The Engineer shall be responsible for the mailing of meeting notices, meeting agenda and meeting minutes.

F. The Contractor shall submit typed reports detailing the project schedule, schedule compliance and future construction plans affecting the project schedule at the project meetings. The Contractor shall keep the project schedule updated throughout the construction period.

1.03 EQUIPMENT INSTALLATION AND START-UP MEETINGS

A. When required in the individual specification sections, the Contractor shall coordinate an equipment installation meeting prior to beginning the work.

B. When required in the individual specification sections, the Contractor shall coordinate a start-up meeting prior to start-up of the equipment.

C. Contractor shall be responsible for the mailing of meeting notice, meeting agenda and meeting minutes.

D. Contractor shall be responsible for coordinating the attendance of all parties involved in the work.

E. Contractor shall notify the Engineer at least 7 days prior to the meeting date.

F. Contractor shall record the meeting minutes and distribute within 3 working days after the meeting.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

- END OF SECTION -

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This Section includes administrative and procedural requirements for submittals required for performance of the work, including the following:
   1. Contractor's progress schedule.
   2. Submittal schedule.
   3. Shop drawings.
   4. Submittal Transmittal Data Sheet.
   5. Product data.
   6. Samples.
   7. Quality assurance submittals.

B. Related Sections and Divisions:
   1. Applicable provisions of the General Conditions shall govern the work in this section.
   2. Requirements for submittals are described in other sections of the specifications.

1.02 IDENTIFICATION OF SUBMITTALS

A. The Contractor shall mark each submittal and re-submittal by providing the information described in 1.06, Submittal Transmittal Data Sheet.

B. The Contractor shall stamp each submittal indicating that submittal was reviewed by the Contractor and meets the requirements of the plans and specifications. Unstamped submittals will not be reviewed by the Engineer and returned.

1.03 CONSTRUCTION SCHEDULE

A. The Contractor shall prepare and submit a detailed progress schedule in accordance with the General Conditions. The construction schedule shall be of sufficient detail to assure adequate planning and execution of the work and provide an appropriate basis for monitoring and evaluation of the progress of work.

B. The progress schedule shall indicate the sequence of all work including the start date, completion date and duration.

C. The progress schedule shall incorporate shop drawing and sample submittals schedule.

D. If, at any time during the Project, Contractor fails to complete an activity by its latest scheduled completion date, Contractor shall, within 3 working days of notification by Engineer, submit to Engineer written statement as to how and when work force will be reorganized to return Contract to current schedule.

E. When it becomes apparent from progress evaluation and updated schedule data that milestone completion or Contract completion dates will not be met, Contractor shall take some or all of following actions.
   1. Increase construction staffing in such quantities and crafts as shall substantially eliminate backlog of work.
   2. Increase number of working hours per shift, shifts per work day, work days per week, or amount of construction equipment, or combination thereof sufficient to substantially eliminate backlog of work.
   3. Reschedule work items to achieve concurrency of accomplishments.

F. Addition of equipment or construction forces, increasing working hours or other method, manner or procedures to return to current Construction Progress Schedule will not be considered justification for amending Contract Documents or treated as acceleration.

G. The progress schedule shall be updated throughout the construction period. The Contractor shall revise the schedule monthly and submit with the monthly payment request. The progress schedule will be reviewed at the monthly construction progress meetings.

1.04 SUBMITTAL SCHEDULE

A. Contractor shall make all submittals far enough in advance of scheduled installation dates to ensure adequate time for review and approval by the Engineer. This schedule shall also take into account possible revisions and resubmittals.

B. To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.
   1. Allow 4 weeks for submittals.
   2. Allow 2 weeks for re-submittals.
   3. No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the work to permit processing

1.05 SHOP DRAWINGS

A. All shop drawings shall be addressed to shop drawing coordinator at Robert E. Lee & Associates. The shop drawing coordinator will be identified at the pre-construction meeting.

B. Shop drawings shall be submitted under an industrial submittal transmittal data sheet as described in 1.06.

C. Shop drawings shall include technical data including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and other pertinent data. Shop drawings shall be submitted for all manufactured or fabricated items.

D. Shop drawings shall be checked, approved and stamped by the Contractor in accordance with the General Conditions before submitting to the Engineer for review and approval.

E. Submit one correctable, translucent, reproducible print and one blue or black-line print for the Engineer/Architect's review. The Engineer/Architect will indicate and will return the reproducible print. Keep one print with the Record Drawings.

F. Do not use shop drawings without an appropriate final stamp indicating action taken.

G. Except for submittals for the record or information, where action and return is required, the Engineer shall review each submittal, mark to indicate action taken, and return promptly. The Engineer/Architect will stamp each submittal with a uniform action stamp. The Engineer/Architect will mark the stamp appropriately to indicate the action taken, as follows:
1. "No Exceptions Taken": The work covered by the submittal may proceed provided it complies with requirements of the Contract Documents.
2. "Make Corrections Noted": The work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents.
3. "Revise and Resubmit": Do not proceed with work covered by the submittal. Resubmit without delay. Do not use, or allow others to use, submittals marked "Revise and Resubmit" at the Project Site or elsewhere where work is in progress.
4. "Rejected": Do not proceed with work covered by the submittal. Resubmit without delay. Do not use, or allow others to use, submittals marked "Rejected" at the Project Site or elsewhere where work is in progress.
5. "Submit Specified Item": Item submitted does not meet specifications. Submit exact item specified.

H. Shop drawings that require resubmission shall be revised as follows:
1. Revise initial drawings and data and resubmit as required.
2. Provide an itemized list of all changes other than those requested by the Engineer in the cover letter.

1.06 SUBMITTAL TRANSMITTAL DATA SHEET

A. The Contractor shall submit a submittal transmittal data sheet for each shop drawing. Refer to the form at the end of this section.

B. Each shop drawing shall be submitted under its own submittal transmittal data sheet. If more than one shop drawing is submitted on one sheet, the submittal will be rejected and returned.

C. The submittal transmittal data Sheet must be filled out correctly or the submittal will be returned. The following information MUST be included:
1. Date.
2. Project Name.
3. Contractor.
4. Submittal Number.
5. Previous Submittal Number, if applicable.
6. Specification Section Number.
7. Submittal for.
8. Information Block.
9. Name and Signature of Contractor.

D. The submittal transmittal data sheet will be provided by e-mail, if desired by the Contractor.

1.07 PRODUCT DATA

A. Contractor shall provide product data as required to supplement shop drawings.

B. Submittal Transmittal Data Sheet shall be provided for each product data submittal.

C. Product data shall include illustrations, schedules, installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

D. Contractor shall mark each copy of the product data to identify products, models, options and other pertinent.

E. Submit five copies of each required submittal.

F. Contractor shall include all Material Safety Data Sheets (MSDS) required by OSHA.

1.08 SAMPLES

A. Contractor shall provide samples where noted or specified.

B. Submittal Transmittal Data Sheets shall be provided for each sample submittal.

C. Samples are physical examples which illustrate the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

D. Samples shall have attached labels for identification bearing the following information:
   1. Project name.
   2. Description of sample.
   3. Contractor name.
   4. Standards met by the sample.
   5. Submit three samples for review.

E. Approval of the samples shall be obtained before proceeding with the work relating to the sample.

F. Samples not incorporated into the work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site.

G. Field samples shall comply with submittal requirements to the fullest extent possible.

1.09 QUALITY ASSURANCE SUBMITTALS

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other sections of the specifications.

B. Submittal Transmittal Data Sheets shall be provided for each quality assurance submittal.

C. Inspection and Test Reports shall be submitted as required by other sections of the specifications.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

- END OF SECTION -

SUBMITTAL TRANSMITTAL DATA SHEET

(Attach to Each Submittal)

DATE: _____ PROJECT NAME: _____

CONTRACTOR: _____ CONTRACT NO.: _____

SUBMITTAL NO. _____ New Submittal _____ Resubmittal _____ Previous Submittal No. _____

SPECIFICATION SECTION NO. _____
(Cover only one section with each transmittal)

SUBMITTAL FOR: _____ Shop Drawings _____ Product Data _____ Samples

_____ O&M Information _____ Proposed Substitution _____ Other

Specifications Section	Number of Copies	Description ( )	Catalog Drawing or Brochure No.

I certify that the above submitted item has been reviewed in detail and is correct and in strict conformance with the contract drawings and specifications, except as otherwise stated, and is stamped accordingly.

_____
Signature of Contractor

SUBMITTAL REVIEW (**FOR ENGINEER'S USE ONLY**)

TO: _____ TARGET DATE: _____

REVIEWER INITIALS AND DATE: _____

COMMENTS _____

DISPOSITION:

1. No Exceptions Taken
2. Make Corrections Noted
3. Revise and Resubmit
4. Rejected
5. Submit Specified Item

Returned By: _____

Date: _____

SECTION 01323

CONSTRUCTION PHOTOGRAPHS

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: This section includes photography of:
   1. Utility construction routes.
   2. Building sites.

B. Related Sections and Divisions:
   1. Applicable provisions of the General Conditions shall govern the work in this section.
   2. Section 01300, Submittals.

1.02 UTILITY ROUTES

A. Before construction may start in any section, the contractor shall deliver pre-construction photographs to the Engineer. The photographs shall be collated by project stationing. The photographs shall include:
   1. Intervals of 100-feet along pipeline route. (Indicate by station)
   2. Trees and shrubbery.
   3. Surfacing, sidewalks, driveways, and curb and gutter.
   4. Structures.
   5. Fencing, signs, and mail boxes.
   6. Culverts and topographic features.

1.03 BUILDING SITES

A. Building sites shall include wastewater treatment plants, water treatment plants, elevated tanks, bridges, and other structures.

B. Before construction may start, the Contractor shall provide pre-construction photographs to the Engineer. The photographs shall show building conditions and site features.

1.04 PHOTOGRAPHS

A. Photographs shall be in digital format, minimum 3.0 megapixels.

B. The digital footnote/file name shall include the date, name of work, direction of view, and location on each photo.

C. The Contractor shall provide two copies of each photo disc in .jpg format. The project name and project number shall be listed on each disc.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

- END OF SECTION -

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This section includes providing temporary services. Temporary services and be included in total price of contract and maintained until final completion of project.

B. Related Sections and Divisions: Applicable provisions of the General Conditions shall govern the work in this section.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 TEMPORARY HEAT

A. Provide temporary heat required by construction activities for:
   1. Curing or drying of completed installations.
   2. Protection of installed construction from adverse affects of low temperatures or high humidity.
   3. Maintain a minimum temperature of 60°F in permanently enclosed portions of the building and areas where finished work has been installed.

B. Select safe equipment that will not have harmful effects on completed installations or elements being installed.

C. Coordinate ventilation requirements to produce ambient conditions required.

D. Except where use of the permanent system is authorized, provide vented, self-contained LP gas or fuel oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open flame or salamander type heating units or any units that discharge products of combustion into the space being heated is prohibited.

E. When the permanent heating system is tested and ready for operation, it may be used on a temporary basis for heating and building until final acceptance:
   1. Contractor shall be responsible for cost of operation and fuel.
   2. The Owner will assume responsibility for operation and fuel costs on the date of final acceptance of the contract.
   3. Prior to final acceptance, clean entire unit and replace all filters.

3.02 TEMPORARY ELECTRICAL SERVICE

A. Provide a temporary, weatherproof, grounded electric service and distribution system of size and capacity needed for construction including:

1. Meters.
2. Transformers.
3. Overload protected disconnects.
4. Automatic ground-fault interrupters.
5. Main distribution switchgear.

B. Permanent service may be used during construction when available.

C. Contractor shall be responsible for the costs of consumed power furnished through temporary or permanent service until final acceptance of project.

3.03 TEMPORARY WATER SERVICE

A. Provide temporary water service for construction operations.

B. If water service is available from the municipal water utility, the Contractor shall arrange for a temporary metered water service.
1. Size of temporary service shall be minimum of 1 inch.
2. Provide hose bibs as needed.
3. Provide backflow protection as required by DCOMM plumbing code.

C. If water service is not available from a public utility, the Contractor shall be responsible for providing water from some other source.

D. The Contractor shall be responsible for costs of providing temporary service and water usage regardless of source.

3.04 SANITARY FACILITIES

A. Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation or combustion type, properly vented and fully enclosed with a fiberglass reinforced polyester shell or similar non-absorbent material.

B. Use of Owner's sanitary facilities is prohibited.

3.05 FIRST AID

A. Provide first aid equipment complying with governing regulations.

3.06 FIRE EXTINGUISHERS

A. Provide temporary fire extinguishers at project site until Owner occupation or final acceptance, whichever occurs first.

B. Provide hand-carried, portable UL rated, Class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable UL rated, Class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classed for the exposures.

C. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

3.07 REMOVAL OF TEMPORARY FACILITIES

A. Contractor shall remove temporary materials, equipment, services and construction as soon as practicable but not later than final completion.

B. Clean and repair damage caused by temporary facilities and restore to original condition.

C. Temporary facilities, which interfere with Owner's operation, shall be removed at the end of each work period.

- END OF SECTION -

SECTION 01563

EROSION CONTROL

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: This section consists of construction and maintenance of temporary erosion and sediment control measures to be performed prior to and during construction.

B. Related Sections and Divisions:
1. Applicable provisions of the General Conditions shall govern the work in this section.
2. All related construction sections.
3. Erosion Control and Storm Water Management Plan.
4. Section 01300, Submittals.

C. Unless shown otherwise, the contractor shall be responsible for selecting method of erosion and sediment control.

D. The Contractor's erosion control measures must comply with the approved Erosion Control and Storm Water Management Plan, Wisconsin DNR Conservation Practice Standards, Latest Edition, WisDOT Product Acceptability List, Latest Edition, and local erosion control ordinances.

1.02 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals:
1. Material samples upon request or owner's representative.
2. Manufacturer's certification that materials delivered comply with requirements of this section.

PART 2 - PRODUCTS

A. Products used for implementing the Erosion Control and Storm Water Management Plan and for conformance to WDNR Conservation Practice Standards, Latest Edition shall conform to the WisDOT Product Acceptability List, Latest Edition.

PART 3 - EXECUTION

A. All installations shall conform to requirements of the WDNR Conservation Practice Standards, Latest Edition.

B. The Contractor shall maintain a written record of all implemented erosion control practices as required by the WDNR. A suggested format is WDNR Form 3400-187, latest revision (see attached). The written record shall be maintained throughout final completion. Copies shall be forwarded to the Engineer upon request and with each pay request.

C. Inspections of implemented erosion and sediment control best management practices must be performed weekly and within 24 hours after a precipitation event 0.5 inches or greater which results in runoff.

D. Installed erosion control measures shall be removed from the site after 70% revegetation has been achieved, and all remaining disturbed areas shall be seeded, fertilized, and mulched.

PART 4 – PAYMENT

A. Payment shall be based on the following:
   1. Erosion Control shall be incidental to the appropriate bid item.

- END OF SECTION –

Notice: Use of this specific form is voluntary, but the information contained on this form must be collected and kept by the permittee under s. NR 216.48(4), Wis. Adm. Code, for a construction site covered under the General WPDES Construction Site Storm Water Discharge Permit, Permit No. WI-0067831-2. This form is provided for the convenience of the permittee to meet the requirements of s. NR 216.48(4), Wis. Adm. Code. Multiple copies of this form may be made to compile the inspection report.

Inspections of implemented erosion and sediment control best management practices must be performed weekly and within 24 hours after a precipitation event 0.5 inches or greater which results in runoff.

Weekly written reports of all inspections conducted by or for the permittee must be maintained throughout the period of general permit coverage.

The information maintained in accordance with s. NR 216.48 (4) must be submitted to the Department upon request.

Name of Permittee:	
Construction Site Name (Project):	**Construction Site ID No.: (WDNR #)**
Location:	**County:**
Contractor:	**Field Office Phone:**

Note: Weekly inspection reports, along with erosion control and storm water management plans, are required to be maintained on site and made available upon request.

Date of inspection (mm/dd/yy): ___ **Time of inspection: Start: ___ a.m./p.m.** **End: ___ a.m./p.m.**	**Type of inspection: ☐ Weekly ☐ Precipitation Event** **☐ Other (specify) _____** **Name(s) of individual(s) performing inspection:**

Weather:

Description of present phase of construction:

Modifications Required	Yes	No	Not Applicable	**Comments/Recommendations** about the overall effectiveness of the erosion and sediment control measures. **Note**: For each item checked "Yes", complete the follow-up information on page 2.
Ditch Checks	☐	☐	☐	
Erosion Control Plan	☐	☐	☐	
Erosion Mat	☐	☐	☐	
Grading Practices	☐	☐	☐	
Inlet Protection	☐	☐	☐	
Mulch	☐	☐	☐	
Offsite Sediment	☐	☐	☐	
Permanent Seeding	☐	☐	☐	
Schedule / Phasing	☐	☐	☐	
Silt Fence	☐	☐	☐	
Silt Screen	☐	☐	☐	
Sod	☐	☐	☐	
Stabilized Outlet	☐	☐	☐	
Temp. Diversion Channel	☐	☐	☐	
Temp. Settling Basin	☐	☐	☐	
Temporary Seeding	☐	☐	☐	
Tracking Pads	☐	☐	☐	
Turbidity Barrier	☐	☐	☐	
Other (specify) ___	☐	☐	☐	

Use the space below for detailed follow-up action items.

Name of Permittee:		
Construction Site Name (Project):		Construction Site ID No.: (WDNR #)
Exact place of erosion/sediment control inspected	Type of erosion/sediment control and its observed condition	Description of any necessary maintenance or repair to erosion/sediment control, including anticipated date of completion

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

B. Related Sections and Divisions:
1. Applicable provisions of the General Conditions shall govern the work in this section.
2. Section 01300, Submittals.

1.02 MATERIALS - QUALITY ASSURANCE

A. It is the intent of these specifications to procure a quality product by an established manufacturer of the latest design. All components of systems shall be engineered for long, continuous, uninterrupted service. The cost of the equipment shall include all royalties and costs arising from patents and licenses associated with furnishing the specified equipment.

B. All materials shall be designed to withstand stresses encountered in continuous operation, fabrication and erection. All equipment shall be of corrosion-resistant materials or shall be suitably protected by the supplier with corrosion-resistant industrial coatings. Provisions shall be made for ease of lubrication, adjustment and replacement of parts.

