VILLAGE OF EAST TROY
STANDARD SPECIFICATIONS 2024

Adopted 9/16/2024

SECTION 01 00 00

GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 PROJECT DESCRIPTION

A. The project is located as shown on the Drawings.

1.2 STAKING

A. The Owner will provide primary survey reference points as shown on the drawings as well as the following:

1. Sanitary Sewer: Line and grade with stakes every 100 feet and at manhole locations.

2. Water Main: Line and grade with stakes every 100 feet, at fittings, and hydrants.

3. Storm Sewer: Line and grade with stakes every 100 feet and at all inlet and manhole locations.

4. Curb and Gutter: Line and grade with stakes every 50 feet along straight lines and 25 feet through vertical and horizontal curves.

5. Curb and Gutter Spot Replacement: No staking provided. Restore to match existing grade.

6. Roadway with Curb and Gutter: Utilize curb and gutter staking. No additional roadway staking will be provided.

7. Roadway without Curb and Gutter: Line and grade with stakes every 50 feet along straight lines and 25 feet through vertical and horizontal curves.

8. Roadway Patching: No staking. Restore to match existing grade. Slope to provide drainage.

B. Notify A/E at least two days prior to required staking. Submit A/E staking request form.

C. Staking shall be completed at a distance of 1000 LF unless project limits are less than 1000 LF in which case, one trip per item listed in Section A will be accomplished for staking. Any additional trips will be charged to the contractor at a cost of not less than $500 per trip.

D. Each type of staking will be provided once. The contractor is responsible for preserving the stakes. Any additional staking required shall be paid for by the Contractor.

E. All elevations and locations provided by A/E must be verified and agreed to in writing by Contractor before work is performed.

1.4 WORKING HOURS

A. Work creating noise levels that could negatively affect adjacent properties shall be conducted between the hours given below unless approved by the Owner in writing:

1. Weekdays from 7 a.m. to 6 p.m.

2. Saturdays from 8 a.m. to 5 p.m.

3. Sundays no work allowed

1.5 PERMITS AND LAWS

A. Owner will obtain the following permits, licenses, and approvals:

B. The contractor shall be responsible for complying with the requirements of the above permits, licenses, and approvals. If the permit includes provisions that are not part of these Contract Documents, such a requirement will be considered extra work. Work shall not begin on items requiring a permit until the permit is received.

C. Contractor shall provide all other necessary permits. Contractor shall pay all fees unless otherwise indicated.

D. Comply with all local, state, and federal codes and laws.

E. For work within a Village Street, the Contractor shall obtain a street opening permit from the Village Building inspector.

1.6 PROJECT MEETINGS

A. A preconstruction meeting will be scheduled after the award of the contract and prior to beginning work. The meeting shall be attended by an authorized representative of the Contractor.

B. Periodic progress meetings will be held at a mutually agreed upon location as needed throughout the project. An authorized representative of the Contractor and subcontractors shall attend each progress meeting.

1.7 SUBMITTALS

A. Submittals may be transmitted either electronically or in paper copy. Provide one PDF electronic copy or three paper copies unless otherwise specified. One paper copy will be returned to the Contractor and two will be retained.

B. Submittals shall include the project name and bear the stamp of the Contractor. Drawings that are not stamped will be returned without review.

C. Submittals shall not be used in the work unless they have been reviewed and bear the stamp and signature of the A/E. Shop drawings will be reviewed for general compliance with the contract documents. Contractor shall be responsible for confirming all quantities and dimensions, coordinating their work, and performing all work in a safe and satisfactory manner. Comments, corrections, or other annotations on the shop drawings shall not relieve the Contractor of their responsibility.

D. Prior to beginning work, submit 24-hour contact information for Contractor. Owner will make contact information available to the Owner's Police Department and other officials as necessary.

E. Prior to submitting the final Application for Payment, submit the following documents to the A/E:

1. Project record drawings showing all changes made during construction. Dimension all changes to the nearest 0.1 feet. Record drawings shall be updated in AutoCAD and the Village provided with a finished AutoCAD and PDF version. Handwritten corrections to the drawings will not be accepted.

2. Evidence of continuing insurance coverage.

3. Contractor's affidavit of payment and lien waivers

4. Consent of Surety to final payment

1.8 TEMPORARY FACILITIES

A. The Owner will supply and pay for all temporary water for construction purposes. Contractor shall supply hoses and required fixtures. Contractor shall be responsible for minimizing usage. If excessive usage (such as leaving water run overnight when not required) occurs, the Owner reserves the right to charge the Contractor for the volume of water utilized.

B. Contractor shall be responsible for providing electrical power as required for construction.

C. Contractor shall be responsible for providing temporary toilet facilities for workers. Maintain facilities in a clean and sanitary condition until completion of work.

D. Provide temporary mailbox facilities if mail delivery will be impacted. Coordinate location of facilities with USPS.

1.9 OWNER FURNISHED PRODUCTS

A. There are no Owner furnished products except those shown on the Drawings.

1.10 MEASUREMENT AND PAYMENT

A. Work required by the Contract Documents but not included in the Bid Schedule shall be considered incidental to the Contract.

B. The Owner reserves the right to alter the Drawings, modify work as necessary, and increase or decrease the quantity of work to be performed. When changes to the Work cause a change in the total quantity of work performed, the Contractor shall accept payment at the contract unit price that was included in the Bid Schedule.

C. When a bid item for “Mobilization” is included in the Bid Schedule, the Contractor will be paid 60% of the amount of mobilization when 5% of the work is completed. The remainder will be paid as demobilization at the time of Substantial Completion.

1.11 QUALITY CONTROL/QUALITY ASSURANCE TESTING

A. Contractor shall arrange and pay for testing as shown in the individual specification sections. Payment for items requiring testing will not be made until satisfactory test results have been obtained.

1.12 EROSION CONTROL

A. Contractor shall be responsible for completing weekly inspection reports of erosion and sediment control measures. Reports shall be submitted at a minimum, prior to each application for payment. Complete reports in accordance with WDNR permit, but no less than once per week and within 24 hours of any precipitation event that produces 0.5 inches of rain or more. Submit reports on A/E provided forms.

B. Unless otherwise specified, all erosion control measures shall comply with the WDNR Stormwater Management Technical Standards. Stormwater Management Technical Standards that are anticipated to be utilized on this project are located in the Appendices. Additional Standards can be found line at http://dnr.wi.gov/topic/stormwater/standards/const_standards.html.

C. Maintain erosion control measures to protect the project site, adjacent properties, and waters of the state.

D. Install erosion control measures prior to beginning work and maintain until final restoration is complete. Remove temporary erosion control measures prior to final application for payment, unless otherwise directed by A/E.

E. Only strip sod and vegetation in areas that will immediately have work completed in them. Minimize bare soil to prevent erosion.

F. Minimize dust from construction operations by applying water or dust control polymer.

G. Comply with all requirements of most recent version of the Owner's erosion control ordinance. Where ordinance conflicts with WDNR requirements, comply with WDNR.

1.13 TRAFFIC CONTROL

A. Schedule work to minimize roadway closures.

B. Keep at least one lane of traffic open at all times on all streets. Provide proper traffic control, including flagmen, when only one lane of traffic is available.

C. Maintain access overnight to all properties. Keep pedestrian access open to all businesses and residents at all times.

D. When roads must be closed, provide and maintain construction barricades on all approaches to the work. Traffic control shall be provided in accordance with the Wisconsin Manual on Uniform Traffic Control Devices (MUTCD). Any traffic control shown in the plans is for reference only. The Contractor shall be responsible for determining the extent of traffic control required in order to comply with the MUTCD.

E. Prior to closing any streets, notify the following at least 72 hours in advance:

1. Owner

2. Village of East Troy Police Department

3. Walworth County Sheriff's Department

4. Village of East Troy Fire Department

5. East Troy School District

6. USPS

7. Local Ambulance Service

F. Provide businesses and residents at least 24 hours' notice that driveways will be blocked. Construct temporary ramps at all driveways to provide access during road construction.

G. The Contractor shall provide access for garbage collection and mail delivery on those streets closed to through traffic for the duration of the project.

H. The Contractor shall provide full time access to residents of handicapped persons, nursing and retirement homes, hospitals, and other facilities as directed by the A/E unless satisfactory arrangements can be made.

I. Provide access at all times to businesses unless satisfactory arrangements can be made.

1.14 JOBSITE CLEANING

A. Keep jobsite picked up and free from litter, debris, waste, and surplus materials.

B. Do not bury any debris onsite.

C. All materials shall be stored in appropriate containers. Prevent materials from being windblown.

1.15 EXPLORATORY BORINGS

A. Contractor shall not perform subsurface investigations without obtaining prior permission from Owner.

B. Provide information to Owner on proposed backfill methods. Utilize bentonite or other approved material.

1.16 UTILITIES

A. Contractor shall be responsible for contacting Digger's Hotline prior to beginning Work.

B. The location of utilities shown on the Plans are from existing records and/or field locations and may not be complete or accurate.

C. It shall be the responsibility of the Contractor to protect all utilities that are encountered during his operations. The Contractor shall contact utilities to determine their procedure and schedule for supporting and/or relocating poles and shall notify any above ground utility such as electric and telephone companies to relocate or reinforce any poles, ties or anchors which may be near the proposed construction. All costs for protecting existing utilities including those charged by the utility company shall be considered incidental to the Work.

D. Water and sanitary sewer service may be temporarily interrupted in order to make connections to existing mains. All utilities must be restored at the end of each day. All service interruptions shall last no more than 4 hours. The Contractor shall be responsible for notifying all customers at least 48 hours prior to an interruption. Failure to provide proper notification shall result in the Village not allowing for the interruption to occur until proper notice is given at least 48 hours prior to the interruption.

1.17 GENERAL WORK ITEMS

A. The Contractor shall remove and reinstall all mailboxes located within the project corridor, including those not damaged or disturbed by the Work to meet USPS requirements.

B. The Contractor shall ensure that mail delivery can be made to the properties affected by the Work. If the Contractor's operations will restrict or prohibit mail delivery, the Contractor shall either temporarily relocate mailboxes removed during Work or provide temporary collection boxes at a central location. The Contractor shall be responsible for coordinating temporary mailbox relocations with the Post Office and property owners.

C. The Contractor shall coordinate his activities with the appropriate entity responsible for snow removal during periods of inclement weather.

1.18 DEFINITIONS

A. The term "furnish" means to supply and deliver to the project site.

B. The term "install" means to place, assemble, anchor, apply, finish, protect, clean or similar operations.

C. The term "provide" means to furnish and install.

D. Reference to A/E, Engineer, or Architect shall mean the Village Engineer.

E. Reference to Owner shall mean the Village of East Troy.

F. Reference to "WDNR" shall mean the Wisconsin Department of Natural Resources. Reference to "WISDOT" shall mean the Wisconsin Department of Transportation.

SECTION 01 01 00

WARRANTY

PART 1 GENERAL

1.1 SUMMARY

A. All items installed shall be warranted against defects in materials and workmanship for a period of one (1) year from the date of final acceptance.

1.2 AMOUNT OF WARRANTY

A. Village Bid Projects
   a. A written guarantee and warranty bond equal to 10% of the value of the items bid, to the benefit of the Village of East Troy, in a form acceptable to the Village, shall be provided prior to final payment.

B. Developer Projects
   a. A written guarantee and warranty bond equal to 10% of the value of the items installed within the right of way or easements, to the benefit of the Village of East Troy, in a form acceptable to the Village, shall be provided prior to final occupancy

SECTION 02 44 00

REMOVAL OR ABANDONMENT OF UTILITIES

PART 1 GENERAL

1.1 SUMMARY

A. Remove or abandon utilities as shown and as specified.

1.2 RELATED SECTIONS

31 23 00 Excavation and Fill

1.3 MEASUREMENT AND PAYMENT

A. Unless a bid item is included in the Bid Schedule, removal or abandonment of existing utilities shall be considered incidental to the bid items.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 ABANDONING WATER MAINS

A. The Contractor shall abandon water mains within the road right of way as shown on the Plans or as directed by A/E. Mains shall be abandoned to an existing tee or cross if limits are not shown on the Plans.

B. Plug ends of abandoned mains with a minimum 6-inch thick concrete bulkhead.

C. Provide additional joint restraints as necessary to support mains remaining in operation after abandonment is completed.

D. Abandoned valves shall be closed and left in place unless shown to be removed.

E. Valve boxes shall have the cover and top 3 feet removed. Backfill the remaining valve sections with crushed stone.

F. Valve manholes shall be abandoned by removing the casting and manhole sections to 3 feet below finished grade. Cut a 6 inch hole in the bottom of the manhole to facilitate drainage. Backfill remaining manhole with granular backfill.