C. Material for which no detailed specifications are given shall:
1. Meet the particular industry standard for the material used.
2. Meet the specifications of ASTM, ANSI or SAE for metals and plastics for the use intended.
3. Not be used unless it has previously been used for a like purpose for a sufficient length of time in the field or under field-simulated laboratory conditions to demonstrate its successful use.

D. Source Limitations
To the fullest extent possible, provide products of the same kind from a single source.
1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Engineer/Architect to determine the most important product qualities to consider before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

E. Compatibility of Options
When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.03 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Provide equipment and personnel to handle products by methods that avoid soiling or damage.
4. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
5. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that quantities are correct, products are undamaged, and properly protected. Inform the Engineer or Owner before the inspection occurs, so that they may participate in the inspection if so desired.
6. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units. Seals and labels shall be intact and legible.
7. Store products in accordance with manufacturer's instructions. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
8. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.
9. Arrange for fabricated items or products stored outside to be placed on sloped supports above the ground. Items subject to deterioration shall be covered by weather proof sheet covering which is ventilated to prevent condensation.
10. Store loose granular materials on solid surfaces which are well drained and prevent contamination by foreign matter.
11. Arrange for periodic inspection of stored materials to insure that materials remain undamaged and are maintained under required conditions.
12. All shipment, delivery and storage charges shall be at the expense of the contractor.

1.04 MAINTENANCE OF STORAGE

A. Contractor shall periodically inspect stored products on a scheduled basis.

B. Contractor shall verify that storage facilities comply with manufacturer's product storage requirements, and verify that manufacturer required environmental conditions are maintained continually.

C. Contractor shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of Contract Documents.

D. Contractor shall perform scheduled maintenance of equipment in storage as recommended by the manufacturer. A record of the maintenance shall be kept and turned over to Engineer when the equipment is installed.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
   1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

3.02 INSTALLATION REQUIREMENTS

A. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditions as directed by the respective manufacturers, unless otherwise specified.

B. After installation, Contractor shall protect all materials and equipment against weather, dust, moisture, and mechanical damage.

C. Contractor shall be responsible for all damages that occur in connection with the care and protection of all materials and equipment until completion and final acceptance of the work by Owner. Damaged material and equipment shall be immediately removed form the site.

3.03 FIELD QUALITY CONTROL

A. Qualifications of Manufacturers Field Personnel
   1. Personnel shall be authorized by the manufacturer to erect start-up and initiate warranty of the equipment provided.
   2. Personnel shall come to the site with the required tools and electrical instruments.
   3. Personnel shall have full knowledge of electrical controls pertaining to the equipment and control panels furnished.
   4. Failure to provide personnel with full qualifications shall be cause for service trip to be disqualified as part of the requirements and may because for reimbursement for costs incurred by the Owner due to services required for a qualified start-up inspection.

- END OF SECTION -

SECTION 01661

TESTING AND INSPECTION OF PIPELINE CONSTRUCTION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This section specifies various types of tests and inspection procedures to be used on installed pipelines for determining water and pressure tightness and alignment.

B. Related Sections and Divisions:
1. Applicable provisions of the General Conditions shall apply to this section.
2. Section 01300, Submittals
3. Section 02565, Forcemain
4. Section 02616, Ductile Iron Pipe
5. Section 02617, Steel Pipe
6. Section 02618, Stainless Steel Pipe and Fittings
7. Section 02622, PVC Plastic Pipe
8. Section 02623, Polyethylene Pipe
9. Section 02624, PVC Lined R.C.P Sewer
10. Section 02625, Centrifugally Cast Fiberglass Mortar Pipe
11. Section 02626, Corrugated High Density Polyethylene Pipe
12. Section 02660, Watermain
13. Section 02730, Sanitary Sewer
14. Section 02780, High Density Polyethylene Pipe
15. Section 13325, Double-Walled Leachate Transfer Line
16. Section 15050, Methods and Materials for Piping Installation

1.02 REFERENCE STANDARDS

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

1.	ASTM C828	Low Pressure Air Test of Vitrified Clay Pipe Lines (4 to 12 in.).
2.	ASTM D3034	Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
3.	ASTM F679S	Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings.
4.	ASTM D3350-84	Polyethylene Plastic Pipe and Fittings Material

B. American Water Works Association (AWWA):

1.	AWWA C651	Disinfecting Watermains

C. American National Standards Institute (ANSI):

1.	ANSI B16.5-81	Pipe Flanges (150 lb.)

D. American Water Works Association (AWWA):

1.	AWWA C207-86	Standard for Steel Pipe Flanges for Waterworks Service – Size 4 inches through 144 inches

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 PREPARATION OF PIPELINE BEFORE TESTING

A. The pipes shall be clean of debris and materials prior to testing.

B. Televising shall be performed immediately after cleaning.

3.02 STANDARD GRAVITY PIPELINE INFILTRATION TEST

A. Measurement of infiltrating flow utilizing weir or a dam with measuring container at downstream end of pipeline sector being tested.

B. Conditions to Prevail Before Infiltration Test Commences
   1. Groundwater level shall produce a minimum positive head of 2 feet over all sections of pipeline being tested.
   2. Groundwater level shall be measured by the Contractor prior to the infiltration test utilizing a measurement method acceptable to Engineer.
   3. Weir or dam shall be in place 12 hours before measurement of flow.
   4. Any source of water, sewage or other liquid except infiltrating groundwater shall be eliminated before conducting test.

C. Maximum Limits of Infiltration
   1. Infiltration shall be limited to the maximum allowed as specified in the section for Materials and Methods of Construction for the pipeline specified.
   2. When infiltration limits for gravity pipelines are not given in the appropriate section for Materials and Methods of Construction, the following limits shall apply:
      a. Two hundred gallons in 24 hours for each inch of the diameter of pipe being tested, for every one mile of pipe.
      b. Infiltration rate for manholes shall be computed using the total number of vertical feet of manhole expressed as the equivalent largest diameter sewer entering the manhole.

D. Equipment and Personnel to be supplied by the Engineer
   1. Measuring weirs.
      a. "V" notch 30°, 60°, or 90° with end contractions.
      b. Sharp crested with edge ground to 45°.
      c. Install in manhole or pipe in such a manner that leakage is zero.
      d. Discharge for "V" notch weirs shall be based on the following formula:
         When:
         Q = Cu. ft. per second
         C =.57
         L = Width of notch in ft. at H distance above the apex.
         H = Head of liquid above the apex of notch in feet.
         g = 32.174

e. End contractions shall not be less than 3/4 L.

2. Shallow measuring vessel calibrated to gallons and tenths of gallons.
3. Stop watch with sweep hand indicating seconds and tenths of seconds (certified accurate by a state licensed watchmaker).
4. Sufficient personnel to conduct tests.
5. Either weir method or stopwatch and container method may be used at discretion of Engineer.

E. Equipment and Personnel to be provided by Contract.

1. Qualified observer.
2. Personnel to assist in placing and removing weirs.
3. Contractor responsible for safety during tests including:
   a. Providing signs.
   b. Providing safety equipment including safety equipment for confined entry.
   c. Providing signalmen when necessary.

3.03 STANDARD GRAVITY PIPELINE EXFILTRATION TEST

A. The Contractor may perform an exfiltration test when groundwater level is less than 2 feet above sections of pipeline being tested.

B. The following shall be completed prior to testing:

1. Pipeline shall be tested with a minimum positive head of 2 feet in all sections.
2. Pipeline and manholes shall be filled with water until the water level is a minimum of 2 feet above the highest section of pipe or a minimum of 2 feet above the groundwater level, whichever elevation is higher.
3. Groundwater level shall be measured by the Contractor prior to the infiltration test utilizing a measurement method acceptable to Engineer.

C. The following is the recommended test procedure:

1. Plug section to be tested.
2. Laterals on the line being tested shall be provided with a temporary cleanout to permit adequate release of trapped air in laterals.
3. Fill line and manhole with water as per paragraph B.
4. Let line stand for 12 hours adding water periodically to retain test level as it is reaching its maximum absorption and entrapped air is escaping.
5. After 12 hours, refill line to test level and let stand for 1-hour test period.
6. Measure and record loss of water in gallons per hour.
7. Subtract manhole loss as previously determined, to get actual line loss.
8. Repair and retest until results of final test hour are within allowable leakage limits.

D. Exfiltration shall be limited to 8.34 gallons per hour per inch diameter per mile of pipe.

3.04 STANDARD PRESSURE AND LEAKAGE TEST FOR PRESSURIZED PIPELINES

A. Measure drop in pressure and leakage from liquid filled and pressurized pipelines.

B. Conditions to prevail before commencement of test.

1. Disinfect all testing equipment and fittings.
2. Backfill to at least minimum 4 feet compacted backfill material.

3. Length of pipeline tested shall not exceed 2,000 feet.
4. Reaction backing to be in place a minimum of;
   a. Thirty-six hours if concrete thrust backing has been cast with high early cement.
   b. Seven days if concrete thrust blocking has been cast with standard cement.
5. Fill with water.
   a. Fill each valved section with water slowly, expelling air completely from the pipeline, valves, and hydrants.
   b. Where permanent air vents are not located at all high points or dead ends, Contractor shall install corporation cocks at such points so that air can be expelled as the line is filled with water.
      1) Close all these corporation cocks before applying pressure or leakage tests.
      2) At the conclusion of the leakage and pressure test, the corporation cocks shall be removed and plugged, or left in at the discretion of the Owner.
6. Pressurize to normal working pressure.
   a. After test connections are made and pipeline is filled with water, the pipeline shall be subjected to water pressure normal for that segment of the system being tested.
   b. Examine system for any visible leakage at this stage.
      1) Repair any visible leaks.
      2) Re-pressurize to normal working pressure and continue to repair and re-pressurize until all visible leaks have been stopped.

C. Pressure Test
1. Test pressure shall be not less than 150 lbs. per sq. inch at the lowest point of elevation of the segment being tested.
   a. The minimum test pressures specified above may require that the installed system be tested in several segments in order to attain the proper pressure.
   b. If test pressures other than indicated above are called for in the sections for Materials and Methods of Construction, those pressures shall be used.
2. Pressurize the system being tested to pressure required above by adding water with high-pressure test pump.
3. Repair any visible leaks occurring due to test pressure application.
4. Repeat pressurizing of system to test pressure until no visible leaks can be found.
5. Duration of pressure test.
   a. Test period shall be two continuous hours with no visible leaks occurring.
   b. Pressure during test period shall be sustained.
6. Contractor shall provide pressure gauge with 4-inch face and snubber. Pressure shall read in one-pound increments.
7. If it is found unnecessary to add water during the duration of the pressure test, the leakage test may be waived with the approval of the Engineer.

D. Leakage Test
1. Leakage test shall be conducted after completion of the pressure test.
2. At the option of the Contractor, pressure and leakage tests may be run concurrently.
   a. This option must have the approval of the Engineer.
   b. If this option is agreed upon, then the test procedures required for pressure tests shall prevail for both pressure and leakage tests.
3. When leakage test is conducted after satisfactory completion of the pressure test, the test section shall be subjected to 100 pounds per square inch gauge pressure at the lowest elevation of the section of the main being tested.
   a. If leakage test pressures other than indicated above are called for in the sections for Materials and Methods of Construction, those pressures shall be used.

4. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section of it, necessary to maintain the specified leakage test pressure after the main has been filled with water and the air expelled.
   a. Pressure during test period shall be sustained within plus or minus 5 lbs. of the required test pressure by adding water with test pump.
   b. Meter the amount of water added.
5. Leakage shall not exceed the number of gallons per hour as determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

When:
L = Allowable Leakage in Gallons/Hr.
S =Total Length of Pipe Tested in Feet
D =Nominal Pipe Dia. in Inches
P = Average Test Pressure in lbs/sq. in.

6. When the section under test contains various diameters of pipe, the available leakage will be the sum of the computed leakage for each size of pipe.
7. Should any test section fail to meet the leakage test, the Contractor shall immediately make the necessary repairs at his own expense.
8. Duration of final leakage test shall be one continuous hour with leakage within the allowable limits during the test hour.

E. Contractor shall provide all equipment required to perform the test.

3.05 LOW PRESSURE AIR TEST

A. Contractor shall perform a low-pressure air test on gravity pipelines in lieu of infiltration or exfiltration tests when pipeline is not submerged in groundwater. Test shall conform to ASTM C828.

B. Contractor shall provide all equipment required to perform the test.

C. Testing Procedure
1. Determine test time as follows:
   a. Test times for pipeline segments with uniform pipe size shall be taken from test timetable list below.
   b. Test times for pipeline segments longer than those shown and/or of non-uniform pipe size shall be calculated utilizing appropriate formulas in ASTM C828.

Test Timetable

PIPE DIAMETER "D" IN INCHES

	8	10	12	15	18	21	24	27	30	36	42
25	0.30	0.37	0.45	0.52	0.60	0.74	0.89	1.04	1.19	1.50	1.82
50	0.59	0.74	0.89	1.04	1.20	1.49	1.78	2.08	2.39	3.01	3.64
75	0.89	1.11	1.34	1.57	1.80	2.23	2.67	3.12	3.58	4.51	5.45
100	1.19	1.48	1.78	2.09	2.40	2.97	3.56	4.16	4.77	6.01	7.27
125	1.48	1.86	2.23	2.61	3.01	3.72	4.45	5.20	5.96	7.51	9.09
150	1.78	2.23	2.67	3.13	3.61	4.46	5.34	6.24	7.16	9.02	10.91
175	2.08	2.60	3.12	3.65	4.21	5.21	6.23	7.28	8.35	10.52	12.73
200	2.37	2.97	3.56	4.17	4.81	5.95	7.12	8.32	9.54	12.02	14.54

	8	10	12	15	18	21	24	27	30	36	42
225	2.67	3.34	4.01	4.70	5.41	6.69	8.01	9.36	10.73	13.52	16.36
250	2.97	3.71	4.45	5.22	6.01	7.44	8.90	10.40	11.93	15.03	18.18
275	3.26	4.08	4.90	5.74	6.61	8.18	9.79	11.44	13.12	16.53	20.00
300	3.56	4.45	5.34	6.26	7.21	8.92	10.68	12.48	14.31	18.03	21.81
325	3.86	4.82	5.79	6.78	7.81	9.67	11.58	13.52	15.50	19.53	23.63
350	4.16	5.19	6.23	7.30	8.41	10.41	12.47	14.56	16.70	21.04	25.45
375	4.45	5.57	6.68	7.83	9.02	11.16	13.36	15.60	17.89	22.54	27.27
400	4.75	5.94	7.12	8.35	9.62	11.90	14.25	16.64	19.08	24.04	29.09
425	5.05	6.31	7.57	8.87	10.22	12.64	15.14	17.68	20.27	25.54	30.90
450	5.34	6.68	8.01	9.39	10.82	13.39	16.03	18.72	21.47	27.05	32.72
475	5.64	7.05	8.46	9.91	11.42	14.13	16.92	19.76	22.66	28.55	34.54
500	5.94	7.42	8.90	10.43	12.02	14.87	17.81	20.80	23.85	30.05	36.36
525	6.23	7.79	9.35	10.96	12.62	15.62	18.70	21.84	25.04	31.55	38.18
550	6.53	8.16	9.79	11.48	13.22	16.36	19.59	22.88	26.24	33.06	39.99
575	6.83	8.53	10.24	12.00	13.82	17.10	20.48	23.93	27.43	34.56	41.81
600	7.12	8.90	10.68	12.52	14.42	17.85	21.37	24.97	28.62	36.06	43.63

c. Specified test time (minutes) required for pressure drop from 3-1/2 to 2-1/2 psi when testing one pipe diameter only.

d. Interpolate test times for segment lengths not specifically listed.

2. Pressurize pipeline to 4.0 psi and allow to stabilize (stabilization of air temperature may cause pressure drop).

3. When pressure has stabilized, start test at 3.5 psi and record time.

4. If pressure drops more than 1.0 psi during the determined test time, the test will be considered failed.

3.06 TELEVISING OF PIPELINES

A. Televising of pipelines shall be in accordance with Section 02608, Sewer Cleaning and Televising.

3.07 DEFLECTION TEST

A. Perform deflection tests on all PVC and HDPE gravity pipelines.

B. Not less than 30 days after the installation and backfilling of sewers, including any service connections, the Contractor shall, in the presence of the Engineer, test deflection of the pipe with a mandrel (GO-NOGO device). The mandrel shall be hand-pulled. All pipe with deflections in excess of 5% of the base internal diameter, as determined by ASTM D 3034, ASTM F 679, or ASTM F 794, shall be excavated, rerounded, backfilled and retested after an additional period of at least 30 days. Mandrels shall have nine ribs and be only hand-pulled through the test section. The Contractor shall furnish the mandrels. The length of the minimum radius portion of the mandrel shall not be less than one-third of the nominal diameter of the pipe tested. The pipe shall be flushed and cleaned by the Contractor prior to testing. No flow will be permitted in the pipe while testing for deflections.

1. All expense for trenching, backfill, compaction, paving, and related work that is required because of failure to meet deflection test requirements shall be borne by the Contractor.

2. Acceptance of plastic pipe sewers shall be made only after these deflection test requirements have been met.

C. Mandrel sizes shall be in accordance to the following:

1. PVC SDR 35 (ASTM D3034)

Pipe Size (Inches)	Mandrel Size (Inches)
8	7.28
10	9.08
12	10.79
15	13.20

2. PVC (ASTM F679)

Pipe Size (Inches)	Wall Thickness	Mandrel Size (Inches)
18	T-IA	16.13
18	T-2B	16.20
21	T-IA	19.00
21	T-2B	19.09
24	T-IA	21.36
24	T-2B	21.46
27	T-IA	24.06
27	T-2B	24.17

3. N-12 (5% Deflection

)

Pipe Size (Inches)	Mandrel Size (Inches)
8	7.39
10	9.26
12	11.23
15	14.02
18	16.84
24	22.46
30	28.07
36	33.69
42	38.83
48	44.50

3.08 REPLACEMENT AND REPAIRS

A. The Contractor shall replace or repair any section of pipeline found to be defective so that the pipeline meets the requirements of the specification.

3.09 DISINFECTION

A. The following shall be disinfected in accordance with AWWA C651:
1. New watermain construction.
2. Existing watermain when cut into or repaired.

B. The lines shall be disinfected and flushed until the system is safe.

C. At least one sample shall be collected from every 1,200 feet of watermain, plus one set of samples from the end of each main and a minimum of one from each new branch.

D. The Contractor shall provide the Owner' with two copies of lab test results certifying that the water sampled is free of contamination prior to standard pressure and leakage test for pressurized pipelines.

3.10 TRACER WIRE TESTING

A. Contractor shall test all tracer wire.

B. A power source shall be provided which will transmit a measurable amount of DC current the length of the tracer wire or length of the test area. Current readings shall be taken with the test current "off', then "on" to differentiate between test current and stray current.

C. If continuity is not achieved, the Contractor shall perform required repairs and repeat the test.

3.11 BASIS OF PAYMENT

A. Testing of pipe segments in considered to be incidental to the work and payment for testing the piping segments is included in the cost to provide and install the pipe.

– END OF SECTION –

ATTACHMENT TO FORM

EXAMPLE CALCULATION SHEET

GIVEN: $P_i = 10$ psig

$T_i = 21.1\ ^\circ C = 70^\circ F$

and at time t = 60 minutes

$P_t = 10.05$ psig

$T_t = 23.0\ ^\circ C = 73^\circ F$

Calculate Corrected Initial Pressure

$$P_c = \frac{(10.0 + 14.7)\,(23.0 + 273)}{(21.1 + 273)} - 14.7$$

$$P_c = 24.85 - 14.7 = 10.15 \text{ psig}$$

Calculate Percent Pressure Loss

$$\% \text{ Pressure Loss} = \frac{10.15 - 10.05}{10.15} \times 100 = 0.98\% < 1\% \text{ ok}$$

Note: The difference between the corrected pressure reading (P_c) and the gauge reading (P_t) cannot differ by more than 1% of the corrected pressure reading (P_c) (i.e., .105 @ 10.5 psig) over a time interval of 60 minutes.

SANITARY SEWER LOW PRESSURE AIR TEST

PROJECT: ______________________ CONTRACTOR: ______________________

LOCATION: ______________________ DATE: ______________________

Test Location
MH # To MH #
Length of Main Size of Main
Length of Lateral Size of Lateral
Length of Main
Length of Lateral
Type of Pipe
Req'd Holding Time
Start Pressure
End Pressure
Test: Pass Fail
No Go
Witnessed By

Test Location
MH # To MH #
Length of Main Size of Main
Length of Lateral Size of Lateral
Length of Main
Length of Lateral
Type of Pipe
Req'd Holding Time
Start Pressure
End Pressure
Test: Pass Fail
No Go
Witnessed By

Test Location
MH # To MH #
Length of Main Size of Main
Length of Lateral Size of Lateral
Length of Main
Length of Lateral
Type of Pipe
Req'd Holding Time
Start Pressure
End Pressure
Test: Pass Fail
No Go
Witnessed By

Test Location
MH # To MH #
Length of Main Size of Main
Length of Lateral Size of Lateral
Length of Main
Length of Lateral
Type of Pipe
Req'd Holding Time
Start Pressure
End Pressure
Test: Pass Fail
No Go
Witnessed By

HYDROSTATIC TEST REPORT

Project: _____ Contract: _____

Location of Watermain: _____

Date of Test: _____ Tested By: _____

TEST SECTION:

Size (in.)	No. of Joints	Elevation		Allowable Leakage[a] (GPH)
		High	Low	
			Total	

Type of Pipe and Joints: _____

Average Length of Pipe Sections: _____ ft. Total Length: _____ ft.

Pressure applied at:[b] _____

PRESSURE TEST:

Initial Test Pressure: _____ psi Duration of Pressure Test: _____ hrs

Final Test Pressure: _____ psi Pressure Drop During Test: _____ psi

Remarks:[c] _____

_____

LEAKAGE TEST:

Pressure During Test: _____ psi Duration of Leakage Test _____ hrs

Allowable Leakage of Test Section _____ GPH (Total from above)

Actual Leakage _____ GPH

Percent of Allowable _____

Leakage shall not exceed the number of gallons per hour as determined by the following formula:

$$L = \frac{SD\sqrt{P}}{133{,}200}$$

When:

L = Allowable Leakage in Gallons/Hr.

S =Total Length of Pipe Tested in Feet

D =Nominal Pipe Dia. in Inches

P = Average Test Pressure in lbs/sq. in.

b. Describe location and elevation of point of application of pressure

c. Include results of inspection of the test section and description of repair of any defects

COMMENTS: PASS_____ FAIL_____

_____

_____

SECTION 01740

WARRANTIES

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This Section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers standard warranties on products and special warranties.

B. Related Sections
1. Applicable provisions of the General Conditions shall govern terms of the Contractor's special warranty of workmanship and materials.
2. Section 01770, Closeout Procedures.
3. Specific requirements for warranties for the Work and products and installations that are specified to be warranted, are included in the individual Sections of Divisions 2 through 16.

C. Disclaimers and Limitations
Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.02 DEFINITIONS

A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special Warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.03 WARRANTY REQUIREMENTS

A. Starting date for all warranties shall be the date of Substantial Completion as indicated on Certificate of Substantial Completion, except that warranties for work completed after the date of substantial completion shall begin on date of acceptance of such work by the Owner.

B. Related Damages and Losses
When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.

C. Replacement Cost
Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Document. The Contractor is

responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.

D. Owner's Recourse
Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

1.04 SUBMITTALS

A. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Prepare warranties as various components of the project are completed.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

- END OF SECTION -

SECTION 01770

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: This section includes project requirements for project completion, record document submittal and closeout procedures.

B. Related Sections:
1. Applicable provisions of the General Conditions shall govern the work in this section.
2. Section 01300, Submittals.
3. Specific requirements for individual units of work are included in appropriate technical sections.

1.02 DEFINITIONS

A. Time of Closeout:
1. Directly related to "Substantial Completion," may be either a single time period for entire work or series of time periods for individual elements of work that have been certified as substantially complete at different dates. This time variation, if any, shall be applicable to other provisions of this section.

1.03 PREREQUISITES TO PARTIAL COMPLETION

A. General Requirements:
1. Complete before requesting Engineer's inspection for certification of substantial completion for each phase of work. List known exceptions in request.

B. Substantial Completion:
1. Administrative actions and submittals to precede or coincide with Substantial Completion include.
   a. Incomplete Work:
      1) List of incomplete work
      2) Value of incomplete work
      3) Reasons for work being incomplete
   b. Monetary:
      1) Progress payment request coinciding with, or first request following date substantial completion is claimed showing 100 percent complete or list incomplete work.
      2) Submit statement of changes to contract sum.
   c. Regulatory Requirements:
      1) Obtain, submit releases enabling Owners' full, unrestricted use of work and access to services and utilities. Where required, include occupancy permits, operating certificates, similar releases.
   d. Bonding and Insurance:
      1) Request partial release of retainage.
      2) Advise Owner of pending insurance change-over-requirements (if

Builders Risk Insurance is provided by Contractor).

C. Inspection Procedures:
   1. When prerequisites are complete, submit request in writing to Engineer stating that all requirements are satisfied, and requesting inspection. Upon receipt of Contractor's request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled prerequisites.
      a. Following initial inspection, Engineer will either prepare certificate of substantial completion, or advise Contractor of work which must be performed before certificate will be issued. Engineer will repeat inspection when requested and when assured that work has been substantially completed.
      b. Results of completed inspection will form initial "punch list" for final acceptance.

1.04 PREREQUISITES TO FINAL ACCEPTANCE

A. General Requirements:
   1. Complete punch list items, before requesting Engineers inspection for final acceptance and final payment as required by General Conditions. List known exceptions, if any, in request.

B. Final Payment Application:
   1. Administrative actions and submittals which must precede or coincide with submittal of final payment application for payment include:
      a. Completion of Work:
         1) Completion of Project requirements
         2) Completion of items specified for completion after Substantial Completion
         3) Assurance that work not complete and accepted will be completed without undue delay
         4) Final cleaning
      b. Transfer of Site to Owner:
         1) Removal of temporary facilities and services
         2) Removal of surplus materials, rubbish, similar elements
      c. Submittals:
         1) Consent of Surety (if Performance Bond provided)
         2) Assurance that unsettled claims will be settled
         3) Transmittal of required project construction records (as-built drawings, etc.) to Owner
         4) Certified copy of Engineers final punch list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by Engineer.
         5) Evidence of final, continuing insurance coverage complying with insurance requirements.
      d. Final payment request including certificates of insurance for products and completed operations where required.
         1) Updated final statement, accounting for final additional changes to Contract Sum
         2) Final liquidated damages settlement statement, acceptable to Owner

C. Reinspection Procedure:

1. Engineer will reinspect work upon receipt of notice that work, including punch list items resulting from earlier inspections, has been completed, except for items whose completion has been delayed because of circumstances that are acceptable to Engineer will either prepare a certificate of final acceptance, or will advise Contractor of work that is incomplete or of obligations that have not been fulfilled, but are required for final acceptance. If necessary, reinspection procedure will be repeated.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

- END OF SECTION -

2

DIVISION 2

SITE CONSTRUCTION

SECTION 02052

ABANDONMENT AND GROUTING EXISTING PIPELINES

PART 1 – GENERAL

1.01 SUMMARY

A. Work Included: This section provides for grouting of existing pipelines to be abandoned in place, as shown on the drawings.

B. Related Sections and Divisions:
1. Applicable provisions of the General Conditions shall govern the work in this section.
2. Section 01300, Submittals.
3. Section 02290, Soils and Aggregates.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards.

B. American Concrete Institute (ACI) Standards.

C. State of Wisconsin Department of Transportation, Division of Highways; Standard Specifications for Highway and Structure Construction, latest edition.

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals including the following:
1. The contractor shall submit manufacturer's data for all cement grout mixtures.
2. One copy of all test reports.

PART 2 - PRODUCTS

2.01 CEMENT

A. Portland Cement shall conform to ASTM C150.

B. Portland cement shall be Type I, Type II, or Type III Portland Cement.

2.02 AGGREGATE

A. Aggregate shall conform to ASTM C33.

B. Aggregate shall consist of clean, hard, durable sand and crushed rock, crushed gravel, or gravel. Coarse aggregate shall conform to Soil Class B-3.

2.03 MIX DESIGN

A. All grout shall have a compressive strength of not less than 2000 psi at 28 days when tested in accordance with ASTM C109 or ASTM C579, as applicable.

B. Minimum bags of cement/cubic yard: 2.25

C. Slump: Sufficient to fill all voids.

PART 3 – EXECUTION

3.01 PLACEMENT

A. Contractor shall notify Engineer of grout placement schedule one day in advance of pour to allow for scheduling of inspection.

B. All abandoned pipelines shall be completely filled with grout.

C. Once placing operation commences, it shall be carried out as a continuous operation until a section is completed.

D. The Contractor shall be required to prepare the ends of pipes with pipe caps, vents, and fill pipes.
   1. The low end of the pipe shall be capped and provided with a 4-inch diameter vent to permit the escape of air while filling. The ends shall be adequately restrained to support the head of grout during filling and curing.
   2. The upper end of the pipe shall be capped and provided with a vertical fill pipe and minimum 4-inch diameter vent.

E. Placing should be carried on in such manner that the grout in the pipeline is still plastic and can be integrated with fresh grout.

F. Grout shall not be placed in water. Water level shall be removed or lowered in a manner approved by Engineer.

G. Grout shall be placed before initial set has occurred. Excess water will not be permitted.

H. Where chutes are used to transport grout, they shall be of metal or wood with metal lining. They should have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal so that the concrete will travel fast enough to keep the chute clean but slow enough to avoid segregation of materials. The end of each chute shall be provided with a baffle to help prevent segregation, or the concrete should be discharged through a tremie or elephant trunk directly into the fill pipe.

I. Grout shall not fall freely more than 4 feet. Elephant trunks and/or tremies shall be used to prevent free fall of the grout and to allow the grout to be placed.

J. Pumping equipment shall be of suitable type, without Y-sections, and with adequate pumping capacity.

3.02 CURING AND PROTECTION

A. All freshly placed grout shall be protected from damaging effects of the elements such as freezing, rapid drop in temperature and loss of moisture.

PART 4 MEASUREMENT AND PAYMENTS

4.01 Work under this section shall be incidental to the project or paid for as shown in the bid schedule.

- END OF SECTION -

SECTION 02073

NON-WOVEN GEOTEXTILE

PART 1 – GENERAL

1.01 SUMMARY

A. Work Included: This section consists of everything necessary to deliver and install a non-woven geotextile as specified in the contract documents.

B. Related Sections:
1. Applicable provisions of the General Condition and Special Conditions of the Contract shall govern the work in this section.
2. Section 01300, Submittals
3. Section 02220, Trenching, Backfilling and Compacting
4. Section 02300, Earthwork
5. Section 02772, Linear Low Density Polyethylene Geomembrane
6. (Project specific per Engineer/Designer)

1.02 DELIVERY, STORAGE, AND PROTECTION

A. Transportation of the geotextile is the responsibility of the Contractor. All handling on site is the responsibility of the Contractor. The Engineer will monitor the Contractor as it relates to:
1. The on-site handling equipment being sufficiently adequate to minimize risk of damage to the geotextile;
2. The Contractor's personnel handling the geotextile with care.
3. Upon delivery at the site, the Contractor, in the presence of the Engineer (acting as an observer), will inspect exposed roll surfaces for defects and/or damage. This visual observation should be conducted without unrolling (unfolding) rolls unless defects or damages are found on the surface or suspected. The Engineer will document the following:
   a. That the rolls are tagged with the proper identification, including roll numbers and applicable testing methods;
   b. Rolls or portions thereof, which in the opinion of the Engineer should be rejected and removed from the site because of visually obvious flaws;
   c. Rolls that include flaws, which may be repairable.

B. The Contractor will provide the Engineer with all relevant information from the tags that have been attached to each roll.

C. On-site geotextile storage is the responsibility of the Contractor. Storage space will be reasonably protected from theft, vandalism, passage of vehicles, etc., but the Contractor is solely responsible for the security and quality of the geotextile until the geotextile is accepted by the Owner.

D. During shipment and storage, geotextile shall be protected from ultraviolet light exposure, precipitation, mud, dirt, dust, puncture, cutting or any other damaging or deleterious conditions.

E. Consistent with these objectives, geotextile rolls shall be shipped and stored in relatively opaque and watertight wrappings. The Contractor shall be responsible for proper on-site storage of geosynthetic materials.

1.03 WORK SEQUENCE

A. The Contractor shall be responsible for determining the best sequence for installing the geotextile. The Contractor shall submit this sequence to the Engineer for review and approval a minimum of 30 days prior to installing the geotextile.

1.04 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals:
   1. Manufacturer technical and catalog data, including assembly procedure and materials of construction.
   2. Installation procedures
   3. Two (2) 8" x 10" samples of each type of geotextile fabric to be used.

PART 2 - PRODUCTS

2.01 GEOTEXTILE

A. Geotextile
   1. Geotextile materials shall be the weights shown on the contract drawings and shall meet the requirements of Table 1.

Table 1
Geotextile Properties and Minimum Test Frequency

Property	Test Method	Minimum Result					
Fabric	ASTM D5261	4 oz/sy (nominal)	6 oz/sy (nominal)	8 oz/sy (nominal)	10 oz/sy (nominal)	12 oz/sy (nominal	16 oz/sy (nominal)
Grab Tensile Strength	ASTM D4632	110 lbs.	160 lbs.	230 lbs.	305 lbs.	350 lbs.	500 lbs.
Grab Elongation	ASTM D4632	60%	60%	60%	60%	60%	70%
Puncture Strength	ASTM D4833	50 lbs.	80 lbs.	100 lbs.	130 lbs.	150 lbs.	195 lbs.
Mullen Burst Strength	ASTM D3786	190 psi	285 psi	380 psi	510 psi	550 psi	780 psi
Trapezoidal Tear Strength	ASTM D4533	40 psi	60 psi	80 psi	100 psi	120 psi	150 psi
UV Light Resistance	ASTM D4355	Yes	Yes	Yes	Yes	Yes	Yes

B. Selected samples of the stored geotextile sheet material may be obtained by the Engineer for laboratory testing to document that the geotextile material tested satisfies the minimum material property requirements established in this section.

PART 3 – EXECUTION

3.01 SURFACE PREPARATION

A. The Contractor shall prepare the subgrade for the geotextile. Once complete, the Engineer shall examine the surface, and verify the adequacy of the subgrade. When the Engineer deems the surface acceptable, the Contractor may proceed with the placement of overlying materials.

B. At any time during installation of the geotextile, the Engineer shall inform the Owner of any subgrade areas that are unacceptable. Such defects in the subgrade shall be promptly corrected by the Contractor such that repaired areas meet the project specifications and/or manufacturer's requirements.

3.02 ROLL INSPECTION

A. Prior to placement, rolls shall be inspected for damage and defects by both the Engineer and Contractor.

3.03 ROLL DEPLOYMENT

A. Geotextiles shall be handled in such a manner as to ensure they are not damaged. On slopes, geotextiles shall be anchored in the anchor trench; then rolled down the slope in such a manner as to minimize wrinkles.

B. In the presence of wind, the materials shall be weighted with sandbags until final covers are installed. Care shall be taken to ensure that any underlying liners/layers are not damaged during placement of geotextiles.

C. Care shall be taken to ensure that stones, mud, dirt and debris are not entrapped beneath the geotextile during placement and seaming operations that cause damage.

D. The geotextile shall be placed over the entire area identified on the drawings.

E. Geotextiles shall be cut using a geotextile cutter (hook blade) only. If in place, special care shall be taken to protect other materials from damage that could be caused by the cutting of the geotextiles.

F. A visual examination of the geotextile shall be carried out over the entire surface, after installation, to verify that no potentially harmful foreign objects, such as needles, are present.

3.04 SEAMING

A. Geotextile shall have a minimum 12-inch overlap.

B. Contractor shall ensure that no earth cover material could be inadvertently inserted beneath the geotextile.

C. The Engineer shall observe and document that the panel overlap meets the project specifications and that there are no excessive folds or wrinkles in the geotextile.

3.05 DAMAGE AND REPAIRS

A. Any holes or tears in geotextiles shall be repaired by patching with the same geotextile materials. The patch shall be a minimum of 24 inches larger than the area to be repaired in all directions.