3.2 ABANDONING WATER SERVICES

A. See Section 33 11 13.

3.3 REMOVAL WATER MAINS AND SERVICES

A. Remove any water mains and services shown to be removed or that will interfere with construction.

3.5 ABANDONING SANITARY SERVICES

A. See Section 33 31 00.

3.4 SALVAGED MATERIALS

A. Salvage materials as directed by A/E that are shown to be removed. Neatly stockpile materials onsite to prevent damage and deliver to a location designated by Village within 5 miles of the project site.

SECTION 03 30 00

CAST IN PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Provide cast in place concrete as shown and as specified.

1.2 RELATED SECTIONS

01 01 00	Warranty
32 13 13	Concrete Paving
32 16 13	Curbs and Gutters
32 16 23	Sidewalks
32 16 33	Driveways

1.3 SUBMITTALS

A. Submit mix design for each mix that will be utilized at least five days prior to beginning concrete work. Design shall include the moisture content of all aggregates being utilized.

B. Submit product data sheets on all admixtures and joint fillers.

C. Submit joint plan showing proposed locations of all expansion and contraction joints.

D. Submit delivery tickets daily to A/E.

E. Verbally provide field testing results to A/E at time of testing. Test reports shall be submitted to A/E directly by laboratory after 7 day testing is completed and again after 28 day testing is completed.

1.4 TESTING

A. During work, prepare test cylinders for each 50 yards of concrete or portion thereof for each class or concrete placed on each day. Label samples with date and time of sample and sample ID number. Moist cure samples in accordance with ASTM C31 and ship samples to laboratory for one 7-day compressive strength test and two 28-day tests. Retain the fourth sample for use if 28 day sample does not meet requirements.

B. Contractor shall test concrete for slump, air entrainment content, and temperature onsite. Samples shall be taken at the same interval as the test cylinders. Do not reuse concrete. If measured slump, air content or temperature falls outside the requirements, immediately recheck. If second tests are non-compliant, concrete shall be rejected.

C. Onsite testing shall be completed in front of A/E unless waived.

D. Test procedures shall be in accordance with ASTM C31, C39, C143, C172, C231, and C1064.

E. The cost of the tests, including equipment, materials and transportation shall be paid by the Contractor and shall be considered incidental to concrete work items.

PART 2 PRODUCTS

2.1 CEMENT

A. Portland cement, type I, complying with ASTM C150

2.2 AGGREGATES

A. Provide course and fine aggregate complying with ASTM C33, consisting of clean, hard, durable sand and crushed rock, crushed gravel or gravel. Coarse aggregate shall meet the grading requirements for number 57, 67, or 467. Maximum aggregate size shall not exceed 1.5 inches or ¼ of the slab thickness, whichever is smaller. The ratio of course aggregate to fine aggregate shall not be less than 1:1 or greater than 2:1.

2.3 WATER

A. Water shall be clean, potable, free of oil, organic material, salts, and other harmful substances.

2.4 ADMIXTURES

A. Air entraining admixture shall comply to ASTM C260.

B. Accelerator admixtures shall comply to ASTM C494 and AASHTO M194 Type C.

C. Superplasticizers shall comply to ASTM C1017, Type 1.

D. Water reducing admixtures shall comply to ASTM C494 and AASHTO M194 Type M.

E. Other admixtures that do not adversely affect the strength and durability will be considered by the A/E if used in accordance with manufacturer's recommendations. Chemical anti-freeze admixtures will not be allowed.

2.5 EXPANSION JOINT FILLER

A. Pre-molded joint filler, asphalt saturated cellulose fiber, ½ inch thick complying with ASTM C309. Joint filler shall extend through the entire depth of slab unless otherwise shown. Utilize 1 inch thick joint filler between new concrete and existing buildings.

2.6 CURING COMPOUND

A. White pigmented, liquid membrane forming compound complying with ASTM C309 Type 2.

PART 3 EXECUTION

3.1 FORMWORK

A. Set forms to the line and grade shown. Curves shall be made with smooth transitions.

B. Slipforming may be utilized in lieu of formwork as indicated in each Specification Section.

3.2 PREPARATION

A. Prior to placement of concrete, A/E shall verify reinforcement steel placement. Provide a minimum of 1 ½ inch of concrete cover on all sides of reinforcing steel.

B. Apply form release to forms.

C. Install expansion joint filler between existing concrete and locations of new concrete.

3.3 JOINTS

A. Install expansion joints to full depth of concrete.

B. Install contraction joints at least 1 inch deep by ¼ inch wide. Joints may be tooled or saw cut.

C. Install expansion joints as specified in individual Specification Sections.

3.4 MIXING AND PLACEMENT

A. Concrete shall be prepared as “ready mix” in accordance with ASTMC94.

B. Place concrete within 90 minutes of adding water to the mix. Time shall be determined based on the time indicated on the batch ticket. If the time extends past 90 minutes, the concrete shall be rejected and removed from the project site.

C. Concrete shall be placed to reduce handling. Do not move compactor to move concrete within forms.

D. Place concrete in a manner that does not disturb formwork, castings, frames, joints, or other items located within the concrete. Ensure that each item is properly positioned throughout concrete placement.

E. Provide mechanical vibration of concrete.

3.5 WEATHER CONSIDERATIONS

A. Comply with ACI 306 for cold weather damage prevention.

B. When air temperature is anticipated to fall below 40 degrees, heat the water and aggregate prior to batching. Concrete shall be delivered to the jobsite between 60 and 90 degrees. Cover material as required to provide insulation.

C. Do not place concrete on frozen base. Remove any ice or snow from ground, forms, rebar, and other items that are located within the concrete.

D. Comply with ACI 305 for hot weather damage protection.

3.6 FINISHING

A. Strike concrete off and then float each surface.

B. Provide a brushed finish on sidewalks, pavements, curb and gutter, and driveways. Brushing shall be done perpendicular to the typical direction of travel.

C. Tool edges with ¼ inch edging tool unless otherwise indicated.

3.7 CURING

A. Apply curing compound at the manufacturer’s recommended application rate.

B. Protect concrete from traffic until it has reached at least 75% of the required 28-day strength. Any damage to concrete caused by traffic shall be replaced to the nearest joint at the Contractor’s expense.

PART 4 SCHEDULE

4.01 CONCRETE SCHEDULE

Type	Minimum Compressive Strength (psi)	Days to Reach Compressive Strength	Maximum Slump (in)	Minimum Cement (Bags/CY)	Maximum Water Content (gal/CY)	Air Content (%)	Use
1	3000	3	3	7.0	33	5-8	High Early Strength
2	4000	28	3	6.0	30	5-8	Pavement, Curb and gutter, sidewalk, walls, foundation, driveway
3	3000	28	4	5.5	32	3-5	Manhole bases and flow lines, buttresses

SECTION 07 21 13

BOARD INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Provide board insulation as shown in the plan and as specified.

1.2 SUBMITTALS

A. Product Data: Submit product data with thickness and R value indicated.

1.3 MEASUREMENT AND PAYMENT

A. Board insulation will be considered incidental to Bid Items. No additional compensation will be given.

PART 2 PRODUCTS

2.1 BOARD INSULATION

A. Extruded polystyrene boards complying with ASTM C578, Type X. Provide in 4 feet by 8 feet sheets with a minimum compressive strength of 25 psi. R-value shall be 5 per inch of thickness. Provide Dow Chemical Styrofoam SM blue board, UC Industries Foamular 250 pink board, or approved equal.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify substrate surface is flat and free of irregularities.

B. Verify insulation boards are unbroken and free from damage. Do not use damaged boards; dispose of offsite.

3.2 INSTALLATION

A. Install insulation where shown or in any location where depth of water main or sanitary sewer is less than 6 feet.

B. Place 2 inches of board insulation over top of utility for full width of trench or as shown. Utilize 2 thick foam board if available. If unavailable, utilize 1 inch board and alternate seam direction and location to achieve the required 2 thickness.

SECTION 10 14 53

TRAFFIC SIGNAGE

PART 1 GENERAL

1.1 SUMMARY

A. Provide signage as shown and as specified.

1.2 MEASUREMENT AND PAYMENT

A. When a bid item for single sign assembly is included in the bid schedule, it shall be paid per each assembly successfully installed. The pay item shall include the post, sign, hardware, restoration and all other associated work.

B. When a bid item for multiple sign assembly is included in the bid schedule, it shall be paid per each assembly successfully installed. The pay item shall include the post, signs, hardware, restoration, and all other associated work.

1.3 SUBMITTALS

A. Furnish shop drawings of signs. Include type of sign, materials, dimensions, colors, text, graphics, and mounting details.

PART 2 PRODUCTS

2.1 SIGNS

A. Provide signs as shown in accordance with the MUTCD. Signs shall be from the WisDOT approved products list.

2.2 MOUNTING HARDWARE

A. Furnish components to attach signs to ground mounted wooden posts using hex head nuts and bolts, washers, and other steel hardware. Hardware shall be either hot dipped galvanized in accordance with ASTM A153 class D or stainless steel.

2.3 MARKER POSTS WITH DELINEATORS

A. Furnish flanged channel section posts weighing 1.12 pounds per lineal foot or more before zinc coating and made of steel with a minimum tensile strength of 50 ksi, minimum tensile yield strength of 36 psi, and minimum elongation of 5% in 2 inches.

B. Posts shall be symmetrically, well rolled, and free of defects that impair their strength or appearance.

C. Delineator deflectors shall be sheet aluminum covered with type SH reflective sheeting. Provide delineators from the WisDOT approved products list.

2.4 SIGN POSTS

A. Sign posts shall be pressure treated lumber and timber of the dimensions shown on the plans. Posts shall conform to Section 634.2.1 of the WisDOT Standard Specifications

PART 3 EXECUTION

3.1 INSTALLATION

A. Install signs in accordance with the details included in the Drawings and the MUTCD. Install delineators in accordance with WisDOT section 633.

SECTION 31 23 00

EXCAVATION AND FILL

PART 1 GENERAL

1.1 SUMMARY

A. Provide excavation and filling as shown and as specified.

1.2 RELATED SECTIONS

01 01 00	Warranty
32 92 00	TURF AND GRASSES

1.3 MEASUREMENT AND PAYMENT

A. Site preparation, trenching, backfilling, and excavation specified under this Section shall be considered incidental to the bid items. No additional compensation will be allowed unless a separate bid item is included in the Bid Schedule unless otherwise indicated.

B. If a bid item for Rock Excavation is included in the Bid Schedule, it will be paid per the contract unit price per yard of excavation completed. Measurements will be taken of the actual width of excavated trench. The width of the trench shall not exceed the outside diameter of the pipe plus 24 inches. The bottom of rock shall be measured to no lower than 4 inches below the barrel of the pipe. The vertical limits of rock excavation will be measured to the top of the exposed rock in the trench walls. Overburden depth will not be included in the rock excavation measurement.

1.4 TYPE OF EXCAVATED MATERIALS

A. Materials excavated under this Section will not be classified except for excavation of rock.

B. Rock is defined as hard, either deposits, boulders, buried concrete masses not shown on the plans, and other firmly cemented materials that possess all the characteristics of solid rock. Isolated pieces with a size less than 1 cubic yard will not be considered rock.

C. When material is encountered that may be considered rock, notify A/E who will make final determination of material classification.

PART 2 PRODUCTS

2.1 WASHED STONE

A. Clean, hard, durable 1 ½ inch washed stone, crushed rock, crushed gravel, or gravel.

2.2 GRANULAR BACKFILL

A. Soils complying with ASTM D2487 soil classification groups including.

1. 00GW- Well graded gravel
2. GP- Poorly graded gravel
3. SW- Well graded sand
4. SP- Poorly graded sand

B. All aggregates should pass the ¾ inch sieve and not more than 35% shall be retained on the No. 10 sieve. A maximum of 5% shall pass the No. 200 sieve.

C. Crushed pea gravel will not be allowed.

2.3 BACKFILL

A. Native material, free from aggregate larger than 3 inches. Do not utilize organic material.

2.4 ROADWAY BACKFILL

A. Soils meeting the requirements of Granular Backfill with a plasticity index not exceeding 5.

2.5 BEDDING AND INITIAL BACKFILL MATERIALS

A. Bedding material for 18 inch diameter and smaller sanitary sewer pipes shall conform to one of the two gradations:

Sieve Size	Option 1 % Passing	Option 2 % Passing
3/4”	100	100
½”	100	90-100
3/8”	85-100	20-55
No. 4	10-30	0-10
No. 8	0-10	0-5
No. 16	0-5	0

B. Crushed pea gravel will not be allowed.

2.6 SLURRY

A. Mixture of sand, gravel, and water in the following proportions per cubic yard:

1,350 pounds sand
775 pounds 1” stone
1,150 pounds 2” stone
25 gallons water

B. The proportions shown above are damn weights for sand and stone. If moisture content exceeds 10%, dry materials before mixing or decrease added water.