B. Care shall be taken to remove any soil, object, or and other material which penetrated or tore the geotextile.

C. The Contractor shall document that any holes or defects were repaired.

- END OF SECTION -

SECTION 02201

EARTHWORK
(ROADWAY CONSTRUCTION)

PART 1 – GENERAL

1.01 SUMMARY

A. Work included: This section shall include everything necessary for earthwork for roadway construction.

B. Related Section and Divisions:
   1. Applicable provisions of the general conditions shall govern as work in this section.
   2. Section 01300, Submittals.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1.03 SUBMITTALS

A. Submit two (2) copies of test reports performed by Contractor in accordance with section 01300, Submittals.

PART 2 - PRODUCTS

2.01 CLEAN EARTH FILL

A. Soil used for borrow, fill, and backfilling shall meet the requirements of soil class as called for on plans or in specifications.

B. Clean earth fill shall be void of the following:
   1. Stones or rocks larger than 3-inches.
   2. Organic content.
   3. Silty clays with high plasticity.
   4. Man-made rubble.
   5. Contaminated or hazardous waste.

PART 3 - EXECUTION

3.01 EXCAVATION

A. Clear and grub site and dispose of vegetation.

B. Strip and stockpile topsoil. Topsoil not used in the project shall be stockpiled and remain on the property of the owner unless otherwise noted.

C. Excavate to elevation, grade and section as shows on the plans

D. Excavate for any proposed structure as follows:
   1. Remove any unstable material from under structures.
   2. Undercut material shall be removed and replaced with compacted backfill sloped 1:1 at its perimeter.
   3. Removal of unstable material shall be done only with the owner's approval.

3.02 SUBGRADE COMPACTION IN CUTS

A. Compact subgrade to a density of not less than 95 percent of modified proctor.

3.03 SUBGRADE COMPACTION IN FILL AREAS

A. Contractor shall scarify and compact existing ground prior to placing fill material.

B. Compact fill in layers not exceeding 8 inches in thickness.

C. Compact subgrade to a density of not less than 95 percent of modified proctor.

3.04 MOISTURE REQUIREMENTS

A. Proper soil moisture contents for compaction shall be maintained in all soils.
   1. Optimum moisture content as determined by Modified (ASTM D1557) Proctor shall be used to determine acceptable moisture contents for soil compaction.

3.05 DEWATERING

A. The Contractor shall be responsible for the following:
   1. Determination of groundwater conditions.
   2. Providing and maintaining necessary means and methods to dewater excavations.
   3. Disposal of water.
   4. Prevention of runoff and discharge from entering excavations & subgrade.
   5. Securing permits from all regulatory, governmental agencies governing dewatering.
   6. Providing pumping equipment, generating equipment, and/or power.
   7. Maintaining dewatering operation and prevention of water from entering the work area until backfilling, placement of fill, base course, and compaction procedures are completed.

3.06 DISPOSAL OF SURPLUS MATERIAL

A. The Owner shall have prior claim to all surplus excavated material. If such claim is exercised by the Owner, the material shall be deposited at such points as may be directed by the Engineer at the expense of the Contractor, the haul not to exceed two (2) miles. If Owner does not desire to claim surplus excavated material, the Contractor shall be totally responsible for obtaining a disposal site. No material shall be disposed of in a flood plain, wetland or waterway.

B. After delivery to any designated location, such material shall be leveled off by the Contractor.

3.07 FINISH GRADING

A. Grade, trim, and shape subgrade to required grade and section.

1. Adjust slopes by grading so that transition is smooth and gradual.
2. The crests of cut banks shall be rounded and shaped.
3. Washouts and ruts shall be refilled, regraded, and properly compacted.
4. Remove all stones 3 inches or larger from grading limits.

B. Grade shall be finished within 0.05 feet at required line and grade.

3.08 TESTING

A. Contract with an independent testing laboratory to provide testing services required by this section. Contractor shall be responsible for the cost of all testing required for submittals.

B. The following testing services shall be provided:
1. Source Testing:
   a. Test all soils for acceptance as required by Section 02290, Soils and Aggregates for Soils.
   b. Test all aggregate for acceptance as required by Section 02235, Crushed Aggregate Base Course.
2. Installation Testing:
   a. Determine maximum density and optimum moisture content for compaction in accordance with ASTM D1557 (one test for each type of material for each source).
   b. Conduct field density tests in accordance with ASTM D1556 and/or D2922 and D3017.
3. Perform additional testing when:
   a. Densities do not meet project requirements.
   b. Change in material source.
   c. Change in compaction methods.
4. Minimum frequency for field density testing shall be two (2) acceptable tests per project or as follows, whichever number is greater:
   a. Perform one (1) density test per 350 square yards per lift or every 100 lineal feet of roadway in accordance with ASTM 1556 and/or D2922.

C. The provisions of the above testing requirements may be waived by the Engineer in lieu of the following testing methods.
1. The subgrade condition and elevation shall be checked by the Engineer prior to placement of basecourse material. The subgrade will be proof rolled using a tandem axle dump truck fully loaded with basecourse material to the maximum legal weight limit. The basecourse condition and elevation shall be checked by the Engineer prior to placement of the asphalt binder material.

D. When the testing results show that the work is of an acceptable nature, the acceptance of the work shall not relieve the Contractor from making corrections to the tested work during the warranty period.

PART 4 – MEASUREMENT AND PAYMENT

A. Excavation
1. Work under this section shall be incidental to the project or paid for as shown in the bid schedule.

2. Payments for excavation shall include:
   a. Hauling and grading.
   b. Compaction of grade.
   c. Backfilling and compacting around structure.
   d. Disposal of surplus material off site as necessary.
   e. Finish grading.
   f. Testing.
   g. Clearing and grubbing.
   h. Stripping and stockpiling topsoil.
   i. Erosion Control

- END OF SECTION -

SECTION 02203

CUTTING AND PATCHING (ROADWAYS)

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: This section shall consist of the replacement and repair of pavement, including any existing patching or surfacing materials disturbed by construction. Work covered by this section shall include but not limited to the following:
   1. Sawcutting of pavement edges.
   2. Removal of sidewalks, driveways and curb and gutter.
   3. Excavation, removal, and disposal of pavement material.
   4. Replace and compact subbase material.
   5. Replacement of pavement material in kind.

B. Related Sections and Divisions:
   1. Applicable provisions of the general conditions shall govern the work in this section.
   2. Section 02201, Earthwork (Roadway Construction).
   3. Section 02235, Crushed Aggregate Base Course (Roadway Construction).
   4. Section 02505, Asphaltic Concrete Pavement.
   5. Section 02521, Concrete Curb and Gutter.
   6. Section 02775, Concrete Sidewalk and Driveway.
   7. Section 03200, Concrete Reinforcement.
   8. Section 03251, Expansion and Contraction Joints.
   9. Section 03303, Cast-In-Place Concrete, Street Work.

C. All replacement of pavement material shall be performed by a contractor whose primary business is concrete or bituminous roadwork. The contractor shall be listed on the subcontractor list, included with the bid & approved by the Owner.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Bituminous pavement, concrete and base material shall be equal in quality and kind as to the materials removed, unless otherwise specified.

B. Materials shall be approved prior to installation.

PART 3 - EXECUTION

3.01 PREPARATION

A. Perform cutting and patching without injury to remaining adjacent pavement and concrete

B. Unless indicated otherwise, roadway shall be kept open to all traffic during performance of work.

C. Remove pavements, sidewalks, driveways and curb and gutter to the construction limits.

D. Sawcut vertically all pavement, sidewalks, and driveways to a minimum depth of 3 inches prior to breaking.

E. Remove all curb and gutter and sidewalks to nearest joint outside work area.

F. Sheet and brace trench walls if necessary to maintain cutting and patching within limits.

G. At a minimum, replacement shall be a full-lane width patch.

H. Subbase, base, pavement, sidewalks, driveways, and curb and gutter shall be prepared and placed in accordance with the plans and applicable specifications.

I. Minimum thickness shall be as follows:
   1. Bituminous pavement shall be 3" unless otherwise shown on plans.
   2. Concrete pavement in roadways shall be 6" unless shown otherwise on plans.
   3. Concrete pavement in sidewalks shall be 4" unless shown otherwise on plans.

PART 4 – MEASUREMENT AND PAYMENT

A. Work under this section shall be incidental to the project or paid for as shown in the bid schedule.

- END OF SECTION -

SECTION 02220

TRENCHING, BACKFILLING AND COMPACTION

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This Section shall include all work required for trenching, backfilling, and compaction of utility trenches.

B. Related Sections and Divisions:
1. Applicable provisions of the General Conditions shall govern the work in this section.
2. Section 01300, Submittals.
3. Section 01563, Erosion Control.
4. Section 02600, Buried Piping.
5. Section 02616, Ductile Iron Pipe.
6. Section 02622, PVC Plastic Pipe.
7. Section 02623, Polyethylene Pipe
8. Section 02624, PVC Lined RCP Sewer.
9. Section 02625, Centrifugally Cast Fiberglass Mortar Pipe.
10. Section 02565, Forcemain.
11. Section 02720, Storm Sewer and Drainage.
12. Section 02730, Sanitary Sewer.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1.	D4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
2.	D1140	Test for Amount of Materials in Soils Finer than the No. 200 Sieve.
3.	D1556	Test for Density of Soil in Place by the Sand-Cone Method.
4.	D1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-Lb (4.54 kg) Rammer and 18 in. (457 mm) Drop.
5.	D2216	Laboratory Determination of Water (moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures
6.	D2922	Test for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
7.	D3017	Test for Moisture Content of Soil and Soil-Aggregate by Nuclear Method (Shallow Depth).

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals:
1. Two (2) copies of testing data of laboratory tests and test performed by Contractor.
2. Two (2) copies of testing data to the Owner's Representative.
3. Shoring, bracing and sheet piling procedures and details.

1.04 PROJECT/SITE CONDITIONS

A. Do not block or obstruct sidewalks or pavement with excavated materials without approval from Owner.

B. When close sheeting is required, drive to prevent soil from entering trench below or through sheeting.

C. Fill voids remaining after sheeting is pulled with approved material.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 GENERAL

A. It shall be the Contractor's responsibility to comply with all federal, state, and local rules and regulations concerning:
   1. Construction safety including confined entry.
   2. Noise Control
   3. Dust and smoke control

B. Heating
   1. When weather dictates, provide temporary heat to protect work prone to freezing.

C. Access to Public Services
   1. Insure free access to all fire hydrants, valve boxes, manholes, curb stops, fire alarms, police call boxes, etc.
   2. Contractor shall be responsible for notifying police, sheriff, fire department, ambulance services, and school bus services before blocking or partially blocking any public thoroughfare.

D. Protection of Work, Public, and Property
   1. Provide safe passage for local traffic, pedestrian and vehicular.
   2. Provide access to properties abutting street where utilities are being constructed.
   3. Provide all necessary barricades, warning lights, and signs, signals, flagmen, etc. in accordance with federal, state, and local regulations.

E. Work on Streets and Work In Waterways and Wetlands
   1. Work on streets or in waterways and wetlands are subject to provisions of special permits required and issued by governmental agencies having jurisdiction in addition to requirements of specification for this work.
   2. Work shall not commence prior to receiving required permits.
   3. Provide special bonds when required by permit.
   4. Notify controlling authority prior to beginning and after completing any construction in right-of-ways or streams.
   5. Bear all expenses related to permit compliance.

F. Easements

1. Owner will provide all easements. Contractor shall verify easements one in place prior to commencing work.
2. All work on easements will be in strict compliance with the terms of the easements.
3. Owner, easement grantee, Contractor and Engineer shall be in full agreement on the method of execution prior to beginning work.
   a. Only structures, trees, shrubs, and other obstructions are to be removed as mutually agreed.
   b. Restoration shall be equal to original condition or the conditions of the agreement.

G. Protection of Established Property Markers

1. Contractor shall protect all property markers (iron pipe, concrete, or wood posts, steel pins) from movement from original position.
2. Cost of replacement of property markers moved during construction shall be at Contractor's expense.

3.02 OBSTRUCTIONS AND CONFLICTS

A. When existing utilities and structures are indicated on the drawings, it should not be assumed that all existing utilities and structures are shown.

B. The locations of existing utilities and structures when given, are plotted on the drawings for the information of the Contractor, but should not be construed as a representation of the exact location.

C. When an underground structure not shown or indicated occupies the alignment of the proposed pipe or structure, the Contractor shall give immediately notice to the Engineer and the Owner of the structure of such conflict. The Owner will issue a change order to remove, relocate or alter the structure, plan, or profile of the proposed structure as required to eliminate the conflict.

D. The Contractor shall be responsible for all injuries to any below or above ground utilities and structures encountered during construction.

E. The Contractor shall make arrangements with the utility companies for any relocation of Interfering utilities. No extra cost due to unexpected delays or coordination work shall be incurred by the Owner except for authorized utility alterations performed by the Contractor as provided below.

F. Any underground utilities or other structures that are located outside of the construction limits of this contract which the Contractor wishes to have moved to facilitate construction shall be arranged with the owner of such structures, the Contractor shall pay all costs of the accommodation.

G. Separation of Watermains and Sewers

1. The following separations shall be minimum:
   a. Parallel
      1) Eight feet, measured center to center
   b. Vertical (when pipelines cross)
      1) Watermain below a sewer - 18 inches clear
      2) Watermain above a sewer - 6 inches clear

2. When crossing a sewer, center a full length of watermain or sewer to position joints as far as possible from sewer.

H. The Contractor shall be responsible to:
1. Maintain or provide temporary service for water, sewers, gas, culverts, drains, electricity, or other utilities interrupted.
2. Provide temporary connections and outlets for all private and public utilities that are interrupting construction.
3. Provide disposal for all drainage and wastewater resulting from relocations and/or interruptions in accordance with regulations and permits of the controlling governmental agency(s).

I. In the event the Contractor fails to make restitution to any damaged property, the Owner reserves the right to deduct the cost of repairs from monies due him.

J. Obstruction Removal
1. Clear all obstructions from within the construction limits.
2. Remove pavement, curb and gutter, sidewalks and driveways within the trench limits.
3. Construction limits shall be defined as:
   a. Street right-of-ways.
   b. Project site property lines.
   c. Easement limits.

3.03 DEWATERING

A. The Contractor shall be responsible for the following:
1. Determination of groundwater conditions.
2. Providing and maintaining necessary means and methods to dewater excavations.
3. Disposal of water.
4. Prevention of runoff and discharge from entering excavation.
5. Securing permits from all regulatory, governmental agencies governing dewatering.
6. Providing all wells, pumping equipment, generating equipment and/or power.
7. Damage caused to private wells due to dewatering.
8. Maintaining a water supply to all wells affected by the dewatering operation.
9. Dewatering to a minimum depth of 12 inches below all excavations.
10. Maintaining dewatering operation until backfilling and compaction procedures are completed.
11. Removing all dewatering equipment and removing/abandoning wells in accordance with regulatory agency requirements.

B. Groundwater Disposal
1. Convey groundwater to point of discharge through pipelines.
   a. Open ditches and trenches are not permitted.
   b. Use of Owner's utilities is not permitted without written consent.
2. Maximum Sediment Content- 10 milligrams per liter.

3.04 TRENCHING

A. Excavate to the depth and width necessary to install the intended pipeline.

B. Contractor shall excavate whatever materials are encountered as required to complete the work. The bottom of the trench shall be leveled off, all loose and disturbed soils removed and hard tamped prior to installation of pipe.

C. The trench at the crossing of underground utilities in place shall be as narrow as practicable. All underground utilities shall be protected from damage and maintained in service at their original location and grade during the work. Any damage to underground utilities shall be replaced or repaired at no cost to the Owner.

D. Immediately upon backfilling in paved areas, a temporary 3-inch thick bituminous (cold mix) concrete pavement shall be placed and maintained daily to provide a smooth even surface until final surface replacement is made.

E. Pipe bedding shall be in accordance with the standard details shown on the drawings.

3.05 BACKFILLING

A. When backfilling, the Contractor shall insure that the backfill is free of:
1. Stones larger than 3 inches. (Stones larger than 3 inches and up to 6 inches may be used provided a min. of 24 inches of cover material is provided over pipelines).
2. Frozen material.
3. Concrete and rubble.
4. Blasted rock.
5. Vegetation and organic material.
6. Refuse and debris.

B. No backfill shall be placed under water or over unsuitable subgrade conditions as determined by Owner's representative.

C. Pipe backfill shall be in accordance with the standard details shown on the drawings.

3.06 COMPACTION

A. Compact fill in horizontal layers not exceeding 8 inches in thickness.

B. Provide specified compaction through entire lift thickness by mechanical compaction. Compaction with a backhoe bucket is not acceptable.

C. Proper soil moisture contents for compaction shall be maintained in all soils.
1. Optimum moisture content as determined by Modified (ASTM D1557) Proctor shall be used to determine acceptable moisture contents for soil compaction.

D. Compaction requirements for all fill soils unless specified elsewhere shall be as follows:

Class 1 - Fills supporting structures.
- Subgrade under pavements or floors.
- Backfill under piping and conduits.
- Trench backfill over pipelines.
- Trenches within existing or proposed roadways, sidewalks, driveways, shoulders, and other hard surfaces

Class 2 – Fills which do not support structures.

COMPACTION REQUIREMENTS FOR VARIOUS SOIL CLASSES

	Required Compaction (%) of Modified Proctor Density	
Soil Class	**Class 1**	**Class 2**
B-3 through B-4	95	90
C-1 through C-6	95	90
D-1 through D-3, and G-1 and G-2	95	90
E-1	95	90

D. Pipe backfill shall be in accordance with the standard details shown on the drawings.

3.07 TESTING

A. The Contractor shall secure the services of an established independent Soils Engineer/laboratory for services as follows:
   1. The laboratory selection shall be subject to the approval of the Owner's representative.

B. Testing Requirements:
   1. Source Testing:
      a. Test all soils and aggregates for acceptance as required by Section 02290, Soils and Aggregates.
   2. Installation Testing:
      a. Determine maximum density and optimum moisture content for compaction in accordance with ASTM D1557 (one test for each type of material for each source). Maximum density test results shall be submitted to the Engineer within 48 hours after starting construction.
      b. Conduct filed density tests in accordance with ASTM D1556 and/or D2922 and D3017. Provide the Engineer with the test results at the end of each work day.
      c. If the contractor proceeds with backfilling without density testing or without a maximum density test, he does so at his own risk. Any portion of the work that does not meet the contract specifications will be removed and recompacted at the contractor's expense.
   3. Perform additional testing when:
      a. Densities do not meet project requirements.
      b. Change in material source.
      c. Change in compaction methods.
   4. Minimum frequency for filed density testing shall be two (2) acceptable tests per project or as follows, whichever number is greater:

Fill Utilized For:	Number of Acceptable Tests:
Trench backfill under paved or surfaced areas greater than 15' depth	1 test per 100 feet of trench or any portion there of, in the lower 1/4, each middle 1/4, and upper 1/4.
Trench backfill under paved or surfaced areas less than 15' depth	1 test per 100 feet of trench or any portion there of, in the lower 1/3, middle 1/3, and upper 1/3.

Lateral trench backfill	1 test per 100 feet of trench with a minimum of 1 test location per trench, in the lower 1/3, middle 1/3, and upper 1/3.
Backfill under structures or floors	1 test per 1,500 square feet, minimum of 1 test per lift.

5. All field density testing shall be performed during trench backfilling and compaction operations. Spot excavation and density testing after backfilling and compaction has been completed is not acceptable.
6. The Contractor shall be responsible for the cost of all testing.
7. When the testing results show that the work is of an acceptable nature, the acceptance of the work shall not relieve the Contractor from making corrections due to failure of the tested work during the warranty period.

3.08 DISPOSAL OF SURPLUS MATERIALS

A. The Owner shall have prior claim to all surplus excavated material. If such claim is exercise by the Owner, the material shall be deposited at such points as may be directed by the Engineer at the expense of the Contractor, the haul not to exceed two (2) miles. If Owner does not desire to claim surplus excavated material, the Contractor shall be totally responsible for obtaining a disposal site. NO material shall be disposed of in a floodplain, wetland, or waterway.

After delivery to any designated location, such material shall be leveled off by the Contractor.

B. Pavement shall be disposed of separately from the soils material.

3.09 SHEETING AND BRACING

A. Contractor shall provide adequate sheeting and bracing to prevent earth from caving or washing into the trench, and shall do all shoring and underpinning to properly support adjacent structures.

B. Trenches and excavations shall be sheeted and braced as required by applicable federal and state code, and as may be determined by the Contractor to be necessary to protect life and property.

C. When close sheeting is necessary, it shall be driven sufficiently to prevent soils from entering the excavation.

D. Sheeting shall be removed during backfilling. Remove sheeting in a manner that will protect the completed pipeline adjacent structures from disturbance.

3.10 TRENCH BOX

A. A trench box shall be used at the Contractor's discretion.

B. Trench box shall conform to the following:
   1. Shall not exceed trench limits.
   2. Shall be constructed in accordance with governing authorities.
   3. Shall be utilized in a manner that will not disturb the pipeline when the trench box is moved.

3.11 RESTORATION

A. Contractor shall clean the site of all surplus excavated material, rubbish and debris, and construction material.

B. Culverts removed for the purpose of installing pipeline shall be reinstalled to their original position. Any culverts damaged during removal or construction activities shall be replaced by the Contractor.

- END OF SECTION -

SECTION 02229

ROCK REMOVAL

PART 1 -GENERAL

1.01 SUMMARY

A. Work Included:
   1. Rock removal during excavation for structures and roads.
   2. Rock removal during excavation for utility trenches.

B. Related Sections and Divisions:
   1. Applicable provisions of the General Conditions shall govern the work in this section.
   2. Section 02220, Trenching, Backfilling and Compaction.

1.02 SUBMITTALS

A. Prior to blasting, submit the following to the Engineer:
   1. One copy of blasting permits.
   2. Structure survey including:
      a. Video tape or photographs of existing structure defects.
      b. Written report.

1.03 DEFINITIONS

A. Rock Excavation: All hard, solid rock ledges, bedded deposits and unstratified masses and all conglomerate deposits or any other material so firmly cemented that, in the opinion of Engineer, it is not practical to excavate and remove same, except after continuous drilling and blasting or rock trenching. Rock excavation shall also include all rock boulders necessary to be removed having a volume of one cubic yard or more. Soft or disintegrated rock, shales, hard pan, masonry and concrete rubble, boulders less than one (1) cubic yard, which can be removed with a pick; loose, shaken or previously broken rock; and rock which may fall into the excavation from outside the limits of excavation will not be classified as rock excavation.

1.04 QUALITY ASSURANCE

A. Employ a seismic survey firm if explosives are to be used. Seismic survey firm shall be a company specializing in seismic surveys with five years documented experience.

B. If explosives are to be used, Contractor shall have five years experience or shall employ a firm with five years experience with use of explosives.

C. Blaster shall hold necessary licenses for the type of work performed.

D. Contractor shall be solely responsible for damage to any work or property due to the rock removal operations.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable federal, state, and local codes for explosive disintegration of rock.

B. Obtain permits from authorities having jurisdiction before explosives are brought to site or drilling is started.

C. No explosives shall be used without written permission from Owner.

D. Comply with OSHA, State and Local requirements.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

3.01 STRUCTURE SURVEY

A. Prior to blasting or rock trenching, the Contractor shall conduct a survey of all structures, utilities, and existing surfaces that are within destructive range of the rock blasting or rock trenching area.

B. The survey shall include structures, utilities, and existing surfaces within a minimum radius of 300 feet of the blasting or rock trenching area, and with the actual limits to be determined by the licensed Contractor.

C. Structures include but are not limited to:
   1. Buildings (interior and exterior).
   2. Bridges.
   3. Walkways and retaining walls.
   4. Concrete and masonry structures.

D. Contractor shall be responsible for arranging access to building, property, etc.

E. Survey shall include:
   1. Video tape or photographs depicting all existing interior and exterior defects of structures.
   2. Written report which provides a narration of the videotapes or photographs.
   3. The Contractor shall receive written acknowledgement of any observed defects from property owners and utilities that may be affected by the drillling and blasting or rock trenching work.

3.02 EXCAVATION IN ROCK

A. General
   1. When rock is encountered, it shall be stripped of earth and shale and the Engineer notified in order that he may measure or cross-section the same. In lieu of stripping the earth overburden prior to blasting, the Engineer and the Contractor may mutually agree on a

method to define the vertical limits of the rock. Any rock excavated, before such measurement or agreement is made, will not be estimated, allowed or paid for.

2. All sewers, watermain, and lateral trenches shall be blasted or trenched to 10' beyond the end of the proposed main or lateral stub.

B. Drilling and Blasting-

1. Drilling and blasting work shall only be performed between the hours of 7:00 A.M. and 7:00 P.M. Blasting mats, or other established method, shall be used to prevent flying debris resulting from the blasting operation.
2. Not less than one-half hour before blasting, the Contractor shall notify residences and businesses in the vicinity of the work of the Contractor's intent to blast.
3. The Contractor shall comply with all provisions of the "Special Provisions Applicable to Blasting and Associated Works", revised January 24, 1984, as provided by the Wisconsin Department of Transportation, pages 1-3.
4. In areas where drilling or blasting is adjacent to or downwind of existing structures, dust control shall be used in the drilling operations. The control shall be by water spray or vacuum, and shall be approved by the Engineer and Owner during initial field operating conditions.
5. Blasting near structures, utilities, or any other appurtenances that exist in the construction area shall be at the sole discretion of the Contractor. If the Contractor believes that blasting in certain areas will or may cause damage, he shall select another alternative to accomplish the excavation. There will be not extra compensation for this type of work, and the cost thereof shall be included in the appropriate bid item.

C. Disposal (Blasting and Drilling)

1. All excavated rock shall be classified as undesirable backfill material and shall be disposed of in accordance with Section 02220, Trenching, Backfilling and Construction.
2. At the request of the Contractor, the Engineer may allow the Contractor to crush the excavated rock for use as backfill or bedding material.

D. Rock Trenching

1. The trenching machine shall be laser controlled for line and grade and capable of cutting the trench to the required depth and width in a single pass.
2. Multiple passes will be permitted for pipeline structures and appurtenances or common trench construction.
3. Pneumatic tools may be used to assist with utility crossings and other obstacles.
4. Rock trenching work shall only be performed between the hours of 7:00 a.m. and 7:00 p.m.
5. Not less than one-half hour before trenching, the Contractor shall notify residences and businesses in the vicinity of the work of the Contractor's intent to trench.
6. In areas where trenching is adjacent to or downwind of existing structures, dust control shall be used in the trenching operations. The method of control shall be determined by the Contractor and shall be approved by the Engineer and Owner during initial field operating conditions.
7. Trenching near structures, utilities, or any other appurtenances that exist in the construction area shall be at the sole discretion of the contractor. If the Contractor believes that trenching in certain areas will or may cause damage, he shall select another alternative to accomplish the excavation. There will not be extra compensation of this type of work, and the cost thereof shall be included in the appropriate bid item.

E. Disposal (Rock Trenching)

1. Larger rock, as may be generated from pneumatic tools shall be removed from the site to a disposal area obtained by the contractor.

PART 4 - MEASUREMENT AND PAYMENT

A. Rock Excavation

Rock excavation shall be paid for as hereinafter defined, which price shall be payment in full for completing all work as specified herein including:

1. Drilling and blasting or trenching and removal of rock.
2. Disposal of the unacceptable rock.
3. Backfilling of the void space in the bedding area created by the rock excavation with a suitable bedding material.
4. Backfilling the trench with soil or granular backfill as required.

B. Where there is no bid price for rock excavation, (as hereinafter defined) the Owner will pay for such rock excavation as extra work.

C. The trench in rock excavation shall be excavated to a point six (6) inches below the bell of a bell and spigot type pipe and six (6) inches below the outside of the barrel of a tongue and groove type pipe.

D. Drilling and Blasting

1. Rock excavation shall be paid for per cubic yard as specified herein.
   a) The maximum pay width for rock excavation in a separate trench for sewers and watermains shall be the outside diameter of the pipe plus 12 inches, but not less than 36 inches. The maximum pay width in common trench construction shall not exceed the sum of the outside diameter plus 48 inches.
   b) The maximum pay width for rock excavation in a separate trench for sewer and water laterals shall be the outside diameter of the pipe plus 12 inches, but not less than 36 inches. The maximum pay width in common trench construction shall be the outside diameter of the pipes plus 24 inches, but not less than 36 inches.
   c) The pay quantities for rock excavation for manholes or sewer structures shall be:
      1) For circular structures, a cylinder having a diameter equal to the outside diameter of the structure walls plus six feet and a depth measured from six inches below the base to the top of rock,
      2) For rectangular structures, a prism having length by width dimensions equal to the outside structure wall dimensions plus six feet and a depth from six inches below the base to the top of rock.

E. Rock Trenching

1. Rock excavation shall be paid for per lineal foot as specified herein:
   a) The minimum trench width for rock excavation in a separate trench for sewers and watermains shall be the outside diameter of the pipe plus 12 inches. The minimum trench width in common trench construction shall be the sum of the outside diameter plus 48 inches.
   b) The minimum trench width for rock excavation in a separate trench for sewer and water laterals shall be the outside diameter of the pipe plus 12 inches. The

minimum trench width in common trench construction shall be the sum of the outside diameter plus 18 inches, but not less than 24 inches.

c) The minimum dimensions for rock excavation, for manholes, sewer water, or other structures shall be lump sum as specified herein:

1) For circular structures, a cylinder having a diameter equal to the outside diameter of the structure wall plus four feet.

2) For rectangular structures, a prism having length by width dimensions equal to the outside structure wall dimensions plus four feet.

- END OF SECTION –

SECTION 02230

SITE CLEARING

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This section includes all work associated with site clearing.

B. Related Sections and Divisions:
1. Applicable provisions of the General Conditions shall govern the work in this section.
2. Section 01300, Submittals.
3. Section 01563, Erosion Control.
4. Section 02290, Soils and Aggregates.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Topsoil as referred to in this section shall be a soil material as defined by Soil Class F-1, in accordance with Section 02290, Soils and Aggregates.

PART 3 - EXECUTION

3.01 PREPARATION

A. Contractor shall identify existing plant life to remain and tag accordingly in the presence of the Engineer.

3.02 PROTECTION

A. Contractor shall protect from damage utilities and structures that are to remain.

B. Contractor shall protect all trees, plants and features designated to remain as final landscaping.

C. Protect all survey monuments.

3.03 CLEARING, GRUBBING, AND DISPOSAL

A. Select Clearing
Remove all brush, shrubs, stumps, and trees to within 4 inches of the existing ground surface where designated by the Owner's representative.

B. Grubbing
1. Remove all stumps, roots, logs, and timber.
2. Grubbing shall be carried to a minimum depth of 12 inches.

C. Disposal
   1. The Owner reserves right to all excess top soil, if desired.
   2. Contractor is responsible for the following:
      a. Disposal of all material removed under clearing and grubbing if not wanted by the Owner.
      b. Furnishing of a disposal site.
      c. Obtain and conform to all necessary, federal, state, and local permits for burning and/or burial of material.
      d. Conform to all requirements for disposal of diseased trees.
      e. If permits are not required, Contractor shall comply with the following requirements:
         1) Open burn in a manner as not to damage adjacent trees, shrubs, property, impede traffic, or create a nuisance.
         2) Cover disposal material in a manner that shall minimize future cover settlement.
         3) Maintain a minimum of 2 feet of soil cover.

D. Clearing operations shall be completed in a manner so as to prevent obstruction of traffic and to protect all remaining trees, shrubs, and other vegetation from injury.

3.04 TRIMMING

A. With permission from the Engineer, the Contractor may trim overhanging branches or limbs that interfere with the construction operation. All branches damaged during construction shall be neatly trimmed.

3.05 STRIPPING AND STOCKPILING TOPSOIL

A. Stripping
   1. Remove all topsoil beneath:
      a. Structures.
      b. Roadways.
      c. All paved areas.
   2. Remove topsoil to a depth of 6 inches in:
      a. Areas disturbed by utility construction.
      b. Areas requiring cuts or significant fills (significant fills are fills which cannot be obtained by the addition of topsoil only).

B. Stockpiling
   1. Contractor shall stockpile topsoil obtained in the stripping operation for replacement.
      a. For areas where topsoil is to be replaced after underground utility construction.
      b. For areas involving site grading where topsoil is to be replaced in order to sustain vegetative growth.
   2. In areas where topsoil will not be required as specified above, Contractor shall remove and dispose of excess material as defined in other sections.

- END OF SECTION -

SECTION 02235

CRUSHED AGGREGATE BASE COURSE (ROADWAY CONSTRUCTION)

PART 1 - GENERAL

1.01 DESCRIPTION

A. Work Included: This section includes constructing a crushed aggregate base for roadways shouldering, curb and gutter, and parking lots.

B. Aggregates from recycled material may not be used unless required as part of this project.

1.02 REFERENCE STANDARDS

A. ASTM: American Society for Testing and Materials

B. AASHTO: American Association of Highway and Transportation Officials

C. W.D.O.T.: Standard Specifications for Highway and Structure Construction, Latest Edition.

1.03 SUBMITTALS

A. Test results for aggregate materials supplied for use on this project may be from a source which was approved for a previous project, provided the submitted test results were obtained within 6 months previous to this submittal
   1. Source testing report.

B. Submit two (2) copies of testing data of tests performed by Contractor:
   1. Test reports must include location in work where test was taken.

C. Delivery Tickets
   1. Provide delivery tickets daily for each load of crushed aggregate for base course delivered to the work, including:
      a. Date.
      b. Tare and net weight.
      c. Type of material.

D. Samples
   1. Provide material samples needed for required testing.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Aggregates
   1. Aggregates shall consist of hard, durable particles of crushed stone or crushed gravel and a filler of natural sand, stone sand or other finely divided mineral matter.
      a. Remove oversize material by screening or by crushing to required sizes.

b. Composite material shall be free from organic matter, shale, and lumps or balls of clay and shall conform to the gradation requirements below.

2. Liquid limit and plasticity index.
   a. Aggregate including any blended filler shall have a liquid limit of not more than 25 and a plasticity index of not more than 6.
3. Fracture Count
   a. At least 45% of particles retained on the No. 4 sieve shall have at least one fractured face.
4. Soundness
   a. When the fraction of aggregate retained on the No. 4 sieve is subjected to five cycles of the sodium sulfate soundness test, weighted loss shall not exceed 18% by weight.
5. Filler for blending
   a. Additional mineral filler require to meet gradation requirements or for satisfactory binding of material shall be uniformly blended with base course material at the screening plant.
   b. Mineral fillers shall be free from agglomerations or lumps and shall contain not more than 15% of material retained on a No. 4 sieve
6. Moisture content: Shall not exceed 7%.

2.02 GRADATION REQUIREMENTS

A. Gradation No. 1

% By Weight Passing

Sieve Size	Crushed Gravel	Crushed Stone
1½-inch	100	100
1 inch	75-100	--
3/8-inch	40-75	30-65
No. 4	30-60	25-55
No. 10	20-45	15-40
No. 40	10-30	--
No. 200	3-10	2-12

B. Gradation No. 2

% By Weight Passing

Sieve Size	Crushed Gravel	Crushed Stone
1-inch	100	100
3/8-inch	50-85	40-75
No. 4	35-65	25-60
No. 10	25-50	15-45
No. 40	10-30	--
No. 200	3-10	3-12

C. Gradation No. 3
% By Weight Passing

Sieve Size	Crushed Gravel	Crushed Stone
1-inch	100	100
¾- inch	95-100	95-100
3/8-inch	50-90	50-90
No. 4	35-70	35-70
No. 10	20-55	15-55
No. 40	10-35	--
No. 200	8-15	5-15

D. Gradation No. 4
% By Weight Passing

Sieve Size	% By Weight Passing
1¼-inch	95 – 100
¾-inch	70 – 93
3/8-inch	45 – 80
No. 4	30 – 63
No. 10	20 – 48
No. 40	8-28
No. 200	2.0 – 12.0

E. Breaker Run Base Course

Sieve Size	% By Weight Passing
3-inch	90- 100
1½-inch	60 – 85
¾-inch	40 – 65
No. 4	15 – 40
No. 10	10 – 30
No. 40	5 – 20
No. 200	2 – 12

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

A. Preparation of subgrade for crushed aggregate base course shall be in accordance with requirements of Section 02201, Earthwork for Roadway Construction.

B. Do not place the base course on a subgrade that is soft or spongy or one that is covered by ice or snow.

C. Do not place base course material on a dry or dusty subgrade when existing condition would cause rapid dissipation of moisture from base course material and hinder or preclude its proper compaction.
1. Apply water to such dry foundations and rework or recompact as necessary.