PART 3 EXECUTION

3.1 PROTECTION

A. Project improvements on project site and adjacent properties. Provide barricades, coverings, or other protection as necessary to prevent damage and injury. Restore to original condition any improvements that were damaged due to Work.

B. Protect existing vegetation from unnecessary cutting, breaking, or bruising. Do not stockpile excavated materials within 5 feet. Replace or repair vegetation damaged by the Work.

C. Maintain survey monuments, markers, reference points, benchmarks, or other points. Contractor shall pay for the cost of reestablishing all survey points that were damaged due to is negligence.

3.2 LOCATING EXISTING UTILITIES

A. The location of the existing utilities shown on the plans are from existing system mapping. There may be other utilities within the project area that are not shown.

B. Notify all affected utilities regarding construction operations at least three working days prior to beginning work. Do not begin excavation around underground utilities until they have been located.

C. If unmapped utilities are encountered during excavation or if the proposed construction interferes with an existing utility, give prompt notice to A/E. If required, make arrangements with utility companies for relocation of interfering utilities. No extra cost or time will be allowed for unexpected delays due to work coordination.

D. During underground excavation, it may be necessary to cross under other utilities. Prevent damage to such utilities. Where necessary, divert flow in drains or culverts so that trenches remain dry during Work.

3.3 SITE CLEARING

A. Remove trees, stumps, brush, weeds and other vegetation, improvements, and debris that must be removed in order to complete work. Minimize area of disturbance to only those impacted by construction. Only remove those trees shown on Drawings to be removed.

B. Cut brush flush with the ground. Remove, by grubbing, any stumps and roots larger than 2-inch diameter to a depth of at least 2 feet below subgrade elevation.

C. Cleanly cut roots and branches on trees that shall remain standing.

D. Remove removed trees, stumps, brush, vegetation, improvements, and debris from the jobsite and legally dispose of them. Do not burn any items onsite.

E. The Contractor shall carefully trim limbs or branches overhanging the road of trees to be preserved. Such trimming shall be performed in accordance with generally accepted horticultural practices and all cut surfaces shall be painted with asphalt based tree paint.

3.4 TOPSOIL STRIPPING

A. Strip topsoil from project areas. Prevent mixing topsoil with other soil materials. Remove heavy growth of grass, brush, or other debris prior to stripping topsoil.

B. Stockpile topsoil onsite in area approved by A/E. Provide proper erosion control measures and ensure surface water drainage.

3.5 REMOVALS AND DEMOLITION

A. Remove existing structures, pavement, and improvements within the construction limits that are shown to be removed or as required for construction. Remove below grade items encountered that interfere with construction.

B. Owner reserves the right to retain all useful salvage. Any items not retained by the Owner shall be disposed of by the Contractor.

3.6 TRENCHING

A. Excavate trenches so that pipe can be laid safely and accurately to the required line and grade. Excavate for pipe bells, fittings, and other protrusions to allow for proper joining of pipe.

B. Do not excavate below the required depth of pipe bedding. Over excavation shall be backfilled with granular bedding.

C. In sand and gravel soils, the bottom of trench may be shaped to fit bottom 1/3 of pipe. In silt or clay soils, bottom of trench shall be 4 inches below pipe barrel and 3 inches below bell. In rock, bottom of trench shall be 6 inches below pipe barrel.

D. Limit trench width to not less than 6 inches clearance on either side of the pipe nor more than the pipe diameter plus 24inches at the top of the pipe. Trenches above the top of pipe may be sloped, stepped, or other OSHA approved methods to comply with regulations.

E. Maintain trenches in a safe condition until completion of backfilling. Take precautions to prevent slides or cave-ins.

F. Provide sheathing when necessary to protect structures and pavement. Do not remove sheathing until backfill is completed.

G. Do not open trenches more than 100 feet in advance of the pipe laying operation. The backfill shall be kept within 200 feet of the completed pipe laying. At end of day, no more than 50 feet of trench shall remain open.

H. Barricade, fence, or otherwise protection open trenches when unattended.

I. Contractor shall attempt to dewater trenches. Dispose of diverted water in an approved manner. Do not place water in sanitary sewer or onto adjacent properties. Provide proper erosion control devices to prevent sediment from being pumped.

J. When trench bottoms are unstable due to groundwater, notify A/E that over excavation may be required.

3.7 POOR SOILS

A. When poor soil conditions such as organics, sawdust, or bark are encountered, notify A/E. A/E may order it removed and replaced with granular backfill. This shall be considered Extra Work.

3.8 BEDDING AND INITIAL BACKFILL

A. Provide washed stone backfill in all trenches from subgrade to the spring line. Place and compact bedding so that it fills all voids under pipe.

B. For flexible pipe systems (PVC, HDPE, etc.), extend washed stone backfill to a minimum depth of 1 foot above the top of the pipe. For non-flexible pipe systems, washed stone or granular backfill may be utilized to a minimum depth of 1 foot above the top of pipe.

3.9 TRENCH BACKFILL

A. Backfill more than 1 foot over the pipe under roadways, shoulders, sidewalk, curb and gutter, and driveways shall be Roadway Backfill. Backfill located in other areas may be native backfill.

B. When backfilling when temperature is below 32 degrees, cover pipe and backfill at least 3 feet over the top of pipe with unfrozen ground.

3.10 SLURRY BACKFILL

A. Place slurry backfill in locations shown on the Plans or as required by permits. Slurry shall be utilized for all utility repairs or lateral installations within the roadway unless otherwise approved by the Village DPW. Extend slurry at least five feet beyond the edge of shoulder or back of curb.

B. Just prior to placing slurry, the mixer shall be run at full speed for one minute.

3.11 COMPACTION

A. Provide mechanical compaction equipment for backfill. Compact each layer in the thicknesses and to the density shown below.

Backfill Type	Usage	Maximum Lift Thickness	Percent Compaction (ASTM D1557 Modified Proctor Test)
Washed Stone	Trench EBS	6”	NA
Granular Bedding	Bedding and Haunching	6”	90%
Granular Backfill	Backfill to 1’ over top of pipe	12”	90%
Roadway Backfill	Trench backfill under roads, shoulders, sidewalk, curb, and driveways	12”	95%
Backfill	Trench backfill not under roads, shoulders, sidewalk, curb, and driveway	12”	90%
Slurry		NA	NA

3.12 RESTORATION

A. Restore drainage, lawns, and other items disturbed by construction. Replace sidewalk, driveways, curb, gutter, shoulder, pavement, culverts, lawn, ditch, fence, signs, mailboxes and other property damaged during construction.

B. Comply with the requirements of Section 32 92 00.

3.13 DISPOSAL OF EXCESS MATERIALS

A. The Contractor shall dispose of excess materials at an approved offsite location unless on site disposal site is approved by Owner.

B. Maintain disposal sites in a neat, leveled fashion and graded to drain.

C. Any material lost from trucks during transit shall be cleaned up immediately. Material not cleaned up will removed by the Owner and the cost thereof charged to the Contractor.

D. Onsite stockpiles shall be maintained at a slope not greater than 4:1 to allow for mowing.

SECTION 31 32 19

GEOSYNTHETIC SOIL STABILIZATION AND LAYER SEPERATION

PART 1 GENERAL

1.1 SUMMARY

A. Provide soil stabilization fabric as shown and as specified and as directed by A/E.

1.2 MEASUREMENT AND PAYMENT

A. If a bid item for Geotextile fabric is included in the Bid Schedule, it will be paid per contract unit price per square yard. Areas of fabric overlap will not be measured.

1.3 SUBMITTALS

A. Submit fabric product data.

PART 2 PRODUCTS

2.1 GEOSYNTHETIC SOIL STABILIZATION FABRIC

A. Woven polypropylene, polyethylene, or polyamide material designed for the purpose of providing subgrade stabilization.

B. Fabric shall have the following characteristics:

Property	Value	Test
Weight	6 oz/yd^2 (min.)	ASTM D5261
Tensile Strength	300 lb (min.)	ASTM D4632
Elongation	12% (min.)	ASTM D4632
Puncture (CBR)	900 lb (min.)	ASTM D6241
Trapezoid Tear Strength	110 lb (min.)	ASTM D4533
Water Flow Rate	4 gal/min/ft^2 (min.)	ASTM D4491
Apparent Opening Size (AOS)	40 sieve	ASTM D4751

PART 3 EXECUTION

3.1 GEOTEXTILE INSTALLATION

A. Before placing fabric, grade the area to remove all stones, rocks, sticks, and other material that may puncture or tear material.

B. Install fabric as shown and in accordance with the manufacturer's recommendations.

C. Manually roll out fabric and pull tight to remove wrinkles. If lapping of fabric is required, minimum lap shall be three feet. Lapping shall not be required if fabric is sewn together. Overlap fabric onto stable ground a minimum of 5 feet in each direction.

D. Seam strength shall be a minimum of 80% of the fabric tensile strength.

E. Anchor fabric to prevent lifting or movement. Cover fabric within 48 hours of placement. Do not allow traffic or equipment on fabric prior to backfill placement.

F. Place initial lift of backfill in a manner that will prevent damage to the fabric in a lift not less than 8 inches in thickness and no greater than 2 feet. Ensure rutting beneath fabric does not exceed 4 inches prior to placement of backfill. Compact the subbase using vibratory rollers or other approved equipment in accordance with Section 32 11 23.

SECTION 32 01 16.76

ASPHALT PAVEMENT PULVERIZING

PART 1 GENERAL

1.1 SUMMARY

A. Provide pavement pulverizing as shown and as specified.

1.2 RELATED SECTIONS

01 01 00 Warranty

1.3 MEASUREMENT AND PAYMENT

A. Pavement pulverizing shall be considered incidental to the Work.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 PULVERIZING

A. Pulverize the full depth of the existing asphalt until 97% or more will pass a 2-inch sieve. Also pulverize the existing base to the depth shown on the plans and mix with the pulverized asphaltic pavement. Windrow material as construction operations dictate.

B. Immediately after pulverizing, relay the material with a paver, grader, or other equipment.

C. If sufficient material is available, match the lines, grades, and cross slopes shown on the plans. If there is insufficient material, shape the available material to create a smooth profile and cross slope. Provide additional material as necessary to meet the plan grades. Eliminate localized bumps, depressions, and ruts.

D. Immediately after relaying, compact the re-laid material with either a rubber-tired roller or vibratory compactor. Add water, as required both before and during compaction. Compact each layer to a minimum of 95% of the modified proctor.

SECTION 32 11 22

RIPRAP

PART 1 GENERAL

1.1 SUMMARY

A. Provide riprap as shown and as specified.

1.2 RELATED SECTIONS

01 01 00 Warranty

1.3 SUBMITTALS

A. Load Tickets: Submit load tickets daily. Tickets shall display moisture content.

PART 2 PRODUCTS

2.1 RIPRAP

A. Riprap shall be sound, hard, dense stone. Use pieces with a length and width no more than twice the thickness.

B. Riprap shall be of the following sizes per classification.

% Of Gross In-Place Riprap	Light Riprap (inches)	Medium Riprap (inches)	Heavy Riprap (inches)	Extra Heavy Riprap (inches)
0	>16”	>20”	>25”	>30”
10-14	11-13	14-16	18-20	22-25
15-21	9-11	11-14	14-18	18-22
20-28	4-9	5-11	6.5-14	8-18
5-7	<4	<5	<6.5	<8
2 or less	<1	<1	<1	<1

C. Riprap shall be placed at the following depths unless otherwise indicated: Light Riprap- 12”, medium riprap- 18”, heavy riprap- 24”, extra heavy riprap- 30”

2.2 GEOTEXTILE FABRIC- TYPE R

A. Geotextile fabric having a minimum grab tensile strength of 205 pounds, minimum puncture strength of 80 pounds, maximum apparent opening size of No. 30, and minimum permittivity of 0.12 s^{-1}

2.3 GEOTEXTILE FABRIC- TYPE HR

A. Geotextile having a minimum grab tensile strength of 305 pounds, minimum puncture strength of 100 pounds, maximum apparent opening size of No. 30 and a minimum permittivity of 0.40 s^{-1}

PART 3 EXECUTION

3.1 GEOTEXTILE INSTALLATION

A. Before placing fabric, grade the area to remove all stones, rocks, sticks, and other material.

B. Utilize Type R for light riprap and Type HR for all other sizes.

C. Overlap fabric at least 24 inches with the top piece being in the direction of flow. In lieu of overlapping, sew pieces of geotextile together.