3.02 AGGREGATE USAGE

A. Lower Layer Of Roadways and Shoulders:

1. Use gradation No. 1 or breaker run (as shown on plans).

B. Top Layer of Roadways: Gradation No. 3

C. Top Layers of Shoulders: Gradation No. 2

3.03 CONSTRUCTION METHODS

A. Place crushed aggregate base course to the width and thickness shown on plans.
   1. Maximum compacted thickness of any one layer shall not exceed six (6) inches.
      a. When multiple courses are required, they shall be composed of approximately equal thicknesses.

B. Spreading Base Material
   1. The work shall proceed so that the hauling equipment will travel over the previously placed material.
   2. No hauling shall be permitted on the subgrade.
   3. Route hauling equipment as uniformly as possible over all portions of the previously constructed layers of the base course.

C. Compaction
   1. After a layer of course has been placed and spread to the required thickness, width, and contour, it shall be compacted.
   2. If the material is deficient in moisture content, add moisture during compaction operations by means of appropriate equipment.
   3. Each layer or course of subbase or base placed shall be compacted to a minimum of 95% Modified Proctor.
   4. Areas where proper compaction cannot be obtained due to segregation of materials, excess fines or other deficiencies shall be reworked or the material be removed and replaced with material that will yield the desired results.
   5. Maintain line and grade during compaction operations.

D. Maintenance
   1. The Contractor shall be responsible for and maintain the base course until surface paving is complete.

E. Dust Control
   1. Contractor shall maintain dust control until paving is completed.
   2. Dust control shall be by the application of water or an approved dust control material.

3.04 SHOULDERING

A. Construct shoulders with base course material and conform with the elevation and section shown on the plans.

B. When the finish course of bituminous paving is not placed immediately after the binder course, shouldering shall be placed flush with the surface of the binder.

C. The remainder of the shouldering shall be completed after the finish bituminous course is placed.

D. Shouldering equipment shall be capable of placing shouldering material without marring or damaging pavement or appurtenance.

E. Littering of the pavement with base material shall be corrected by brooming.

3.05 TESTING

A. Contractor shall secure the services of an established independent laboratory for soil testing services as follows:
   1. Source testing
      a. Sampling: AASHTO T2
      b. Sieve Analysis
         1) AASHTO T27 for aggregates including fracture count
         2) AASHTO T37 for mineral fillers
      c. Liquid test: AASHTO T89
      d. Plasticity index: AASHTO T90
      e. Soundness: AASHTO T104 using sodium sulfate
      f. Standard Proctor: ASTM D698
   2. Installation testing
      a. The basecourse condition and elevation shall be checked by the Engineer prior to placement of subsequent basecourse or bituminous material. The basecourse will be proof rolled using a tandem axle dump truck fully loaded with basecourse material to the maximum legal weight limit.

B. When the testing results show that the work is of an acceptable nature, the acceptance of the work shall not relieve the Contractor from making corrections to the tested work during the warranty period.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. Work under this section shall be incidental to the project or paid for as shown in the bid schedule.

B. Base Course
   1. Measurement shall be by the square yard in place.

   2. Payment shall include:
      a. Labor, material and equipment.
      b. Hauling and placing.
      c. Compacting and grading.
      d. Dust control.
      e. Adjusting manholes and valves.
      f. Testing.

C. Shouldering
   1. Shall be incidental.

- END OF SECTION -

SECTION 02290

SOILS AND AGGREGATES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

A. Work Included:
This section includes all material, labor, and equipment necessary to produce, haul, place, and compact the specified soil or aggregate.

B. Related Sections and Divisions:
1. The applicable provisions of the General Conditions shall govern the work in this section.
2. Section 01300, Submittals.
3. Section 02220, Trenching, Backfilling and Compaction.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1.	ASTM C33	Spec. for Concrete Aggregates.
2.	ASTM C88	Test for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.
3.	ASTM C117	Test for Material Finer than No. 200 Sieve in Mineral Aggregates by Washing.
4.	ASTM C131	Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
5.	ASTM C136	Sieve Analysis of Fine and Coarse Aggregates.
6.	ASTM C144	Spec. for Aggregate for Masonry Mortar.
7.	ASTM C207	Spec. for Hydrated Lime for Masonry Purposes.
8.	ASTM C535	Test for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
9.	ASTM C602	Spec. for Agricultural Liming Materials.
10.	ASTM D75	Sampling Aggregates.
11.	ASTM D422	Particle Size Analysis of Soils.
12.	ASTM D448	Spec. for Standard Sizes of Coarse Aggregate for Highway Construction.
13.	ASTM D1140	Test for Amount of Material in Soils Finer than the No. 200 Sieve.
14.	ASTM D1241	Spec. for Materials for Soil-Aggregate Subbase, Base, and Surface Courses.
15.	ASTM D2216	Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures.
16.	ASTM D2487	Classification of Soils for Engineering Purposes.
17.	ASTM D4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity of Soils.

1.03 QUALITY ASSURANCE

A. No soils and aggregates furnished under this section shall be frozen.

1.04 MATERIAL TESTING

A. Contract with an independent testing laboratory to provide testing services required by this section. Contractor shall be responsible for the cost of all testing required for submittals.

B. To establish acceptability of material, tests shall be performed for each soils class in accordance to the following standards:
   1. Soils Class A and C:
      a. ASTM C88.
      b. ASTM C131 (for coarse aggregates smaller than 1½ inches).
      c. ASTM C136.
      d. ASTM C535 (for coarse aggregates 1½ inches and larger).
      e. ASTM C 117 (use when aggregate contains materials finer than No. 200 sieve).
   2. Soils Class B:
      a. ASTM C88.
      b. ASTM C117.
      c. ASTM C136.
   3. Soils Class D:
      a. ASTM C117.
      b. ASTM C136.
      c. ASTM D1241.
      d. ASTM D2487.
   4. Soils Class E:
      a. ASTM C136 (test when gravel content is present).
      b. ASTM D422.
      c. ASTM D1140.
      d. ASTM D2216.
      e. ASTM D4318
   5. Soils Class F:
      a. ASTM D2487.
   6. Soils Class G:
      a. ASTM D2487.

C. In addition to the above, furnish a soil analysis of Soil Class F:
   1. Analyze for the following:
      a. pH
      b. Phosphorus
      c. Potassium
      d. Soluble Salts
      e. Calcium
      f. Magnesium

D. Source sample all soils and aggregates in accordance with ASTM D75.

E. Perform one (1) acceptable test for each type of material at each source.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals.
   1. Test reports.
   2. Soils analysis including recommendations for fertilizer type and application.
   3. Daily delivery tickets with each load.

PART 2 - PRODUCTS

2.01 ENGINEERED SOILS AND AGGREGATES (SOIL CLASS A)

A. General
   1. Material shall be clean, sound, hard, dense, durable, field or quarry stone which is free from seams, cracks, or other structural defects. It shall be angular material from shot rock (blasted) or crushed rock having substantially all face of which have resulted from artificial crushing.
   2. Loss due to sulfate soundness test shall not exceed 10 percent.
   3. Loss due to abrasion test shall not exceed 40 percent.

B. Gradation
   1. Soil Class A-HR (Heavy Rip Rap Rock)

Size of Stone	% Total Wt. Smaller Than the Given Size
500 lbs.	100
400 lbs.	90
150 lbs.	50
40 lbs.	20

   2. Soil Class A-MR (Medium Rip Rap Rock)

Size of Stone	% Total Wt. Smaller Than the Given Size
400 lbs.	100
200 lbs.	90
80 lbs.	50
15 lbs.	20

   3. Soil Class A-LR (Light Rip Rap Rock)

Size of Stone	% Total Wt. Smaller Than the Given Size
150 lbs.	100
60 lbs.	80
20 lbs.	20
2 lbs.	10

   4. Soil Class A-3 (Breaker Run Rock or 6" Crushed Rock)

Sieve Size	% Passing by Weight
7-inch	100
6-inch	90
4-inch	75
3-inch	10

5. Soil Class A-4 (3½-inch Crushed Rock - ASTM D448-No. 1)

Sieve Size	% Passing by Weight
4-inch	100
3½-inch	90-100
2½-inch	25-60
1½-inch	0-15
¾-inch	0-5

6. Soil Class A-5 (2½-inch Crushed Rock - ASTM D448-No.2)

Sieve Size	% Passing by Weight
3-inch	100
2½-inch	90-100
2-inch	35-70
1½-inch	0-15
¾-inch	0-5

7. Soil Class A-6 (1½-inch Crushed Rock - ASTM D448-No. 4)

Sieve Size	% Passing by Weight
2-inch	100
1½-inch	90-100
1-inch	20-55
¾-inch	0-15
3/8-inch	0-5

8. Soil Class A-7 (¾ -inch Crushed Rock - ASTM D448-No. 67)

Sieve Size	% Passing by Weight
1-inch	100
¾-inch	90-100
3/8-inch	20-55
No. 4	0-10
No. 8	0-5

9. Soil Class A-8 (3/8-inch Crushed Rock Chips - ASTM D448-No. 8)

Sieve Size	% Passing by Weight
½-inch	100
3/8-inch	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5

2.02 ENGINEERED SOILS AND AGGREGATES (SOIL CLASS B)

A. General

1. Shall be hard, strong, durable particles free from seams, cracks, and other structural defects.
2. Rounded to subangular.
3. Free from organic impurities and debris.

B. Gradation

1. Soils Class B-1 (Coarse Aggregate - ASTM C33 - No. 3)

Sieve Size	% Passing by Weight
2½-inch	100
2-inch	90-100
1½-inch	35-70

1-inch	0-15
½-inch	0-5

2. Soil Class B-2 (Coarse Aggregate - ASTM C33 - No. 7)

Sieve Size	% Passing By Weight
¼-inch	100
½-inch	90-100
3/8-inch	40-70
No. 4	0-15
No. 8	0-5

3. Soil Class B-3 (Fine Aggregate - ASTM C33)

Sieve Size	% Passing by Weight
3/8-inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	10-30
No. 100	2-10

4. Soil Class B-4 (Masonry Sand - ASTM C144)

	Percent Passing	
Sieve Size	Natural Sand	Manufactured Sand
No. 4	100	100
No. 8	95 to 100	95 to 100
No. 16	70 to 100	70 to 100
No. 30	40 to 75	40 to 75
No. 50	10 to 35	20 to 40
No. 100	2 to 15	10 to 25
No. 200	---	0 to 10

2.03 ENGINEERED SOILS AND AGGREGATES (Soil Class C)

A. General

1. Shall be hard, durable, granular material of uniform quality resulting from crushed rock or crushed bank run sand and gravel.
2. Shall be free from clay lump, organic matter, shale, excess, elongated, or flat pieces, and other deleterious substances.
3. Forty-five percent of the particles retained on a No. 4 sieve shall have at least one fractured face.
4. Wear shall not exceed 50 percent.
5. Loss due to sulfate soundness test shall not exceed 18 percent by weight.
6. Total moisture content shall not exceed 7 percent.
7. Filler for blending shall have a maximum liquid limit of 25 percent and a maximum plasticity index of six.

B. Gradation

1. Soil Class C-1 (Crushed Stone)

Sieve Size	% by Weight Passing
1½-inch	100
3/8-inch	30-65
No. 4	25-55
No. 10	15-40
No. 200	2-12

2. Soil Class C-2 (Crushed Stone)

Sieve Size	% by Weight Passing
1-inch	100
3/8-inch	40-75
No. 4	25-60
No. 10	15-45
No. 200	3-12

3. Soil Class C-3 (Crushed Stone)

Sieve Size	% by Weight Passing
1-inch	100
¾-inch	95-100
3/8-inch	50-90
No. 4	35-70
No. 10	15-55
No. 200	5-15

4. Soil Class C-4 (Crushed Gravel)

Sieve Size	% by Weight Passing
1½-inch	100
1-inch	75-100
3/8-inch	40-75
No. 4	30-60
No. 10	20-45
No. 40	10-30
No. 200	3-10

5. Soil Class C-5 (Crushed Gravel)

Sieve Size	% by Weight Passing
1-inch	100
3/8-inch	50-85
No. 4	35-65
No. 10	25-50
No. 40	10-30
No. 200	3-10

6. Soil Class C-6 (Crushed Gravel)

Sieve Size	% by Weight Passing
1-inch	100
¾-inch	95-100
3/8-inch	50-90
No. 4	35-70
No. 10	20-55
No. 40	10-35
No. 200	8-15

2.04 BANK RUN SOILS

A. Soil Class D-1 and D-2

1. Shall be rounded or subangular material resulting from pit run or crushed material.
2. Shall be free from clay lumps, organic matter, and deleterious substances.
3. One hundred percent by weight shall pass a 3-inch sieve.
4 Maximum liquid limit shall be 25 percent and maximum plasticity index shall be six.
5. The portion of material, which passes a No. 4 sieve, shall conform to the following gradation:

	Maximum % by Weight Passing	
Sieve Size	Grade D-1	Grade D-2
No. 4	100	100
No. 40	75	---
No. 100	15	30
No. 200	8	15

B. Soil Class D-3 (Sand)

1. Well graded, unwashed bank run or crushed bank run, which is free from clay lumps, organic matter, and other deleterious substances with gradation as follows:

Sieve Size	% Passing by Weight
¼-inch	100
No. 4	90-100
No. 10	45-90
No. 40	15-45
No. 200	0-10

C. Soil Class E-1 (Clay Soil)

1. Minimum 50 percent by weight passing the No. 200 sieve.
2. For the fraction passing the No. 40 sieve, the minimum plasticity index shall be 15.
3. Minimum Atterberg liquid limit of 30.
4. Free from organic material, boulders, cobbles, excessive amounts of gravel (greater than 1/4-inch), and other deleterious substances.

D. Soil Class F-1 (Topsoil)

1. Topsoil shall be defined as the upper soil horizon consisting of mineral layers of maximum humus (organic) accumulation.
2. Topsoil shall:
   a. Have adequate mineral content to support the growth of the vegetation intended to be established.
   b. Have one of the following SCS (Soil Conservation Service) soil textures: loam, sandy loam, silt loam, silty clay loam, or clay loam.
   c. Be free from herbicides, which would be detrimental for the intended use.
   d. Have adequate fertility for quick establishment of vegetation.
   e. Shall be neither excessively acid nor excessively alkaline.
   f. Shall be free from deleterious substances.

E. Soil Class G-1 (Clean Earth Fill)

1. Soil Class G-1 shall be any soil material excavated on the project site or obtained from borrow areas.
2. Soil materials unsuitable and, therefore, not approved for this classification are:

a. Soils with high organic contents such as: topsoil, peat, muck, organic silts, and clays, marls, etc.
b. Macadam or rubble filled soils containing such materials as: foundry sand, fly ash cinders, asphalt, and concrete rubble, etc.
c. Silty soils such as: rock flour, loess, etc.
d. Soils with gravel larger than 3-inch.
e. Silty clay or clays with a high plasticity (CH soils as defined in ASTM D2487).
f. All soil contaminated with hazardous waste materials as defined by the EPA.

F. Soils Class G-2 (Clean Earth Fill)
1. Same as G-1 above except shall not contain gravel larger than 3-inch.

2.05 MANUFACTURED AND SPECIAL SOILS

A. Soil Class J-1 (Agricultural Limestone)
1. Conform to ASTM C602.
2. Ground or crushed limestone.
3. Neutralization index of not less than 40 or more than 109.
4. Meet the following gradation:
a. Passing a No. 4 sieve - 100 percent.
b. Passing a No. 10 sieve - 90 to 100 percent.
c. Passing a No. 50 sieve - 50 to 100 percent.

B. Soil Class J-2 (Hydrated Lime)
1. Shall consist of essentially calcium, hydroxide, or a mixture of calcium hydroxide, magnesium oxide, and magnesium hydroxide.
2. Dry powder obtained by treating quick lime with enough water to satisfy its chemical affinity for water under the conditions of its hydration.
3. Hydrated lime shall conform to the requirements of ASTM C207, Type N or S.

PART 3 - EXECUTION

3.01 APPLICATION

A. Use the soil classification name as called for in specifications or on drawings.

B. Place material in accordance with the plans and appropriate specification sections for the type of work being performed.

- END OF SECTION -

SECTION 02505

ASPHALTIC CONCRETE PAVEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes the material requirements for aggregates and bituminous materials for utilization in binder and surface course pavements for light and medium duty streets and parking lots.

1.02 REFERENCE STANDARDS

A. American Society of Testing and Materials (ASTM)

B. American Association of State Highway Officials (AASHTO)

C. Federal Aviation Agency (FAA)

D. Asphalt Institute (AI)

E. Wisconsin Department of Transportation Standard Specifications for Highway and Structure Construction. (Latest Edition).

1.03 SUBMITTALS

A. Submit two (2) copies of test results of quality control testing including:
   1. Materials source testing.
   2. Asphaltic concrete pavement installation testing.
   3. Additional testing.

B. Submit one (1) copy of daily weight tickets showing the net weight for each truckload of pavement delivered and placed.

C. The quantity of asphaltic concrete pavement placed shall be confirmed using theoretical tonnage. Tonnage shall be based on the square yards placed at 110# per square yard per inch. Tonnage shall not deviate greater than 10 percent from the theoretical tonnage.

1.04 STORAGE AND DELIVERY

A. Stockpile aggregate to prevent excessive segregation.

B. Storage period for hot mix shall not exceed 2 hours.

C. Store asphalt cement in tanks free of foreign substances and caked asphalt.

PART 2 - PRODUCTS

2.01 AGGREGATE

A. Aggregate shall conform to Wis. DOT Standard Specifications for Highway and Structures Construction, Sections 450 and 460 (latest edition).

2.02 MINERAL FILLER

A. Mineral filler shall conform to Wis. DOT Standard Specifications for Highway and Structures Construction, Section 450.

2.03 ASPHALT MATERIALS

A. Conform to Wis. DOT Standard Specifications for Highway and Structures Construction, Section 455.

2.04 TACK COAT

A. Tack coat shall conform to Wis. DOT Standard Specifications for Highway and Structures Construction, Section 455.

2.05 ASPHALT MIX

A. Asphaltic mix shall be Type E-1, pg 58-28 and conform to Wis. DOT Standard Specifications for Highway and Structures Construction, Sections 450 and 460 (Latest Edition).

2.06 EQUIPMENT

A. All equipment shall conform to Wis. DOT Standard Specifications for Highway and Structures Construction, Section 450 (Latest Edition).

B. Trucks shall be covered and insulated adequately to provide a mix temperature of 250° F (121°C) at point of delivery.

PART 3 - EXECUTION

3.01 EQUIPMENT REQUIREMENTS

A. Mixing plants shall conform to AASHTO M156.

B. Bituminous paver shall have following features.
1. Hopper distribution system.
2. Screed assembly shall be capable of heating and adjusting to slope and elevation.
3. Paver shall produce an even finished surface with a smooth, dense texture.

C. Roller shall be in accordance to following:
1. Designed specifically for bituminous compaction.
2. Vibratory with adjustable frequency and amplitude.
3. Compression: 250 pounds per inch of width of drive rollers.

4. Provide device to moisture, and clean rollers

D. Trucks shall be covered and insulated adequately to provide a mix temperature of 250° F (121°C) at point of delivery.

3.02 SURFACE PREPARATION

A. Prepare compacted foundation in accordance with Section 02235, Crushed Aggregate Base Course.

B. Remove loose concrete and protruding joint material.

C. Clean surface joints.

D. Control weeds with herbicide in accordance with state and local regulations.

E. Adjust sanitary and storm manholes to finished pavement grade.

F. Adjust valve boxes to finished pavement grade

G. Fill potholes and depressions with a leveling course of asphaltic mix and compact to required density.

H. Tack coat shall be applied to all abutting concrete or asphalt surfaces and new bituminous surfaces which have been driven on or became contaminated.

I. Remove all joint sealant prior to placement of any new bituminous pavement material.

3.03 BITUMINOUS PAVEMENT PLACEMENT

A. Place to thickness, grade and section shown on plan.
   1. When thickness is not shown on plans, pavement thickness shall be 3 inches compacted. (Type E-1 or E-3)
      a. 1¾-inch binder course, Gradation Nominal aggregate size 3/4-inch (19 mm).
      b. 1¼-inch surface course, Gradation Nominal aggregate size 3/8-inch (9.5 mm).
   2. Course thickness shall be achieved by placing single or multiple layers of bituminous to the following tolerances:
      a. Minimum thickness: two times the largest aggregate when compacted.
      b. Maximum thickness: 2¼ inches compacted

B. Hand Spreading
   1. Will be permitted only in areas inaccessible to finishing machines.
   2. Place by means of a shovel and shape with rake or lute.
   3. Do not rake over machine spread surfaces.

C. Compaction
   1. Roll as soon as mixture will support roller without displacing pavement mat.
      a. Initial pass shall be with drive roller toward paver.
      b. Start at lower unsupported edge and progress toward other edge.
      c. Overlap successive trips.

2. Subsequent strips laid; start adjacent to previous laid strip and continue to opposite edge.
3. Roll until:
   a. Roller marks are minimized or eliminated.
   b. Surface is of uniform density.
   c. Required density is obtained.

D. Bonding Joints
1. Clean all joints.
2. Joining new bituminous to existing bituminous:
   a. Saw cut all joints and tack coat.
3. Joining new bituminous to new bituminous
   a. Saw cut end joint if it has been over 12 hours since the other "new" pavement had been placed.
   b. Tack coat all cold joints.
   c. Tack coat all cold surfaces.

E. Bonding Surfaces
1. Tack all existing and new bituminous surfaces.
2. Tack all abutting concrete or asphalt surfaces.
3. Application rate shall be one-tenth (1/10) gallon per square yard.

3.04 PAVING RESTRICTIONS

A. Do not place bituminous pavement when following conditions exist.
1. Unstable or frozen base.
2. During rain or snow.
3. When air temperature is less than 35°F (1.50°C).

3.05 SURFACE REQUIREMENTS

A. Surface shall be dense and to a true plane of 1/8 inch in 10 feet.

B. Bituminous shall be replaced when the following conditions exist.
1. Pavement has raveling, rutting, or will not set up to receive traffic.
2. At a minimum replacement shall be a full lane width, patching will not be permitted.
3. All joints will be saw cut and tack coated.

3.06 SHOULDERING

A. Shoulder all portions of the street where curb and gutter is not required.

B. Unless shown otherwise, shoulders shall be three (3) feet wide.

C. If the finish bituminous course is not placed immediately after the binder course, shouldering shall be completed in multiple lifts, one lift after each course.

D. Conform with Section 02235, Base Course.

3.07 SPECIFIED DENSITY PROCEDURE (TYPE E-1 OR TYPE E-3)

A. Laboratory density is that which is obtained when samples of the mix from the applicable course is compacted and its weight determined in accordance with W.D.O.T. Test Method 1559, "Superpave Method of Mix Design" for each pavement mix.

B. Ordinary Compaction Method
   1. Course
      a. Leveling
      b. Wedging
      c. Patching
   2. Degree of Compaction
      a. Compact to the degree that no further appreciable consolidation is evidenced under the action of the compaction equipment

C. Laboratory Method
   1. Degree of Compaction
      a. Binder course on existing paved surface: 89.5% of laboratory density.
      b. Binder course on crushed aggregate base course: 89.5% of laboratory density.
      c. Surface course: 91.5% of laboratory density.
   2. Acceptance Testing
      a. Perform one (1) density test per 350 square yards per lift or every 100 lineal feet of roadway in accordance with ASTM D2950.
   3. Laboratory density is that which is obtained when samples of the mix from the applicable course is compacted and its weight determined in accordance with ASTM D1559.

D. The Contractor shall secure the services of an established independent testing laboratory to perform all testing.

PART 4 – MEASUREMENT AND PAYMENT

4.01 MEASUREMENT AND PAYMENT

A. Work under this section shall be incidental to the project or paid for as shown in the bid schedule.

B. Measurement and Payment
   1. Square yards shall be computed by measuring the area of bituminous pavement compacted in place.
   2. Payment will be made by the square yard compacted in place.
   3. Payment shall include:
      a. Hauling and placing
      b. Compaction
      c. Tack
      d. Site restoration
      e. Testing

C. Density Deficiency
   1. Density shall be measured by averaging the nuclear density test required for a day's production placed.

2. Should the average density fall below specified densities, the Owner may accept the deficient work in accordance with the terms of Section 00700, Standard General Conditions of the Construction Contract. Payment will be made at an adjusted price as specified in the following table:

PERCENT DENSITY BELOW SPECIFIED MINIMUM	PAYMENT FACTOR (PERCENT OF CONTRACT PRICE)
From 0.5 to 1.0 inclusive	98
From 1.1 to 1.5 inclusive	95
From 1.6 to 2.0 inclusive	91
From 2.1 to 2.5 inclusive	85
From 2.6 to 3.0 inclusive	70

3. If the specified density deficiency is greater than 3%, the material shall be removed and replaced with a mixture to the specified density and, when acceptably replaced, will be paid for at the contract unit price.

D. Thickness Deficiency

1. Thickness deficiency shall be verified using theoretical tonnage. If the in place tonnage is greater than 10 percent below the theoretical tonnage the following shall apply.

   a. Thickness shall be measured by averaging four (4) samples taken after the final course has been compacted in place.

   b. The unit price per square yard will be computed proportional to the average thickness of four cores as follows:

Deficiency in Thickness Determined By:	
Cores in Inches	Percent of Unit Price Allowed
0.00 to 0.125	100%
0.126 to 0.25	85%
0.251 to 0.375	70%
0.376 to 0.50	55%

   c. If the thickness deficiency is greater than 0.50 inches, no payment will be made until the Contractor corrects the deficiency with additional courses (minimum ¾ inches compacted per course).

- END OF SECTION -

SECTION 02565

FORCEMAIN

PART 1 - GENERAL

1.01 SUMMARY

A. Work Included: This section includes furnishing and installing all pipe and fittings for the forcemain as shown on the contract drawings, as specified, and as directed by the Engineer.

B. Related Sections and Divisions:
1. Applicable provisions of the General Conditions shall govern the work in this section.
2. Section 01300, Submittals.
3. Section 01563, Erosion Control.
4. Section 01661, Testing and Inspection of Pipeline Construction.
5. Section 02220, Trenching, Backfill and Compaction.
6. Section 02600, Buried Piping and Appurtenances.
7. Section 02616, Ductile Iron Pipe.
8. Section 02622, PVC Plastic Pipe.
9. Section 02623, Polyethylene Pipe.
10. Section 02936, Landscaping.

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

B. American Water Works Association (AWWA).

C. American National Standards Institute (ANSI).

1.03 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals including:
1. Product literature and catalog cuts of materials to be supplied to relate these materials to the specifications.
2. One copy of test reports.

PART 2 - PRODUCTS

2.01 PIPE MATERIAL

A. Ductile Iron Pipe shall conform to Section 02616, Ductile Iron Pipe.

B. PVC Pipe shall conform to Section 02622, PVC Plastic Pipe.

C. Polyethylene pipe shall conform to Section 02623, Polyethylene Pipe.

2.02 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall conform with AWWA C105.

B. Polyethylene encasement shall be Class C Black, Type 1, and Grade E-1.

C. Thickness shall be 8 mils minimum.

2.03 TRACER WIRE

A. Tracer wire shall be No. 10 AWG, single conductor with Type UF insulation rated for direct burial service.

B. Tracer wire splices shall be made with 3M Scotch Cast, Ideal Twister DB Plus, or equal.

C. Tracer wire signal connection box shall be three-piece, 5¼-inch cast iron valve box with top marked, "Sewer" as manufactured by Clow, Tyler, or equal.

2.04 PIPE BEDDING AND BACKFILLING

A. Trenching, backfilling and compaction shall be in accordance with Section 02220, Trenching, Backfilling and Compaction and standard details on the drawings.

2.05 THRUST BLOCKING

A. Thrust blocks shall be constructed of concrete having a minimum 28-day compressive strength of 2,000 psi. Hardwood blocking may be used if approved by the Engineer.

B. The minimum cement content shall be 4½ bags of cement per cubic yard of concrete. The allowable slump shall be 4 to 5 inches

C. Blocking shall be placed between solid ground and the fitting to be anchored; the area of bearing on the pipe and on the ground shall be as shown or required by the Engineer.

D. Thrust blocks shall, unless otherwise specified or required, be placed so that the pipe and fitting joints will be accessible for repair.

E. A piece of 15-pound building paper or other approved material shall be placed between the cap or plug and the concrete.

2.06 JOINT RESTRAINT MATERIAL

A. Rods shall be ¾-inch Diameter, Type 304, or 316 Stainless Steel.

B. Underground Clamps Shall Conform To The Following:
   1. ½-inch x 2 inches flat bar stock clamps, Astral Corp., or equal.
   2. Clamps shall include retainer washer.

C. Bolts shall be 5/8-inch diameter, stainless steel.

D. Megalugs, by EBAA iron may be used for joint restraint.

2.07 PIPE COUPLINGS

A. Mechanical pipe couplings shall be Desser Style 162, or equal.

2.08 BUILT UP MASTIC COATINGS

A. Coating shall be Tape coat, TC Mastic, or equal.

PART 3 - EXECUTION

3.01 GENERAL

A. Before excavation of trenches is begun, the Contactor shall uncover the end of the existing main to which the new main is to be connected. This will permit adjustments in line and grade and avoid the use of extra fittings. The exposed end of an existing main must be protected and blocked by the Contractor to prevent the blowing out of the plug or cap at the end of the main.

B. The Contractor shall have sufficient and adequate equipment on the site of the work for unloading and lowering pipe and fittings into the trench. Extreme care shall be exercised by the Contractor in handling all pipe, fittings, and special castings to prevent breakage and coating damage. Any significant damage to coating shall be repaired before installation. Under no circumstances shall pipe or fittings be dropped into the trench or so handled as to receive hard blows or jolts. All mud or concentration of dirt shall be removed prior to installation.

C. Every precaution shall be taken to prevent foreign materials from entering the pipe while it is being placed in the line. If the pipe-laying crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe. During the laying operations, no debris, tools, clothing, or other material shall be placed in the pipe.

D. At all times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means accepted by the Engineer. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry. No pipe shall be laid in water or when trench conditions are unsuitable.

3.02 PIPE INSTALLATION

A. Pipe installation shall conform with Section 02220, Trenching, Backfilling and Compaction and bedding details shown on the drawings.

B. Lay pipe to line and depth shown on plans. Unless otherwise stated, pipe shall be laid with the bell ends facing the direction of laying. When grade exceeds two feet per hundred feet, the bells shall face upgrade.

C. When the depth is not shown on the plans, bury the pipe with 6.5 feet of cover as determined from the top of pipe to finished ground elevation.

D. Keep pipe and fittings free of debris and foreign matter. The interior of all pipes shall be clean before being installed. The Contractor shall provide the necessary means to wipe, brush, swab, or air blast to remove foreign matter.

E. Assemble all joints in accordance with manufacturer's recommendations.

F. Utilize full lengths of pipe, except at fittings.

G. Provide thrust blocking and restraints at the following locations:
1. Bend deflecting 11½ degrees or more.
2. Valves and tees.
3. Plugs and caps.

H. When it is necessary to interrupt an existing system to complete construction, adhere to the following:
1. No controls or appurtenances shall be operated without the Owner's consent or direction.
2. Work requiring interruption of existing service shall be done at the Owner's convenience and normal working schedule.

3.03 POLYETHYLENE ENCASEMENT

A. Wrap all below ground metal in accordance with AWWA C105, including:
1. Ductile iron pipe.
2. Fittings, valves, and valve boxes.
3. All metal restraining devices.

3.04 TRACER WIRE

A. Run tracer wire along pipe when PVC or polyethylene pipe is used.

B. Tape wire to each length of pipe at a minimum of two points.

C. Tracer wire shall be tested prior to acceptance of project.

D. Maximum distance for tracer wire shall be 2,000 feet.

3.05 PROTECTION OF BURIED METAL SURFACES

A. All steel clamps, rods, bolts, and other metal accessories using reaction anchorage or joint harness and all mechanical pipe couplings, flanges, and sleeves installed underground shall be protected.

B. Surfaces shall be cleaned by wire brushing immediately prior to application of the mastic.

C. The mastic shall be molded firmly to encase all bolts, nuts, clamps, straps and flanges, and built-up to a uniform surface over the entire fitting.

D. The built-up surface shall be applied in full accordance with manufacturer's recommendations.

E. All buried metal surfaces with built up mastic protection shall be wrapped with polyethylene encasement.

3.06 JOINING PIPE OF DIFFERENT MATERIAL OR OUTSIDE DIAMETER

A. Where specified or required, pipes of different material or outside diameter shall be joined with mechanical pipe couplings.

B. Couplings shall be suitable for the intended service and shall be installed in accordance with the manufacturer's instructions.

C. The Contractor shall submit details of proposed coupling for Engineer's review.

3.07 CONTRACTOR RECORD KEEPING

A. Measure and record the following:
   1. Service locations: Point of origin and terminus.
   2. Valve and fitting locations.

3.08 PIPE TESTING

A. Perform pipe testing in accordance with Section 01661, Testing and Inspection of Pipeline Construction.

3.09 CUTTING OF PIPE

A. Pipe shall be cut at right angles to the centerline of the pipe. Cutting shall be done in a neat workmanlike manner without damage to the pipe and to leave a smooth end. All pipes shall be cut for use with rubber gasket joints shall be tapered by grinding or filling about 1/8 inch back at an angle of approximately 30 degrees with the centerline of the pipe, and any sharp or rough edges shall be removed.

3.10 OBSTRUCTION IN LINE OR GRADE

A. Whenever it becomes necessary to lay a main over, under or around a known obstruction, the Contractor shall furnish and install the required fittings. The laying of such fittings will be paid for at the unit price bid for each size of main. No additional compensation will be paid to the Contractor for any expenses incurred because of such obstruction.

B. When an unknown underground structure interferes with the work and an alteration of the plan is required, the Engineer will issue a written order for such altered work, specifying the basis of payment or credit for such altered work.

PART 4 - MEASUREMENT AND PAYMENT

A. Forcemain
   1. Measure forcemain along the centerline as installed, with no deductions for fittings and valves.
   2. The unit price per linear foot shall include:
      a. Labor, material, and equipment.
      b. Clearing and grubbing.

c. Removal, hauling, and disposal of all street surfacing and curb and gutter in the trench area.
d. Excavation and dewatering.
e. Traffic control.
f. Erosion control.
g. Installation of pipe materials, fittings, including pipe bedding and cover material.
i. Poly-wrap fittings, valves, and valve boxes.
j. Reaction blocking.
k. Joint restraints.
l. Backfilling and compacting.
m. Loading, hauling and disposal of surplus excavated material.
n. Dust control.
o. Restore all facilities damaged or destroyed during construction.
p. Landscaping.
q. Maintenance and repair of all disturbed street surfacing.
r. Leakage and pressure testing.
s. Tracer wire testing.
t. Tracer wire.
u. Tracer wire box.

B. Boring and jacking casing pipe.

1. Measurement for the casing pipe shall be made along the centerline of the casing pipe as installed.

2. Payment shall be made by the unit price per linear foot installed and include:
   a) Labor, equipment, and material necessary to install the casing pipe.
   b) Blocking and supports necessary to anchor the sewer pipe inside the casing pipe.
   c) Placing a sand slurry, pea gravel, or fly ash slurry to completely fill the annular space between the casing and sewer pipe.
   d) The sewer pipe placed inside of the casing.

- END OF SECTION -

SECTION 02600

BURIED PIPING AND APPURTENANCES

PART 1 – GENERAL

1.01 SUMMARY

A. Related Sections and Divisions:
1. Applicable provisions of the General conditions shall govern the work in this section.
2. Section 01300, Submittals.
3. Section 01563, Erosion Control.
4. Section 02050, Demolition.
5. Section 02052, Abandonment and Grouting Existing Pipelines.
6. Section 02220, Trenching, Backfilling and Compaction.
7. Section 02616, Ductile Iron Pipe.
8. Section 02622, PVC Pipe.
9. Section 02623, Polyethelene Pipe.
10. Section 02624, PVC Lined R.C.P. Sewer.
11. Section 02625, Centrifugally Cast Fiberglass Mortar Pipe.
12. Section 02660, Watermain.
13. Section 02720, Storm Sewer.
14. Section 02730, Sanitary Sewer.

1.02 SUBMITTALS

A. Submit shop drawings in accordance with Section 01300, Submittals:
1. General arrangement drawings of 3-inch or larger piping shall be submitted to Engineer for approval. Drawings shall include proposed length, location and elevation of pipe, fittings, valves and appurtenances.

PART 2 – PRODUCTS

2.01 MATERIALS OF CONSTRUCTION

A. Size and Type:
1. All materials shall conform to the size and type shown on the drawings or called for in the specifications.
2. In joining two dissimilar types of pipe, standard fittings shall be used when available. In the event standard fittings are not available, the method of joining shall be standard selected by Contractor and submitted for review and approval by Engineer.