D. Patch any damage. Patches shall overlap at least 3 feet in all directions.

3.2 RIPRAP PLACEMENT

A. Place riprap within 24 hours of geotextile installation.

B. Place material to line, grade, depth, and section shown.

C. Place with larger stones in lower courses. Lay stones perpendicular to the slope with close broken joints, firmly bed into the slope, and compact.

SECTION 32 11 23

AGGREGATE BASE COURSE

PART 1 GENERAL

1.1 SUMMARY

A. Provide crushed aggregate base course as shown and as specified.

1.2 RELATED SECTIONS

01 01 00	Warranty
31 23 00	Excavation and Fill
32 15 40	Crushed Aggregate Surfacing

1.2 MEASUREMENT AND PAYMENT

A. If a bid item for (size) base course is included in the Bid Schedule, it will be paid at the contract unit price per square yard placed. Measurements will be taken of the actual base course installed, measured to the nearest 0.5 feet.

1.3 TESTING

A. Contractor shall provide base course sampling and testing by a qualified testing agency, independent of the Contractor and acceptable to the Owner. Each material shall be tested for compliance with the specifications. At a minimum, perform a mechanical analysis, determine the liquid and plastic limits, and determine the moisture density curve in accordance with ASTM D1557. When material does not meet the required gradation, Contractor shall provide a second sample of the same material. If second test does not meet the requirements, a new source of material shall be located and new testing performed until the requirements are met.

B. Perform at least one field density test per lift of aggregate base material per 100 foot of roadway, curb and gutter, or sidewalk. Density tests shall be performed at randomly selected locations determined by the testing agency. Perform tests in accordance with ASTM D1556 or ASTM D2922. When testing indicates that the minimum density requirement has not been met, Contractor shall provide additional compaction and testing.

C. The cost of performing all testing, including supplying samples, equipment, and testing shall be paid by the Contractor and considered incidental to the Bid Items.

1.4 SUBMITTALS

A. Submit test reports for laboratory testing and field density tests within 72 hours of performing testing. Immediately provide verbal explanation of any failing test results.

PART 2 PRODUCTS

2.1 AGGREGATE

A. Crushed stone or crushed gravel complying with the following gradations:

	% Passing By Weight		
Sieve Size	**3”**	**1 ¼”**	**¾”**
3”	90-100		
1 ½”	60-85		
1 ¼”		95-100	
1”			100
¾”	40-65	70-93	95-100
3/8”		42-80	50-90
No. 4	15-40	25-63	35-70
No. 10	10-30	16-48	15-55
No. 40	5-20	8-28	10-35
No. 200	2-12	2-12	5-15

B. Unless otherwise shown, utilize 1 ¼ inch for roadway, driveway, and curb and gutter base course and
¾ inch for sidewalk base course.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place aggregate in a manner that minimizes hauling on the subgrade. Do not use vehicles or operations that damage the subgrade or in-place base. Deposit material in a way that minimizes segregation.

B. Construct the base to the width and section shown on the Plans. Shape and compact the base surface to 0.05 feet of the plan elevation.

C. Ensure that adequate moisture is present during the placement, shaping and compacting to prevent segregation and achieve the required compaction. Add water as necessary.

D. Maintain the base until pavement is completed.

3.2 COMPACTION

A. Compact the base material in lifts not greater than 6 inches to achieve 95% of the maximum density as determined by ASTM D1557 Modified Proctor Test. Add water and recompact as necessary to reach required compaction.

SECTION 32 12 16

ASPHALT PAVING

PART 1 GENERAL

1.1 SUMMARY

A. Provide asphalt paving as shown and as specified.
B.

1.2 RELATED SECTIONS

01 01 00 Warranty

1.3 MEASUREMENT AND PAYMENT

A. If a bid item for (Depth) (Course) Asphalt Pavement is included in the Bid Schedule, it will be paid at the contract unit price per square yard. After paving is completed, measurements of actual pavement installed will be used as the basis of payment.

B. If a bid item for Asphalt Driveway Replacement is included in the bid Schedule, it will be paid at the contract unit price per square yard. Asphalt paid under this item is the asphalt that is located between the back of curb and existing asphalt driveway.

1.2 SUBMITTALS

A. Load Tickets: Submit load tickets daily.

B. Mix Design: Submit asphalt mix design including aggregate and asphalt percentage.

C. Test Reports: Submit test reports within 72 hours of performing tests. Verbally provide information to A/E on any failing tests immediately.

1.3 QUALITY CONTROL

A. The Contractor shall maintain a quality control program in accordance with the WISDOT Standard Specification Section 460.2.8 to ensure that the asphalt produced meets the job mix design. Documentation submittals are not required. Owner will not provide mix verification testing.

1.4 WORK LIMITATIONS

A. Work shall not be performed between November 1 and May 1 except with specific written approval.

1.5 TESTING

A. Contractor shall provide nuclear density testing performed by a qualified testing laboratory that is independent from the Contractor and approved by the Owner.

B. Perform field density testing on each course at a frequency not less than one test per 2,500 square yards of pavement or fraction thereof per course. If density does not meet the requirement, submit proposed corrective action plan to A/E.

C. The cost for performing testing shall be considered incidental to asphalt paving bid items.

PART 2 PRODUCTS

2.1 ASPHALTIC CONCRETE

A. Hot mixed asphalt pavement consisting of 5 to 7 percent asphalt cement by weight, aggregate,

B. and mineral fillers for Type LT pavement as designated by WISDOT.

2.2 ASPHALT CEMENT

A. Asphalt cement performance grade PG 58-28 S as designated by WISDOT.

2.3 AGGREGATE

Aggregate shall meet the following gradation:

Sieve Size	Percent Passing						
	Nominal Size						
	37.5 mm	25 mm	19 mm	12.5 mm	9.5 mm	SMA 12.5 mm	SMA 9.5 mm
50 mm	100						
37 mm	90-100	100					
25 mm	90 max	90-100	100				
19 mm		90 max	90-100	100		100	
12.5 mm			90 max	90-100	100	90-97	100
9.5 mm				90 max	90-100	58-72	90-100
4.75 mm					90 max	25-35	35-45
2.36 mm	15-41	19-45	23-49	28-58	20-65	15-25	18-28
% minimum VMA	11.0	12.0	13.0	14.5	15.5	16.0	17.0

A. Utilize 19 mm gradation for binder course, 12.5 mm gradation for Roadway surface course, and 9.5 mm gradation for Driveway surface course.

2.4 MINERAL FILLER

A. Portland cement, limestone dust, or other filler meeting ASTM D242 or AASHTO M17.

2.5 TACK COAT

A. Asphaltic material meeting the requirements of MS-2. Dilute with an equal amount of water.

PART 3 EXECUTION

3.1 CONSTRUCTION EQUIPMENT

A. Equipment shall be in accordance with WIDOT Std. Spec., Subsection 450.3.1 and the following criteria; alternate equipment shall be approved by A/E:

1. Asphalt mixing plant designed to produce a uniform mixture within job-mix tolerances.
2. Self-powered pavers capable of spreading mixture to thickness and width specified, true to line, grade and crown.
3. Smooth metal-bedded haul trucks, with covers when required, to insure continuous paving operations; truck boxes shall be cleaned.
4. Self-propelled steel wheeled rollers with minimum 10 ton rating.
5. Self-propelled pneumatic-tired rollers capable of applying a minimum of 30 psi and a maximum of 90 psi ground contact pressure.
6. A power broom or a power blower or both, as required.

7. All hand tools necessary to complete the job.

3.2 PREPARATION

A. Place asphaltic mixture on a prepared, firm, and compacted base or foundation course, substantially surface-dry and free and clear of loose and foreign material. Loose aggregate on roadbed shall be incorporated in shoulder construction, if any, or disposed of as directed by A/E.

B. Prepare holes and depressions in existing asphaltic surfaces by removing loose and defective material and patching with asphalt-aggregate material, compacted to produce a tight surface conforming to adjacent area.

C. Proof-roll prepared surface to check for unstable areas requiring additional compaction. Notify A/E of unsatisfactory conditions; do not begin paving work until such conditions have been corrected.

D. Do not place asphaltic mixture over frozen subgrade or base or where roadbed underlying foundation or base is temporarily unstable from effects of frost heaving.

E. Do not place asphaltic mixture when raining; remove and replace mixture adversely affected by rain or snow before final rolling.

F. Do not place asphaltic mixture when air temperature at site of work, in shade and away from artificial heat, is less than 40 deg F.

G. Saw cut adjacent pavements to a depth not less than 3 inches. Saw cuts shall be in neat, straight lines perpendicular or parallel to the road centerline. If the saw cut edge is damaged, re-saw cut immediately prior to paving operations.

3.3 PREPARING MIXTURE

A. Paving mixtures shall be composed of a homogeneous mixture of coarse and fine aggregate, mineral filler (when required), and asphalt cement heated to proper viscosity for uniform distribution throughout mixture.

B. Store coarse and fine aggregates separately to prevent intermingling. Stockpile in a manner that will prevent segregation of aggregate sizes. If aggregate tends to segregate during handling, supply and stockpile aggregates in two or more sizes.

C. When it is necessary to blend aggregates from more than one source, stockpile each aggregate individually and feed through separate bins to cold elevator feeders. Do not blend in stockpile.

D. When aggregates proposed for work do not provide required stability or void content in compacted mixture or are deficient in fraction passing No. 200 sieve, correct deficiencies by incorporation of mineral filler into mixture or substitute other satisfactory aggregates.

E. Dry aggregates to a moisture content of less than 1 percent. Screen dry aggregates and store in sizes that may be easily recombined into a gradation meeting requirements of job-mix formula.

F. Feed cold aggregates uniformly to plant so that surpluses and shortages will not occur and cause breaks in continuous operation. Heat aggregate to provide a paving mixture temperature immediately after mixing of 300 deg F +/- 15 deg F. Mix for not less than 45 seconds; mixing times shall be based on Ross Count Procedure to achieve 95% of coated particles for surface mixture.

G. Asphaltic mixture which is not sufficiently mixed or is defective in any manner will be rejected.

3.4 PLACING MIXTURE

A. Place asphaltic mixture in one or more courses to the grades and typical section shown. Pavement thickness shall be as shown on the Drawings.

B. Place asphaltic mixture by means of self-propelled paving machines at recommended operating speed. Place inaccessible and small areas by hand. Minimum temperature of mixture at time of placement shall be 250 deg F for surface courses and 225 deg F for binder courses.

C. Place binder course no later than November 1 of the year that utility and roadway improvements are constructed. Binder shall not be placed on frozen subgrade.

D. Protect edge of gutter by providing ramp to top edge of concrete when placing binder course. Remove wedges and ramps prior to placement of the surface course.

E. Place surface course of asphalt after 75% of the homes have been completed in new developments, but not later than two years after the binder course is placed unless otherwise directed by Owner. Place surface course on existing roads within one month of placing binder course.

F. Place surface course no later than October 15.

3.5 UTILITY ADUSTMENTS

A. Manhole covers and valve boxes shall be adjusted to ¼ inch below the finished grade. When placing binder course, install asphaltic wedge with a diameter not less than 6 feet if surface course will not be placed within 30 days.

3.6 COMPACTION

A. While still hot, compact course thoroughly and uniformly by rolling. Begin rolling when mixture will bear roller weight without excessive displacement. Roller speed shall be slow enough to avoid undue displacement of mixture. Compact with hot hand tampers or vibratory compactors in areas inaccessible to rollers. Do not use pneumatic tire rollers on parking lots, driveways, or other areas where traffic will not smooth out roller marks.

B. Accomplish breakdown or initial rolling immediately following rolling of joints and outside edge. Check surface after breakdown rolling, and repair displaced areas by loosening and filling, if required, with hot material. Following breakdown rolling and while mixture is hot, continue second rolling until mixture has been thoroughly compacted.

C. Perform finish rolling while mixture is warm enough to remove roller marks. Continue rolling until roller marks are eliminated and not less than the target maximum density shown below is obtained.

Location	Layer	Percent of Target Maximum Density for E-0.3, E-1, and E-3	Percent of Target Maximum density for E-10, E-30, and E-30X
Traffic Lanes	Binder and Surface	91.5	92.0
Shoulders	Binder	89.5	89.5
Shoulders	Surface	90.5	90.5
Driveway	Binder and Surface	91.0	91.0

3.7 JOINTS

A. Place courses as nearly continuous as possible. Do not roll unprotected end of freshly laid mixture unless placement is to be discontinued long enough to permit mixture to cool.