B. Piping appurtenances shall be made of the materials specified. All appurtenances not designated as to type shall be selected by Contractor and submitted for review and approval by Engineer.

2.02 STEEL CASING PIPE

A. Minimum yield strength of 35,000 psi.

B. Minimum wall thickness for E72 loading:

Nominal Diameter (inches)	Nominal Thickness (inches)
Less than 14	0.188
14-16	0.219
18	0.250
20	0.281
24	0.344
26	0.375
30	0.406
36	0.469
42	0.500

C. Increase casing wall thickness a minimum of 0.060 inches if installed without a protective coating.

2.03 CASING SPACERS

A. Casing spacers shall be as manufactured by Cascade Waterworks Manufacturing or equal and conform to the following:
   1. Spacers shall be bolt on style with a shell made in two sections of minimum 14 gauge T-304 stainless steel and shall be PVC lined with a minimum thickness of 0.90 inches with 85-90 durometer.
   2. Nuts and bolts shall be 18-8 stainless steel.
   3. Runners shall be made of ultra high molecular weight polymer with high abrasion resistance and a low coefficient of friction.
   4. Runners shall be supported by risers made of minimum 14 gauge T-304 stainless steel, MIG welded to the shell and all welds shall be passivated.
   5. Height of supports and runners combined shall be sufficient to keep the carrier pipe at least 2 inches clear of the casing pipe wall at all times.
   6. The spacers shall have restraining style positioning.

2.04 CONCRETE

A. All concrete work under this Contract, unless shown or specified otherwise, shall conform to the requirements of Division 3.

PART 3 – INSTALLATION

3.01 INSTALLATION

A. Pipe bedding shall be in accordance with the standard details shown in the drawings.

B. Thrust blocking shall be in accordance with the standard details shown in the drawings.

3.02 BORING AND JACKING CASING PIPE

A. Install casing pipe to the limits and elevation which will allow the carrier pipe to be installed to the required line and grade.

B. Fit the carrier pipe with casing spacers which shall:
   1. Allow grade adjustments.

2. Prevent floating and buckling of the carrier pipe.
3. Provide a low friction coefficient so the carrier pipe can be slid into place without splitting bells.

C. Fill annular space between casing and carrier pipe with sand, pea gravel or fly ash slurry.

3.03 CASING SPACER INSTALLATION

A. Place size and type of spacer as follows:

Type of Pipe	Carrier Pipe Size	Maximum Spacer Interval	Length of Spacer	Spacer Type
Ductile Iron, Steel, Asbestos Cement and PVC C-900	Up to 24 Inches	10 Foot	8 Inch	Restrained
Ductile Iron Steel, Asbestos Cement and PVC C-900	24-inch to 48-inch	6 Foot	12 Inch	Restrained
PVC SDR-35, PVC Schedule 40 and PVC Schedule 80	All Sizes	6 Foot	8 Inch	Restrained

B. At a minimum, provide spacers at each side of each pipe joint and the center of each pipe.

3.04 FIELD QUALITY CONTROL

A. Contractor shall include the cost of all testing, cleaning and disinfection in the bid.

B. All work shall be inspected, tested, and approved in accordance with federal, state and local rules and regulations. All work shall also be tested as specified in this section. Unless indicated in writing before testing begins, all tests shall be witnessed by Engineer and others as necessary. Test results shall be recorded and reports or appropriate certificates shall be submitted to Engineer in triplicate.

C. All new piping shall be tested. All underground piping shall be backfilled or properly secured to avoid damage during testing. Should underground piping fail test, Contractor shall be responsible for removal and replacement of backfill. All piping, interior or exposed, shall be subject to test before being covered with insulation, or paint. All piping and appurtenances shall be watertight or airtight and free from visible leaks.

D. All piping shall be flushed or blown out after installation prior to testing. Contractor shall provide all necessary piping connections, water, air, test pumping equipment, water meter, bulkheads, valves, pressure gauge and other equipment, materials and facilities necessary to complete the specified tests. Contractor shall provide all temporary sectionalizing devices and vents for testing.

E. Pressure tests shall be performed in accordance with Section 01661, Testing and Inspection of Pipeline Construction.

3.05 CLEANING AND DISINFECTION

A. All equipment and materials shall be clean before installation. Contractor shall disinfect and flush the potable water system before it is put online. Watermain shall be disinfected according to AWWA C651.

3.06 REPAIR AND RESTORATION

A. Unless otherwise specified, Contractor shall replace all bituminous and concrete pavement removed or damaged during performance of the work. Concrete pavement replacement shall conform to Division 3. Bituminous pavement replacement shall conform to Division 2.

B. Clean-up:
   1. Upon completion of the work, all improvements disturbed by Contractor's operations shall be repaired or replaced. Broken concrete, rubble fill, and other excess material shall be removed from the site and wasted.
   2. All areas for the storage of materials or the temporary deposit of excavated earth shall be leveled off and cleaned up. All surplus material, tools, and equipment shall be removed, and the premises shall be left free of everything of the kind.
   3. All pipes and manholes shall be flushed until clean and all debris and mud shall be removed.

3.07 CLEANING OF WORK

A. Pipelines
   1. Interiors of all pipelines (including existing) affected by construction procedures shall be free of all extraneous materials.
   2. Pipelines shall be left clean at the completion of work.

B. Final Clean up and Inspection
   1. Contractor shall remove all of the following:
      a. Temporary offices and storage structures.
      b. Temporary fencing and roads.
      c. Surplus material and rubbish.
      d. Material (liquid or solid) resulting from cleaning operations.
   2. The Engineer and Owner may make final inspection of the work during the progress of the final cleaning and repairing. Any portion of the work accepted by the Owner shall be kept clean by the Contractor until final acceptance of the entire project.
   3. When the contractor has completed the final cleaning operation, he shall notify the Engineer in writing that he is ready for final inspection.
   4. After written notification to the Contractor, the owner may elect to remove from the work site and/or adjacent properties, all rubbish, surplus or waste materials which the contractor has neglected or refused to remove, and deduct the costs of removal from any monies due the contractor.

3.08 DEMOLITION

A. All exterior piping removals, including manholes and appurtenances and abandonment, shall be by Contractor. The locations and elevations of existing piping are approximate. Where necessary, existing piping shall be exposed prior to installing new piping. Any changes in pipe location or elevation shall be approved by Engineer.

B. Contractor shall remove or abandon all existing piping and appurtenances as noted. Unless otherwise shown or specified, the owner shall have the right of first refusal for all, piping and appurtenances to be removed shall be removed from the site for salvage or disposal. Unless otherwise shown or specified, piping shown or specified to be abandoned shall be filled with a 3' concrete plug. Concrete shall be as specified in Division 3. Wherever excavations cross piping

to be abandoned, piping shall be removed to the limits of the excavation and the ends shall be filled as specified above.

C. Valve boxes and exposed valves and operators on piping to be abandoned shall be removed. All concrete surfaces to remain shall be patched as required to provide a smooth surface. Re-piping and connections to new piping shall be as specified for new piping.

D. It is the responsibility of the Contractor to remove or abandon all piping and appurtenances, as shown or specified, and patch all holes resulting therefrom unless specified or shown otherwise. The intent of these specifications is to require that the removal of materials, patching of all existing holes and repiping be done in a workmanline manner. All costs shall be included in the bid.

-- END OF SECTION --

SECTION 02608

SEWER CLEANING & TELEVISING

PART 1 – GENERAL

1.01 SUMMARY

A. Work included: This section includes cleaning and televising for sanitary sewer lines.

B. Contractor shall submit television inspection logs and DVD recordings.

PART 2 – PRODUCTS

NOT APPLICABLE

PART 3 - INSTALLATION

3.01 SEWER LINE CLEANING

A. High-Velocity Jet Equipment shall be used on this project. All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned. The equipment shall carry its own water tank.

B. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it will be assumed that a major blockage exists and the cleaning effort shall be abandoned.

C. Roots shall be removed in the designated sections where root intrusion is a problem. Any work done to remove roots in a section shall be documented in the report. Documentation shall include the locations in the pipe segment where roots were removed and the procedure, which was used to remove the roots.

D. All sludge, dirt, sand, rock, grease, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section, which could cause line stoppages, accumulations of sand in wet wells, or damage pumping equipment, shall not be permitted. A vacuum truck shall be used to remove accumulations of material.

E. All solids or semi-solids resulting from the cleaning operations shall be removed from the site and disposed of at a site designated by the Owner. All materials shall be removed from the site no less often than at the end of each workday. Under no circumstances will the Contractor be allowed to accumulate debris, etc., on the site of work beyond the stated time, except in totally enclosed containers and as approved by the Owner.

F. If the Contractor requires water for cleaning operations from hydrants, the Contractor shall make arrangements with the local water utility and shall use only fire hydrants designated by the

responsible water utility. The Owner will pay all costs associated with use of this water. The Contractor shall provide backflow preventers at the hydrants to prevent contamination of the water system.

G. Acceptance of sewer line cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Owner. If TV inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to re-clean and re-inspect the sewer line until the cleaning is shown to be satisfactory.

3.02 SEWER TELEVISING

A. All designated sewer sections shall be visually inspected by means of closed-circuit color television.

B. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. The camera shall be capable of radial view for inspection of the top, bottom, and sides of pipe and for looking up lateral connections. The camera shall be mounted on adjustable skids, or self propelled, to keep it in the center of the pie. Lighting of the camera shall be supplied by a lamp on the camera, capable of being dimmed or brightened remotely form the control panel. The lighting system shall be capable of lighting the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions and shall have a minimum of 650 lines of resolution and tested at 400 psi. The view seen by the televising camera shall be transmitted to a monitor of not less than 17 inches. The camera, television monitor, and other components of the DVD system shall be capable of producing a picture quality satisfactory to the Engineer; and if unsatisfactory, the equipment shall be removed and no payment will be made for an unsatisfactory inspection.

C. The television camera shall be moved through the line in either direction at a uniform rate, stopping when necessary to insure proper documentation of the sewer's condition but in no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds (or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions) shall be used to move the camera through the sewer line. If, during the inspection operation the television camera will not pass through the entire sewer section, the Contractor shall re-setup his equipment in a manner so that the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire sewer section, the inspection shall be considered complete and no additional inspection work will be required. All costs for re-setup due to an obstruction in the sewer that will not allow the camera to pass shall be considered incidental. If the camera becomes submerged due to a sag in the pipe, a high velocity jet will be utilized to pull water away from the camera lens.

D. The location meter, for accurately recording the location of the television camera with respect to the reference manhole, shall be a direct reading, above ground, friction clamp device or other suitable equipment. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. The meter shall be capable of reducing readings for reverse movement of the camera and shall be capable of being manually re-zeroed for each new setup. Footage shall be shown on the DVD data view and recorded at all times.

E. The logs shall be typed or computer printed and acceptable to the Owner. Printed location records shall be kept by the contractor and will clearly show the location, in relation to adjacent manholes, of each infiltration point discovered by the television camera. An estimate of the flow rate of observed infiltration points shall be made and recorded. In addition, other points of

significance such as locations of building sewer laterals, joints, unusual conditions, roots, storm sewer connections, collapsed sections, presence of scale and corrosion, and other discernible features will be recorded and two (2) copies of such records shall be supplied to the Owner.

F. The purpose of tape recording shall be to supply a visual and audio record of the condition of the lines that may be replayed both daily and at future presentations. DVD recording playback shall be at the same speed that it was recorded. Upon completion of the work, all discs recorded during the television inspection shall become the property of the Owner. Cost of DVDs shall be included in the unit price bid. A complete recording shall be made of each line televised. A voice recording on DVDs shall make brief and informative comments on the sewer conditions.

1. DVDs shall include the following information:
    a. Visual (on screen in corner):
        1) Report number.
        2) Date of television inspection.
        3) Sewer section and number.
        4) Current distance along reach (tape counter footage).
        5) Printed labels on DVD container and DVD disc with location information, date, format information, and other descriptive information.
    b. Audio:
        1) Date and time of television inspection, operator name, name of overlying or adjacent street, and manhole numbers.
        2) Verbal confirmation of sewer section and television direction in relation to direction of flow.
        3) Verbal description of pipe size, type, and pipe joint length.
        4) Verbal description and location of each service connection and pipe defect.
        5) Type of weather during inspection.
2. Television inspection logs shall include, but are not limited to, the following:
    a. Date, time, city, street, basin, sewer section, reference manhole number, name of operator, inspector, and weather conditions.
    b. Pipe diameter, pipe material, section length, depth of pipe, length between joints, and corresponding DVD identification.
    c. Location of each point of leakage.
    d. Location of each service connection.
    e. Location of any damaged sections, nature of damage, and location with respect to pipe axis.
    f. Deflection in alignment of grade of pipe.

G. Acceptance of televising shall be made upon the successful completion of the project and shall be to the satisfaction of the Owner. If the recordings show the inspection to be unsatisfactory, the Contractor shall be required to re-inspect the sewer line.

SECTION 4 – PAYMENT

A. Payment shall be based on following: Line cleaning and television inspection of the sewer lines shall be incidental to the appropriate bid item.

- END OF SECTION -

SECTION 02622

PVC PLASTIC PIPE

PART 1 - GENERAL

1.01 SUMMARY

A. Work included: This section includes material and performance requirements for (polyvinyl chloride) plastic pipe and fittings.

B. Related Section and Divisions:
1. Applicable provisions of the General Conditions shall govern the work in this section.
2. Section 01300, Submittals.
3. Section 01661, Testing and Inspection of Pipeline Construction.
4. Section 02220, Trenching, Backfilling and Compaction.
5. Section 02600, Buried Piping and Appurtenances.
6. Section 02660, Water main.
7. Section 02720, Storm Sewer and Drainage.
8. Section 02730, Sanitary Sewer.
9. Section 15050, Methods and Materials For Piping Installations.

1.02 REFERENCE STANDARDS

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

1.	ASTM D1784	Spec. for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
2.	ASTM D1785	Spec. for Poly (Vinyl Chloride) (PVC) Plastic Pipe Schedules 40, 80, and 120.
3.	ASTM D2241	Spec. for Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
4.	ASTM D2412	Test for External Loading Properties of Plastic Pipe by Parallel-Plate Loading.
5.	ASTM D2466	Spec. for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
6.	ASTM D2467	Spec. for Socket-Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
7.	ASTM D2837	Standard Test Method for Obtaining Hydrostatic Design Basics for Thermoplastic Pipe Materials.
8.	ASTM D2855	Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.
9.	ASTM D3034	Spec. for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
10.	ASTM D3139	Spec. for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
11.	ASTM D3212	Spec. for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
12.	ASTM F438	Spec. for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40.
13.	ASTM 439	Spec. for Socket-Type Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80.

14.	ASTM F441	Spec. for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe Schedules 40 and 80.
15.	ASTM F477	Spec. for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
16.	ASTM F679	Spec. for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings.

B. American Water Works Association (AWWA):

1.	AWWA C900	Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch for water.
2.	AWWA C905	Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-inch.

1.03 QUALITY ASSURANCE

A. Pipe shall be available to Owner's Representative for inspection.

B. Pipe shall be considered defective and will be rejected when:
1. Pitted or cratered.
2. Flaking.
3. Straightness varies more than ½-inch in 10 feet.
4. Any defect that prevents assembly according to manufacturer's recommendations.

C. Material brands and/or pipe classes shall not be mixed.

1.04 PRODUCT DELIVERY

A. Pipe Marking - pipe shall be marked as follows:
1. Manufacturer's name, trademark, or logo.
2. Nominal size.
3. PVC minimum cell classification.
4. Pipe stiffness designation, dimension ratio or schedule size and pressure class.
5. ASTM or AWWA designation.
6. National Sanitation Foundation approval (pipe for potable water).
7. Production date.

B. Storage:
1. Provide a covered storage area.
2. Keep pipe material safe from damage and theft.
3. Protect pipe material from direct rays of the sun.
4. Protect gaskets from sun rays, excessive heat, grease, oil, and electric motors that produce ozone.

1.05 SUBMITTALS

A. Submit the following in accordance with Section 01300, Submittals:
1. Certification of production date of all materials.
2. Manufacturer's certification that materials delivered comply with requirements of this section.

PART 2 - PRODUCTS

2.01 NON-PRESSURE RATED PIPE

A. Gravity Sewer
1. All pipe shall be the product of one manufacturer.
2. All fittings shall be the product of one manufacturer.
3. Pipe shall be manufactured in accordance with the following standards:
   a. Sizes 8-inch through 15-inch: ASTM D3034.
   b. Sizes 18-inch through 27-inch: ASTM F679 or ASTM F794.
4. Elastomeric Gaskets: Conform with F477
5. Fittings and repair couplings shall be the same class and physical properties as pipe and monolithically molded or extruded.
6. Solvent welded and stainless steel strapped wyes or tees may be used for storm sewer laterals: conform to ASTM D3034 and ASTM F679.
7. Elastomeric Joints: ASTM D3212
8. Solvent Weld Joints: Not permitted.

B. Sewer Services
1. Conform with ASTM D1784 and D1785.
2. Pipe sizes 4-inch and 6-inch: Schedule 40
3. Solvent Weld Joints: ASTM D2855
4. Fittings: Socket type, ASTM D2466

C. Piping System Specification (Section 15050)
1. Conform with ASTM D1784 and D1785.
2. Solvent Weld Joints: ASTM D2855.
3. Threaded Joints: ASTM D2464-06.
4. Fittings: Socket Type, ASTM D2466.

2.02 PRESSURE RATED PIPE

A. Water main
1. All pipe shall be the product of one manufacturer.
2. All fittings shall be the product of one manufacturer.
3. Pipe shall be manufactured in accordance with the following standards:
   a. Pipe sizes 4-inch through 12-inch: AWWA C900, pressure Class 150, thickness Class DR 18.
   b. Pipe sizes 14-inch through 36-inch: AWWA C905, pressure Class 235, thickness Class DR18.
4. Elastomeric gaskets shall be manufactured as defined in ASTM F477.
5. Joints shall conform to ASTM D3139.
6. Solvent weld joints may not be used.

B. Pressure Sewer (3 Inches and Smaller)
1. Pipe and joints shall be manufactured in ASTM D2241, minimum pressure Class 160 and thickness Class SDR 26.
2. Solvent Weld Joints: ASTM 2855

C. Pressure Sewer (4 Inches and Larger)