B. Longitudinal joints shall be made by overlapping screed onto previously laid material for a minimum of at least 1 inch depositing a sufficient amount of materials. A minimum distance of 12 inches shall be permitted between location of joints between different courses.

C. Transverse joints shall be constructed with proper use of separation paper and shall be at near right angles to street.

D. Contact surfaces, manholes, valves, and similar structures shall be sufficiently coated with liquid asphalt and cleaned to prevent accumulation of asphaltic material. Joints between old and new pavement and between fresh and previously cooled work shall be cut back on a straight line to provide a butt-joint for full depth of new mat. Prior to paving, clean contact surfaces and apply emulsified asphalt tack coat.

3.8 SURFACE REQUIREMENTS

A. Finished surface shall be smooth and true. Meet curbs, manholes, and other construction at required grades. Test surface by means of a 10 ft straightedge laid parallel to centerline of road; irregularities in excess of 1/8-in. in surface courses and 1/4-in. in binder courses from lower edge of straightedge between any two contact points shall be corrected.

3.9 TACK COAT

A. Heat tack coat in truck designed for such operations. Do not overheat.

B. Prior to applying tack coat, clean existing surfaces by sweeping to remove dust, dirt, and other debris.

C. Place tack in a single application at a rate of 0.05 to 0.15 gallons per square yard to top of binder course immediately prior to laying surface course. Turn outside edge nozzles to stay parallel to the road centerline. Do not operate spraying equipment with plugged nozzles.

D. Protect structures to prevent splatter.

E. Prevent traffic from entering areas with tack coat applied prior to placement of surface course.

3.10 DEFECTIVE WORK

A. If compacted thickness of any cut sample is less than 85% of specified amount, two additional samples shall be taken at locations selected by A/E. If average compacted thickness of original and additional samples is 85% or more of specified amount, thickness of area will be considered acceptable. If average compacted thickness is less than 85% of specified amount, A/E may order deficient area removed and replaced.

B. If average compacted thickness of all cut samples is less than specified amount, paving will be paid for in accordance with the following pay factors (where additional samples were cut for any area left in place, average of samples for area will be considered as one sample for this determination):

Thickness, Percent of Specified Amount	Proportional Part of Contract Price Allowed
100-93	100%
93-85 Inclusive	80%
85-80 Inclusive	70%
80-75 Inclusive	60%
Less than 75	0%

B. If average density of samples from any lot is less than specified amount, lot will be paid for in accordance with the following pay factors:

Percent Lot Density Below Specified Minimum	Pay Factor (as a percentage of the bid price)
0.5-1.0	98
1.1-1.5	95
1.6-2.0	91
2.1-2.5	85
2.6-3.0	70

D. If bitumen content or aggregate gradation of asphaltic mixture is outside tolerances allowed, remove and replace asphalt.

3.11 PROTECTION OF WORK

A. Use barricades, flares, flagging, and other traffic guidance to prevent damage to fresh asphalt until pavement has hardened. Maintain work during various stages of construction and until final acceptance. Any rich or bleeding areas, any breaks, raveled spots, or other unsatisfactory areas in the wearing surface shall be corrected during such maintenance period.

B. Take precautions necessary to protect pavements from being damaged from trucking operations. Repair damage as directed by A/E.

3.12 TEMPORARY PAVEMENT

A. If the Contractor cannot complete the asphaltic pavement prior to the stated deadlines, they shall temporarily restore damaged pavements with a minimum of 2 inches of well compacted cold patch or temporary hot mix.

B. Place temporary pavement as soon as practical after completing work. Remove and replace temporary pavement with permanent paving no later than June 1 of the following year.

C. The Contractor shall maintain temporary pavement in a satisfactory manner throughout the winter and spring. Remove and replace temporary pavement unsuitable for traffic or patch holes as necessary and as directed by A/E.

SECTION 32 15 40

CRUSHED AGGREGATE SURFACING

PART 1 GENERAL

1.1 SUMMARY

A. Provide crushed aggregate surfacing as shown and as specified.

1.2 RELATED SECTIONS

01 01 00	Warranty
31 23 00	Excavation and Fill
32 11 33	Aggregate Base Course

PART 2 PRODUCTS

2.1 AGGREGATE

A. Crushed stone or crushed gravel meeting the requirements of Section 32 11 23.

B. Utilize ¾ inch gradation for roadway

shoulders. PART 3 EXECUTION

3.1 PLACEMENT

A. Place aggregate surface in accordance with Section 32 11 23.

B. Compact aggregate to 95% of the maximum density as determined by ASTM D1557 Modified Proctor Test. If required compacted depth of aggregate exceeds 6 inches, aggregate shall be placed in two or more lifts of thicknesses no greater than 6 inches. Add water and recompact as necessary to reach the required compaction.

3.2 TEMPORARY SURFACING

A. All trenches shall be backfilled to the final pavement thickness with crushed aggregate surfacing at the end of each working day.

B. Maintain temporary surfacing until asphalt or concrete pavement is to be placed.

SECTION 32 16 13

CURBS AND GUTTERS

PART 1 GENERAL

1.1 SUMMARY

A. Provide curbs and gutters, curb ramps, gutter transitions, and appurtenances as shown and as specified.

1.2 RELATED SECTIONS

01 01 00	Warranty
03 30 00	Cast In Place Concrete
31 23 00	Excavation and Fill
32 11 23	Aggregate Base Courses

1.3 SUBMITTALS

A. Submit product data on culverts and end sections.

1.4 MEASUREMENT AND PAYMENT

A. If a bid item for (width) Curb and Gutter is included in the Bid Schedule, it will be paid for at the contract unit price per lineal foot installed. Measurement will be continuous along the gutter plan through driveways, ramps, inlets and manholes, and other structures. The bid item shall include all expansion joint filler, reinforcing steel, and appurtenances. Base aggregate located beneath the curb and gutter will be paid for under a separate bid item.

PART 2 PRODUCTS

2.1 FORMS

A. Forms may be stationary or slip form type.

B. Steel or wood forms shall be straight and free of defects. Remove all concrete deposits from forms prior to use.

2.2 CONCRETE AND APPURTENANCES

A. Comply with requirements of Section 03 30 00. Utilize Type 2 concrete.

2.3 REINFORCEMENT

A. Reinforcing bars and dowels shall be ASTM A615 grade 40 or 60 steel.

PART 3 EXECUTION

3.1 PREPRATION

A. Provide removals in accordance with Section 31 23 00. Backfill any holes caused by removals with granular fill to the depth of the bottom of the subgrade.

B. Prepare an aggregate base comply with Section 32 11 23 for 1 ¼ inch aggregate. Base shall be at least 6 inches deep unless otherwise shown on the Plans.

C. Adjust any utilities located within the curb and gutter prior to concrete placement.

D. Set forms to the required line and grade. Notify A/E when formwork is completed so that grades can be verified prior to concrete placement.

3.2 CONCRETE PLACEMENT

A. Place concrete in accordance with Section 03 30 00. Moisten subgrade prior to placement.

B. Install expansion joints at radius points, each side of driveway aprons, abutting catch basins and inlets, walks, aprons, structures, curb and gutter, driveways, three feet from each side of a drainage structure, and at 96 foot on center unless otherwise shown. Match location of joints in new concrete with joints in existing concrete wherever possible.

C. Install contraction joints at 10 feet on center when gutter will be adjacent to asphalt pavement and at 15 feet on center when gutter will be adjacent to concrete pavement unless otherwise shown.

D. When machine methods are used for forming and finishing, saw cut contraction joints to a minimum depth of 2 inch. Sawing shall be done as soon as practical after concrete has initial set. Perform sawing before shrinkage cracking occurs. If shrinkage cracks develop prior to saw cutting, the cracked sections shall be removed to the nearest joint and replaced at the Contractor's expense.

E. Provide transition and gutter sections for curb ramps, at driveways, in locations shown, and as directed by A/E.

F. After placement, test surface grade with a 10-foot level. Repair grade as necessary to meet Plan grade.

G. Apply curing compound in accordance with Section 03 30 00.

3.3 REINFORCEMENT

A. Curb and gutter constructed adjacent to existing curb and gutter shall be installed using three #6 (3/4") tie bars 18 inhes long, evenly spaced, drilled 9" into the existing curb and gutter at mid-depth of the gutter.

3.4 REMOVAL OF EXISTING CURB HEAD

A. When a driveway is to be constructed in an area that has existing curb and gutter, the curb head shall be removed by cutting. An alternative to having the curb head cut is to remove and replace the existing curb and gutter section. Removal to the nearest joint will be required.

SECTION 32 16 23

SIDEWALKS

PART 1 GENERAL

1.1 SUMMARY

A. Provide concrete sidewalks, ramps, detectable warning fields, and appurtenances as shown and as specified.

1.2 RELATED SECTIONS

01 01 00	Warranty
03 30 00	Cast In Place Concrete
10 45 10	Safety Handrail
31 23 00	Excavation and Fill
32 11 23	Aggregate Base Courses

1.3 SUBMITTALS

A. Submit product data on culverts and end sections.

1.4 MEASUREMENT AND PAYMENT

A. If a bid item for Concrete Sidewalk is included in the Bid Schedule, it will be paid at the contract unit price per square foot installed. Measurements will include the total area of sidewalk installed, including the area located under detectable warning fields. The bid item should include cost of removals, grading, base course, and thickened concrete.

B. If a bid item for Detectable Warning Field is included in the Bid Schedule, it will be paid at the contract unit price per square foot installed.

C. The portion of the concrete driveway located outside of the sidewalk will be paid for as a separate bid item.

D. If a bid item for Concrete Steps is included in the Bid Schedule, it will be paid at the contract unit price per square foot installed. Measurement will be taken of the horizontal surface of each step to determine the total area of payment. If more than three steps exist, refer to Section 10 45 10 for additional requirements.

PART 2 PRODUCTS

2.1 FORMS

A. Forms may be stationary or slip form type.

B. Steel or wood forms shall be straight and free of defects. Remove all concrete deposits from forms prior to use.

2.2 CONCRETE AND APPURTENANCES

A. Comply with requirements of Section 03 30 00. Utilize Type 2 concrete.

2.3 REINFORCEMENT

A. Reinforcing bars and dowels shall be ASTM A615 grade 40 or 60 steel.

2.4 DETECTABLE WARNING FIELD

A. Truncated dome detectable warning fields shall be metal panels on the WISDOT current approved products list. Warning fields shall be yellow in color.

PART 3 EXECUTION

3.1 PREPRATION

A. Provide removals in accordance with Section 31 23 00. Backfill any holes caused by removals with granular fill to the depth of the bottom of the subgrade.

B. Prepare an aggregate base comply with Section 32 11 23 for 1 ¼ inch aggregate. Base shall be at least 6 inches deep unless otherwise shown on the Plans.

C. Adjust any utilities located within the curb and gutter prior to concrete placement.

D. Set forms to the required line and grade. Notify A/E when formwork is completed so that grades can be verified prior to concrete placement.

3.2 CONCRETE PLACEMENT

A. Place concrete in accordance with Section 03 30 00. Moisten subgrade prior to placement. Sidewalks shall be 4 inch minimum thickness except in driveways where the walk should be a minimum 6inch thickness and in curb ramps.

B. Cross slope of sidewalks passing through driveways and alleys shall not exceed 10%. If grade requirements cannot be met, notify A/E prior to proceeding with work.

C. Install expansion joints on each side of driveways, at abutting sidewalks, curb and gutter, structures, and other objects and at 100 foot on center unless otherwise shown.

D. Install contraction joints at 5 foot on center. Provide longitudinal joints at centerlines of walks exceeding 6 feet in width.

E. When machine methods are used for forming and finishing, saw cut contraction joints to a minimum depth of 2 inches. Sawing shall be done as soon as practical after concrete has initial set. Perform sawing before shrinkage cracking occurs. If shrinkage cracks develop prior to saw cutting, the cracked sections shall be removed to the nearest joint and replaced at the Contractor's expense.

F. Provide transition and gutter sections for curb ramps, at driveways, in locations shown, and as directed by A/E.

G. After placement, test surface grade with a 10 foot level. Repair grade as necessary to meet Plan grade.

H. Apply curing compound in accordance with Section 03 30 00.

3.3 REINFORCEMENT

A. Sidewalk constructed adjacent to existing sidewalk shall be installed using two #4 (1/2") dowel bars One Foot long drilled into Sidewalk 6 inches. Space the bars 2 feet apart in sidewalk.

3.4 CURB RAMPS

A. Ramps shall be no less than 60 inches wide. Details of construction include slope shall comply with the most recent ADA requirements.

B. Ramps shall be Type 1 or 1A unless otherwise shown on the drawings.

C. Install a detectable warning field as shown in the Details. Construct warning field in accordance with manufacturer's recommendations. Edges of warning field shall fit surrounding concrete with no variations in height at edges. Completed warning fields should be free of concrete, curing compound, or other construction materials. Clean warning fields as required.

SECTION 32 16 24

DRIVEWAYS

PART 1 GENERAL

1.1 SUMMARY

A. Provide new driveways and driveway replacements as shown and as specified.

1.2 RELATED SECTIONS

011 01 00	Warranty
03 30 00	Cast in Place Concrete
31 23 00	Excavation and Fill
32 11 23	Aggregate Base Courses
32 15 40	Crushed Stone Surfacing
32 12 16	Asphalt Paving

1.3 MEASUREMENT AND PAYMENT

A. If a bid item for “Asphalt Driveway” is included in the Bid Schedule, it will be paid at the contract unit price per square foot installed. Measurements will include the total area of driveway installed excluding any area located within the sidewalk which will be paid for separately under the sidewalk bid item. The bid item shall include cost of removals, sawcut, grading, base course, and asphalt.

B. If a bid item for “(thickness) Concrete Driveway” is included in the Bid Schedule, it will be paid at the contract unit price per square foot installed. Measurements will include the total area of driveway installed excluding any area located within the sidewalk which will be paid for separately under the sidewalk bid item. The bid item shall include costs of removal, sawcut, grading, base course, and concrete.

C. If a bid item for “Aggregate Driveway” is included in the Bid Schedule, it will be paid at the contract unit price per square foot installed. Measurements will include the total area of driveway installed excluding any area located within the sidewalk which will be paid for separately under the sidewalk bid item. The bid item shall include costs of removal, grading, aggregate base course, and compaction.

PART 2 PRODUCTS

2.1 FORMS

A. Forms may be stationary or slip form type.

B. Steel or wood forms shall be straight and free of defects. Remove all concrete deposits from forms prior to use.

2.2 CONCRETE AND APPURTENANCES

A. Comply with requirements of Section 03 30 00. Utilize Type 2 concrete.

2.4 ASPHALT MIXTURE

A. Comply with the requirements of Section 32 12 16 with 12.5 mm aggregate.

2.5 AGGREGATE

A. Comply with the requirements of Section 32

15 40. PART 3 EXECUTION

B. Provide removals in accordance with Section 31 23 00. Backfill any holes caused by removals with granular fill to the depth of the bottom of the subgrade.

C. Prepare an aggregate base under concrete and asphalt driveways complying with Section 32 11 23 for 1 ¼ inch aggregate. Base shall be at least 6 inches deep unless otherwise shown on the Plans.

D. Adjust any utilities located within the curb and gutter prior to concrete placement.

E. Set forms to the required line and grade. Notify A/E when formwork is completed so that grades can be verified prior to concrete placement.

2.6 CONCRETE PLACEMENT

A. Place concrete in accordance with Section 03 30 00. Moisten subgrade prior to placement. Sidewalks shall be 4 inch minimum thickness except in driveways where the walk should be a minimum 6 inch thickness and in curb ramps.

B. Cross slope of sidewalks passing through driveways and alleys shall not exceed 10%. If grade requirements cannot be met, notify A/E prior to proceeding with work.

C. Install expansion joints on each side of driveways, at abutting sidewalks, curb and gutter, structures, and other objects and at 100 feet on center unless otherwise shown.

D. Install contraction joints at 5 feet on center. Provide longitudinal joints at centerlines of driveways exceeding 6 feet in width.

E. The Contraction joints are to match the type (tooled vs sawcut), spacing and layout of existing concrete.

F. When machine methods are used for forming and finishing, saw cut contraction joints to a minimum depth of 2 inches. Sawing shall be done as soon as practical after concrete has initial set. Perform sawing before shrinkage cracking occurs. If shrinkage cracks develop prior to saw cutting, the cracked sections shall be removed to the nearest joint and replaced at the Contractor's expense.

G. Provide transition and gutter sections for curb ramps, at driveways, in locations shown, and as directed by A/E.

H. After placement, test surface grade with a 10 foot level. Repair grade as necessary to meet Plan grade.

I. Apply curing compound in accordance with Section 03 30 00.

J. Test concrete in accordance with requirements of Section 03 30 00.

3.1 REINFORCEMENT

A. Driveway constructed adjacent to existing Driveway shall be installed using #4 (1/2") dowel bars, one foot long drilled into the Driveway 6 inches. Space the bars 2 feet on center in Driveway.

3.2 ASPHALT PLACEMENT

A. Place asphalt in accordance with Section 32 12 16. For driveways not exceeding 3 inches in total asphalt thickness, asphalt may be placed as a single course.

3.3 AGGREGATE DRIVEWAY PLACEMENT

A. Place aggregate driveway in accordance with Section 32 11 23.

B. Compact aggregate to 95% of the maximum density as determined by ASTM D1557 Modified Proctor Test. If required compacted depth of aggregate exceeds 6 inches, aggregate shall be placed in two or more lifts of thicknesses no greater than 6 inches. Add water and recompact as necessary to reach the required compaction.

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

A. Provide or remove pavement markings as shown and as specified.

1.2 MEASUREMENT AND PAYMENT

A. When a bid item for (width) (type) pavement marking is included in the Bid Schedule, it shall be paid per lineal foot of pavement marking installed. For intermittent lines, the length of each individual marking will be multiplied by the number of markings to determine the total length of markings.

B. When a bid item for pavement marking removal is included in the Bid Schedule, it will be paid per lineal foot of pavement marking removed. For intermittent lines, the length of each individual marking will be multiplied by the number of markings to determine the total length of marking removed.

1.3 SUBMITTALS

A. Furnish certificate of compliance for beads showing that gradation complies with these specifications.

PART 2 PRODUCTS

2.1 PAINT

A. Epoxy paint; provide material listed in the WisDOT approved products list.

2.2 GLASS BEADS

A. Furnish glass beads conforming to AASHTO M247 except for the gradation shall be as follows:

Sieve Size	Percent Passing by Weight
No. 20	100
No. 30	75-95
No. 40	-
No. 50	15-35
No. 80	-
No. 100	0-5

B. Beads shall have at least 80% true spheres. Use dual coated beads treated for both moisture resistance and adherence.

C. Beads shall contain no more than 200 ppm arsenic or 200 ppm lead when tested in accordance with EPA method 3052 and 6010C.

PART 3 EXECUTION

3.1 SITE PREPARATION

A. Prepare the surface receiving markings to ensure a good bond. Use equipment with a dust control system. Remove dust, dirt, oil, grease, loose paint, gravel, debris, or other materials and contaminants that might prevent bonding. Ensure that the surface is dry.

B. Prepare concrete surfaces using brush-off blasting to remove curing compound, protective surface treatment on structures, and laitance. Expose at least 85% of the concrete receiving marking.

3.2 APPLICATION

A. Apply markings at the locations and in the dimensions shown on the Drawings or as directed by the A/E. Matching the markings at each end of the project so that markings are continuous between existing markings and new markings. Use the color shown on the plans. Ensure that lines have a uniform cross section and color. Reflectorize the lines with glass beads distributed uniformly throughout the specified thickness.

B. Provide a sharp cutoff at each end of the line. Prevent overspray.

C. Apply permanent edge line markings to the upper layer of new asphaltic pavement or surfacing within 7 days after completion of paving unless otherwise directed by A/E.

D. Apply permanent pavement markings to concrete pavement prior to opening roadway to traffic unless otherwise directed by A/E.

E. If removing existing markings before applying new markings, expose at least 85% of the pavement surface. If not removing existing markings before applying new markings, retrace the existing pavement markings.

F. Protect freshly applied markings until the line is dried.

G. Apply paint in accordance with manufacturer's recommendations. Do not apply below the minimum temperature that the manufacturer recommends.

3.3 REMOVING PAVEMENT MARKINGS

A. Remove pavement markings where shown or as directed by A/E. Do not damage, discolor, or paint over existing markings.

B. Provide a dust control system and remove accumulated material.

C. If blast cleaning occurs within 10 feet of traffic, remove all dust and other residue continually during blast cleaning. Collect, haul, and dispose of material.

SECTION 32 92 00

TURF AND GRASSES

PART 1 GENERAL

1.1 SUMMARY

A. Provide turf and grasses as shown and as specified.

1.2 RELATED SECTIONS

01 01 00 Warranty

1.3 SUBMITTALS

A. Submit Topsoil Analysis as specified in the "Testing" section.

B. Submit documentation on source of sod and composition.

1.4 TESTING

A. Contractor shall arrange for and pay for analysis of the topsoil by a qualified testing laboratory. Analysis shall include percentages of organic matter, gradation of soil, pH, and mineral and plant nutrient content. Report shall include a determination on the suitability of the topsoil for the proposed use. Including the recommended amount of fertilizer or other nutrients that should be added to the soil prior to planting.

1.5 WORK RESTRICTIONS

A. Work shall only be conducted between April 15 and September 15 unless approved by the A/E in writing. Do not proceed with work if the air temperature is above 90 degrees or below 35 degrees.

B. Lawn replacement work in areas constructed during the winter months shall be completed by no later than the following May 15.

C. Lawn restoration shall be completed within 30 days after other work items are completed.

1.6 MEASUREMENT AND PAYMENT

A. If a bid item for Lawn Restoration is included in the Bid Schedule, it will be paid as a lump sum. The bid item shall include preparation of turf areas, topsoil, seeding, sodding, and replanting unsatisfactory growth.

PART 2 PRODUCTS

2.1 TOPSOIL

A. Loam, sandy loam, silt loam, silty clay loam, or clay loam humus-bearing surface soil; 100% passing the 1" sieve and at least 90% passing the No. 10 sieve; pH ranging from 6.0 to 7,0; minimum organic material content of 3% by weight; reasonably free of subsoil, clay lumps, brush and weeds; and free of materials harmful to plant growth.

B. Obtain topsoil from naturally well drained sources. Topsoil salvaged from within the jobsite may only be utilized if it meets all of the above criteria and is screened.

2.2 LIME

A. Agricultural grade limestone ground fine so that 80% passes the No. 8 sieve. Lime shall contain at least 80% calcium carbonate equivalent. Moisture content shall not exceed 8%.

2.3 FERTILIZER

A. Liquid form, commercial fertilizer formulated based on the topsoil report. Fertilizer shall not contain phosphorus.

2.4 GRASS SEED

A. Grass seed shall be comprised of the following mixture:

Species	**Purity (% min)**	**Germination (% min)**	**Mixture Proportion (%)**
Kentucky Bluegrass	98	85	35
Red Fescue	97	85	20
Hard Fescue	97	85	20
Improved Fine Perennial Ryegrass	96	85	25

B. Deliver seed in bags that are labeled with percentage of purity and germination.

C. Seed shall comply with current State and Federal seed laws.

2.5 MULCH

A. Straw or hay, free of grain, weed or mold. Mulch materials shall not contain excessive moisture which prevents uniform application.

2.6 TACKIFIER

A. Non asphalt based tackifier intended for anchoring mulch.

2.7 MULCH NET

A. Biodegradable twisted jute or mesh, 092 pounds per square yard minimum with 50 to 65 percent open area. Included manufacturer's recommended biodegradable 6 inch long stakes.

2.8 EROSION MAT

A. Comply with the requirements of Section 01 00 00.

2.9 HYDROSEED

A. Mixture of seed, fertilizer, mulch fibers, and tackifier.

B.

2.10 SOD

A. Sod shall consist of a dense, well-rooted growth of permanent and desirable grasses, indigenous to the general locality of the project. Sod shall be practicably free from weeds and undesirable grasses. When cutting the sod, the grass should be approximately 2 inches long by 72 inches.

PART 3 EXECUTION

3.1 PREPARATION AND PLACEMENT

A. Protect improvements from damage caused by topsoil and seeding operations.

B. If hydroseeding, protect adjacent improvements from overspray.

C. Prior to topsoil placement, loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inch, along with sticks, roots, vegetation growth, or other materials.

D. Place a minimum of 4 inches of topsoil over areas to receive turf unless otherwise shown. Smooth grade to eliminate irregularities. Finished topsoil grade shall be at least 0.5 inches below adjacent pavement surfaces.

3.2 TREATMENT OF SOIL

A. Apply lime to loosened topsoil to provide a pH between 6.0 and 7.0. Mix into topsoil. Smooth grade to eliminate irregularities. In lawn areas, hand rake topsoil to a smooth, even finish.

B. Apply initial fertilizer application prior to seeding or sodding. Apply at the rate determined in the soils analysis.

3.3 HYDRO-MULCH

A. A tank-mounted truck equipped with a special pump and continuous agitation system is used. The pump forces the slurry through a top-mounted discharge nozzle or discharge can be through 100 to 200 feet of hose. Tank capacities range from 1,000 to 3,000 gallons. Water is added first and then the wood fiber, tackifier (if used), fertilizer (if used), and seeds. Any coated seed would be loaded last. Legume seeds should be pellet inoculated with a special bacteria to stimulate the fixing of nitrogen. Seed should not be added to the slurry until immediately prior to beginning of the operation, and not remain in the tank for more than 30 minutes. Single application hydroseeding uses 1,500 to 2,000 pounds of wood fiber mulch per acre with the seed and fertilizer. Split application hydroseeding and hydro-mulching uses 500 pounds of wood fiber mulch per acre with the seed and fertilizer in the first pass followed by an application of 1,500 to 2,000 pounds of wood fiber mulch per acre and tackifier (if used).

B. Hydro-mulching using 500 to 1,000 pounds of wood fiber mulch per acre and tackifier is often applied over loose, blown straw to tack it down. Hydromulching using 2,000 to 3,000 pounds of wood fiber mulch per acre and tackifier can be used for temporary protection where landscaping will be planted after the rainy season. Wood fiber is usually dyed to aid in uniform distribution, but care should be taken to ensure that concrete or painted surfaces are not stained and that plants and animals are not injured. Wood fiber has natural tackifying properties but adding a tackifier should be considered on steep slopes.

C. Seed Mixtures shall conform to above Section 2.05.

3.3 MULCH

A. Apply mulch at a rate of 1 ½ tons per acre to a loose depth of 1 to 2 inches. Anchor mulch with mulch nets stapled in accordance with the manufacturer's recommendations.

B. Apply mulch within 48 hours of seed placement.

3.4 SODDING

A. Moisten the subgrade prior to sod placement. Do not place frozen sod or place sod onto frozen soil.

B. Lay the sod so that the joints at abutting ends of the sod strips are not continuous. Lay each sod strip to abut snuggly against the previously laid strip. Tamp with suitable wooden or metal tampers to set sod into subgrade. Do not lay partial strips of sod smaller than 18" inches by 24 inches.

C. At points where water will flow over the sod, turn the upper edges of the sod strips into the soil below the adjacent area and place a layer of earth over this juncture. Compact the earth thoroughly so that surface water flows over the upper edge of the sod.

D. At the end of the sodded area, place the end strips to achieve a broken line. Turn the ends of the strips upwards as described above.

E. On slopes greater than 4:1, stake the sod in place with stakes at least 6 inches long spaced at 24 inches apart. After sod is established, remove stakes.

3.5 MAINTENANCE AND REPLACEMENT

A. Water as necessary to ensure that seeded areas are maintained in a wet condition. Water should penetrate topsoil at least 2 inches. Establish watering rates that do not allow for standing water.

B. Apply second application of fertilizer in accordance with the soils analysis report.

C. Mow grass to a height of 2.5 inches. Do not allow grass to exceed 3.5 inches before mowing.

D. Areas that do not produce sufficient growth within one month shall be raked and reseeded and mulched at the Contractor's expense. Areas that do not grow in the fall shall be reseeded the following Spring as soon as weather permits. Satisfactory growth is considered when there are no bare spots larger than 4 inches square and the total bare spots do not exceed 2% of the total seeded area.

SECTION 33 01 30.16

TV INSPECTION OF SEWER PIPELINES

PART 1 GENERAL

1.1 SUMMARY

A. Provide TV inspection of sewer pipes as specified.

1.2 RELATED SECTIONS

33 0 00 Sanitary Utility Sewerage Piping

1.3 SUBMITTALS

A. Test Results: Submit three copies of the DVD and written report of findings. Written report shall include the location and date of the testing, manhole numbers, lateral locations including distance from the manholes and referenced to lot numbers and street address, and any defects that were found.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL

A. Notify A/E at least 48 hours prior to completing televising. Do not complete televising unless A/E is present or if requirements are waived by Owner.

B. The Contractor shall televise all sewers after successfully completing deflection and leakage testing and after forming manhole flow lines and benches.

C. Clean all sewers prior to televising.

D. All defects shall be corrected, and any dirt, gravel, or foreign material removed from the sewer prior to acceptance by the Owner. Retest sewers for deflection and leakage in accordance with Section 33 31 00 if repairs are made.

If defects are found and corrected, re-televise sewer after repairs are made.

SECTION 33 01 30.72

LINING SEWERS & LATERALS

PART 1 GENERAL

1.01 SUMMARY

A. Provide lining of sewer pipes as specified.

1.02 RELATED SECTIONS

01 01 00	Warranty
33 01 30.16	TV Inspection of Sewer Pipelines

1.03 SUBMITTALS

A. Product Data: Submit product data on resin and lining material.

B. Installation Records: If requested by the Owner, provide documentation of installations by the Contractor showing a minimum of 50,000 lineal feet of installation utilizing the products being provided over the past 3 years.

C. Test Reports: Submit test reports of installed CIPP.

D. Sewer Bypass Plan: For projects involving repair, rehabilitation, or replacement of existing sanitary sewer lines or appurtenances, submit a proposed sewerage diversion and pumping plan prior to the preconstruction meeting.

E. Post construction video and reports for lined areas are required.

1.04 MEASUREMENT AND PAYMENT

A. If a bid item for “(diameter) CIPP (type) Sewer Pipe” is included in the Bid Schedule, payment will by the linear foot acceptably completed. Payment for measured quantities will be made at the contract unit price per linear foot for "(diameter) CIPP (type) Sewer Pipe". Payment is full compensation for all labor, materials, tools, equipment and incidentals necessary to completely rehabilitate the existing sewer by using a cured-in-place lining method.

B. If a bid item for “Sanitary Lateral Lining (CIPP) within 25 ft. of Sewer Main” is included in the Bid Schedule, payment will by the number of sanitary lateral lining (CIPP) within 25 ft. of sewer main acceptably completed. Payment for measured quantities will be made at the contract unit price each for "Sanitary Lateral Lining (CIPP) within 25 ft. of Sewer Main". Payment is full compensation for all labor, materials, tools, equipment and incidentals necessary to completely rehabilitate the existing sanitary sewer lateral by using a cured-in-place lining method. This bid item also includes all labor, materials, tools and equipment required to properly connect the proposed lined lateral to the lined main.

C. If a bid item for “Sanitary Lateral Lining (CIPP) Additional Length over 25 ft. from Sewer:” is included in the Bid Schedule, payment will by the lineal foot acceptably completed. Payment for measured quantities will be made at the contract unit price per linear foot for "Sanitary Lateral Lining (CIPP) Additional Length over 25 ft. from Sewer". Payment is full compensation for all labor, materials, tools, equipment and incidentals necessary to

completely rehabilitate the existing sanitary sewer lateral by using a cured-in-place lining method.

PART 2 PRODUCTS

2.01 RESIN

A. Resin shall be polyester or vinyl ester design for use with domestic wastewater. Comply with the requirements of ASTM F1216, Section 5.2.

2.02 TUBE

A. Needle punched felt or non-woven material, single or multi-layer with no layer being less than 1.5 mm thick. Wall thickness shall be uniform throughout entire length. No intermediate or encapsulated elastomeric layers will be permitted.

B. Liner shall be continuous length from manhole to manhole. Material shall be fabricated to create a finished internal circumference that formed to the original pipe. Allowances shall be made for longitudinal and circumferential stretching that occurs during placement of the tube.

C. Material shall be capable of conforming to offset joints, bells, and disfigured pipe sections.

D. Internal finish shall be compatible with resin system utilized. Any plastic film applied to the tube on what will become the interior wall of the CIPP shall translucent so that resin is clearly visible and shall be firmly bonded to the felt material. Wall color shall be light, reflective surface.

E. Tube shall meet the following requirements when testing in accordance with methodology from ASTM F1216, Appendix X1

Flexural Strength (ASTM D790)	4,500 psi
Tensile Strength (ASTM D638)	3,000 psi
Flexural Modulus (ASTM D780)	250,000 psi

PART 3 EXECUTION

3.01 SEWER REHABILITATION GENERAL

A. Notify A/E at least 48 hours prior to completing work.

B. Contractor shall be responsible for verifying the pipe size and length of each sewer line segment. If variations from the plans exist, notify A/E immediately.

C. Prior to liner, Contractor shall remove any existing protruding taps, mineral deposits, roots, and other debris. If existing conditions prevent the lining of the sewer, notify the A/E immediately.

D. Contractor shall be responsible for monitoring flow through upstream manholes. Bypass pump or provide other means of preventing sewer backups as required for the duration of the work.

E. The Contractor shall notify the residents or businesses directly affected by the lining operation a minimum of 3 days prior by mailer or door hanger. For commercial properties or where multiple tenants occupy buildings, the Contractor shall notify the tenants and building owner. This notification must include the Contractor's name and expected timeframe for which it will take this segment of work to be completed.

3.02 SEWER REHABILITATION INSTALLATION

A. Work shall be completed in accordance with ASTM F1216 for direct inversion installation. No pull-in-place methods shall be allowed. Lubricant may be used.

B. The Contractor shall investigate the sewer lateral connections to the main via CCTV to determine which laterals are active and require reconnection. Laterals that are not in service shall not be reconnected unless approved by the Owner.

C. Place a hydrophilic gasket at the end of each lined sewer section, defined as the length of sewer between two adjacent structures, to create a water-tight seal between the host pipe and the CIPP liner. The hydrophilic gasket shall be the **Insignia End Seal Sleeve** or an approved equal.

D. The quantity of resin used for the tube's impregnation shall be sufficient to fill the air voids in the tube with additional allowance for shrinkage and any loss of resin through cracks and irregularities in the pipe wall. Resin to felt ratio by weight shall be between 1:1 and 1.15:1.

E. At the request of the Owner, prepare and test CIPP samples in accordance with ASM F1216, Section 8. Interior shall have a Manning's roughness of n=0.010 or less. Flexural strength and Modulus shall meet requirements of Section 33 01 30.16 Paragraph 2.02E. If test results meet minimum requirements, Owner will pay for cost of testing. If test results do not meet minimum requirements, the Contractor will be responsible for the cost of testing and will not be paid for the respective section of CIPP that does not meet the requirements.

F. The liner shall be free from visual defects. Any longitudinal wrinkles in excess of 2.5% of the pipe diameter which occur within the bottom 1/3 of the pipe shall be removed. The liner shall not be out of round by more than 15%.

G. All existing and confirmed active lateral connections to be reinstated as directed by the Owner shall be re-opened robotically to their original shape and to 95% of their original capacity. All over-cut service connections will be properly repaired to meet the requirements of these specifications.

H. After all work is complete, perform televising in accordance with Section 33 01 30.16.

I. Contractor shall be responsible for disposal of all debris, silt, protruded service connections, roots, and mineral deposits collected rom the existing pipeline and manholes.

3.03 SEWER REHABILITATION POST INSTALLATION REQUIREMENTS

A. If the Contractor damages any sewer during construction, including but not limited to the installation of the CIPP, the cost of the necessary repairs including any pavement repairs, shall be at the Contractor's expense. The method of repair shall be approved by the Engineer.

B. Any defects in the liner that will affect the strength of the liner, its flow carrying capacity, or damage to the liner and/or pipe caused by the routing out of the lateral connections, shall be repaired at the Contractor's expense. The type of repair shall be approved by the Engineer.

3.04 SEWER LATERAL REHABILITATION GENERAL

A. Furnish all labor, materials, tools, equipment and incidentals necessary to completely rehabilitate the existing sanitary sewer laterals where shown on the Plans by using a cured-

B. in-place lining method.

C. In order to complete the sanitary sewer lateral rehabilitation, perform the following:

1. Install a cleanout near the back of walk or work with property owners to utilize an existing cleanout inside the building.

2. Clean the lateral and perform a pre-lining inspection.

3. Repair and/or grout the lateral if necessary.

4. Rehabilitate the sanitary sewer lateral from the public sewer main to the back of walk towards the property and perform a post-lining inspection.

C. All work shall be in accordance with the current State of Wisconsin Plumbing Code.

3.05 SEWER LATERAL REHABILITATION PREPARATION

A. In the circumstance a cleanout is required to perform lateral relining, install a cleanout at the back of sidewalk. Make all efforts to install the sanitary sewer cleanout in a location that minimizes surface disturbance to the residents.

B. The vacuum excavated borehole shall be approximately twenty (20)-Inches diameter and all spoils shall be deposited in a vacuum truck.

C. A riser pipe of an appropriate length shall be solvent welded to the saddle.

D. The adhesive/sealant shall be applied to the underside of the saddle at no less than a 1/4-inch thick layer.

E. Immediately after the saddle has been affixed to the lateral pipe, the riser pipe should be secured by backfilling the bore hole with sand or pea-gravel to within 6-inches of the original grade.

3.06 SEWER LATERAL REHABILITATION INSTALLATION

A. The lateral pipe shall be remotely accessed from the main pipe and from a cleanout. This shall be accomplished by the installation of a resin impregnated one-piece main and lateral lining by means of air inflation and inversion. The liner shall be pressed against the host pipe by pressurizing a bladder that is held in place until the thermo-set resins have cured. When cured, the liner shall extend over a predetermined length of the service lateral and a particular section of the main pipe as a continuous, one-piece, tight fitting, corrosion resistant and verifiable non-leaking cured in-place pipe.

B. The main/lateral lining shall be in accordance with ASTM F2561.

C. The installation shall be done according to the liner manufacturer's requirements.

D. Resin Impregnation: The lateral tube and mainline sheet to be encapsulated within the translucent bladder (liner/bladder assembly) shall be vacuum impregnated with resin (wet-out) under controlled conditions. The volume of resin used shall be sufficient to fill all voids in the textile lining material at nominal thickness and diameter. The volume shall be adjusted by adding 5% to 10% excess resin for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints in the original pipe. No dry or unsaturated area in the mainline sheet or lateral tube shall be acceptable upon visual inspection.

E. Liner Insertion: The lateral tube and inversion bladder shall be inserted into the carrying device. The mainline liner and bladder shall be wrapped around the "T" launching device and held firmly by placing four hydrophilic O-rings around the main liner. An adhesive sealant 300 ml in volume shall be applied to the main/lateral interface and shall be applied as a 2-inch wide band on the main liner. Both the launching and carrying device shall be pulled into the pipe using a cable winch. The pull shall be complete when the open port of the "T" launching device is aligned with the interface of the service connection and mainline pipe. The lateral tube shall be completely protected during the pull. The mainline liner shall be supported on a rigid "T" launcher that is elevated above the pipe invert through the use of a rotating skid system. The liner assembly shall not be contaminated or diluted by exposure to dirt, debris, or water during the pull.

F. Bladder: The main bladder shall be inflated causing the main sheet to unwrap and expand, embedding the hydrophilic O-rings between the main liner and the main pipe as the main liner is pressed tight against the main pipe. The lateral tube shall be inverted by the action of the lateral bladder through the center of the main liner as it extends up into the lateral pipe to a termination point that shall be no less than 2-feet from the exterior cleanout. The main/lateral bladder assembly shall extend past all ends of the liner.

G. Curing: After liner placement is complete, pressure shall be maintained pressing the liner firmly against the inner pipe wall. The liner shall be chemically cured at ambient temperatures or by a suitable heat source. The heating equipment shall be capable of delivering a mixture of steam and air throughout the liner bladder assembly to uniformly raise the temperature above the temperature required to cure the resin. The curing of the CIPP shall take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of the soil). The heat source temperatures shall be monitored and logged during the cure and cool down cycles. The manufacturer’s recommended cure schedule shall be submitted.

H. CIPP Processing: Curing shall be done without pressure interruption with air or a mixture of air and steam for the proper duration of time per the resin manufacturer’s recommendations. When the heat source is removed and the temperature on both ends of the CIPP reaches 100 degrees Fahrenheit or less, the processing shall be finished.

I. The finished CIPP shall be continuous over the entire length of the rehabilitated sewer service lateral and main pipe for a minimum of 5 inches on both sides of the lateral connection. The CIPP shall be smooth with minimal wrinkling for increased flow rate. The CIPP shall be free of dry spots, lifts, and delaminated portions. The CIPP shall taper at each end providing a smooth transition for accommodating video equipment and maintaining proper flow in the mainline. After the work is completed, provide the City with video footage documenting the repair and the visual markings identifying the sewer lateral address as completed work. The finished product shall provide an airtight/ watertight verifiable nonleaking connection between the main sewer and sewer service lateral.

J. If a cleanout is required in order for a proper seal/connection, see the preparation section.

SECTION 33 05 13

MANHOLES AND STRUCTURES

PART 1 GENERAL

1.1 SUMMARY

A. Provide manholes as shown and as specified.

1.2 RELATED SECTIONS

01 01 00 Warranty

31 23 00 Excavation and Fill

1.3 SUBMITTALS

A. Shop Drawings: Submit manhole shop drawings showing inverts, pipe penetrations, total depth, height of adjusting rings, and all other pertinent dimensions.

B. Product Data: Submit product data on castings and adjusting rings.

1.4 MEASUREMENT AND PAYMENT

A. If a bid item for (Diameter) (Type) Manhole is included in the bid schedule, it will be paid for at the unit price per vertical foot of manhole installed. Measurement will be made to the nearest tenth of a foot from the invert of the outlet to the bottom of the casting. The cost shall include risers, base, cone, adjusting rings, and appurtenances.

B. If a bid item for (type) Manhole Casting is included in the bid schedule, it will be paid for per each casting, including frame and lid or grating installed.

C. If a bid item for Chimney Seal is included in the bid schedule, it will be paid per each chimney seal installed.

D. If a bid item is for Connect to Existing (type) Manhole is included in the bid schedule, it will be paid per each connection made. The item shall include coring the existing manhole and installing the pipe and appropriate watertight connection.

E. If a bid item for Outside Manhole Drop is included in the bid schedule, it will be paid per vertical foot.

PART 2 PRODUCTS

2.1 MANHOLES

A. Precast reinforced manholes complying with ASTM C478.

B. Manhole bases shall be precast.

C. Barrel sections shall be precast reinforced concrete. Joint shape shall be compatible with the joint materials. Steps and pipe seals shall be cast into the barrel sections at the appropriate elevations.

D. All manhole benches shall be cast in place.

E. Manhole flat slabs and eccentric cones shall be provided as shown on the Drawings.

F. Steps shall be OSHA approved, fabricated using 3/8 inch minimum diameter steel reinforcing rod

G. with molded plastic covering.

H. Joint sealants shall be rubber ring gaskets or butyl rubber sealant. Rubber ring gaskets shall comply with ASTM C443. Butyl rubber sealant shall be pre-formed, high adhesion material, packaged ready for use between protective paper strips complying with ASTM C990 with a minimum width of 1 inch.

I. Provide flexible, watertight, gasketed seals for pipe penetrations meeting the requirements of ASTM C923. Use Kor-N-Seal, Link Seals, or approved equal. All hardware shall be stainless steel.

J. Adjusting rings shall be precast reinforced concrete adjusting rings 24 inch inside diameter by36" outside diameter.

K. Sanitary & Storm Manhole Frames shall be Neenah R-1580 with solid non-rocking lid.

2.4 NON-SHRINK GROUT

A. Grout shall be premixed, non-metallic; cementitious controlled expansion, high strength, versatile non-shrink grout. Penngrout by IPA Systems or approved equal.

2.5 WATERPROOF CASTING

A. Where waterproof castings are specified, provide one heavy duty padlock for each manhole and 3 matching keys. Padlocks shall be "Master" 1 ½ inch steel padlocks, No. 3-D with pin tumbler or approved equal. Key padlocks per Owner instructions.

2.6 MANHOLE MARKER POSTS

A. 1 inch by inch" by 7 feet long, heavy duty angle steel posts. Paint with red acrylic paint.

2.7 CHIMNEY SEAL

A. External chimney seal for Sanitary Manholes, shall be Adaptor Inc. internal/external EPDM rubber sleeve meeting ASTM C877 with stainless steel compression bands. Seals shall remain flexible and allow up to 2 inches of horizontal movement.

2.8 CATCH BASINS

A. Rectangular catch basins shall be precast concrete, minimum 5 inches thick wall and base with the dimensions as shown on the Drawings.

B. Inlets shall have flexible watertight seals.

C. Provide casting as shown on the Drawings.

D. Adjusting rings shall be precast reinforced concrete adjusting rings matching the size of the catch basin.

2.9 BARREL WRAP

A. Barrel wrap shall be pressure sensitive woven polypropylene wrap designed for preventing infiltration for concrete and steel.

PART 3 EXECUTION

3.1 GENERAL

A. Construct manholes of precast bases, precast risers, precast top section, adjusting rings, and

B. appurtenances in accordance with the Drawings.

C. Excavate as necessary to construct manholes. Set precast bases on firm, level, granular bedding. On wet subgrades, provide 6 inches of crushed stone under bases.

D. Join risers, top sections, adjusting rings, and castings using compatible rubber rings or butyl rubber sealant. When butyl rubber sealant is used, use primer as recommended by manufacturer.

E. All lifting holes shall be plugged using rubber plugs, non-shrink grout, or other approved material. Non-shrink grout shall fill the entire void and shall be troweled to provide smooth surfaces. Do not use cement mortar.

F. Flat tops with offset openings may be used for shallow manholes where there is not sufficient depth to install cones.

3.2 ADJUSTING RINGS

A. Use tapered adjusting rings as necessary to place manhole casting parallel with the plane of the pavement.

B. Install a minimum of 3 inches and a maximum of 18 inches of adjusting rings for each manhole unless otherwise shown. Use thickest rings possible to achieve desired height. Utilize no more than 5 rings on any manhole.

C. Center adjusting rings on manhole cones and center casting on rings.

D. Adjust manhole castings to within 0.05 feet of the grade shown for finished pavement. Match street trade and cross slope.

3.3 CHIMNEY SEAL CONSTRUCTION

A. Set adjusting rings and manhole frames for sanitary sewer manholes using butyl rubber sealant or two-part non-shrink grout system. Apply ¼ inch thick layer of butyl rubber sealant to the outside 1 inch of the horizontal surface of the adjusting rings and cone section. Apply a ¼ inch thick layer of non-shrink grout to the raining horizontal surface.

B. Tuck point all interior mortar joints.

C. Seal entire outside of chimney including adjusting rings and overlapping onto the cone or flat slap and the manhole frame on Storm Manholes and Inlets with Woven Polypropylene Membrane with Elastomeric adhesive (Barrel-Wrap).

3.4 PIPE CONNECTIONS

A. All flexible pipes shall be connected to manholes by using flexible watertight seals. If Link Seals are utilized, locate bolt heads inside manholes.

B. Support piping outside of manholes by bedding as required.

C. Do not pour flowlines until all pipes are installed and backfilled. Flow channel shall be the same diameter as the largest diameter pipe in the sewer.

D. Maintain seal flexibility by plugging interior space between the pipe and manhole wall with butyl rubber sealant.

E. When force mains discharge into a manhole, apply two coats of coal tar to interior of manhole.

3.2 MANHOLE INFILTRATION INSPECTION

A. The Contractor, accompanied by Owner, shall inspect all manholes 6 months after Substantial Completion to check for infiltration and observe the general condition of the manhole. All active or flowing leaks or other necessary repairs shall be corrected under the Correction Period.

3.3 MANHOLE ADJUSTMENTS

A. Adjustments to the rim elevation of a manhole shall be made by removing the casting and installing or removing adjusting rings as necessary. Casting adjustment rings will not be allowed.

SECTION 33 05 23.13

UTILITY HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.1 SUMMARY

A. Provide horizontal directional drilling as shown and as specified.

B. Work shall consist of drilling a small diameter pilot hole along the alignment and at the grades shown on the Drawings, reaming the pilot hole to a diameter large enough for pipe installation, and installing the carrier and/or casing pipe along the reamed hole.

1.2 RELATED SECTIONS

01 01 00 Warranty

31 23 00 Excavation and Fill

33 11 13 Public Water Utility Distribution Piping

1.3 MEASUREMENT AND PAYMENT

A. If a bid item for (Diameter) Directionally Drilled (Utility) is included in the bid schedule, it will be paid per lineal foot measured horizontally from connection to connection. Payment will include the cost of carrier pipe, fittings, and appurtenances. Casing pipe, if required, will be paid separately.

1.4 SUBMITTALS

A. Submit product data on pipe, fittings, and tracer wire.

B. Submit a work plan to A/E at least 5 days prior to beginning work. Plan shall include location of bore pits, type of equipment construction procedures, material delivery dates and location, material staging locations, welding locations, type of drilling fluids, method for tracking boring depth and location, and other pertinent information. Do not proceed with work until work plan is reviewed by A/E.

C. After completion of pilot hole, submit plans showing location and depth of hole as required in this section.

1.5 WORK AREA

A. Work shall only be performed in the areas shown on the Drawings. Contractor may obtain additional work area from property owners by obtaining written authorization. A copy of the authorization from each property owner shall be provided to the A/E prior to beginning work. The cost of acquiring additional work area, area maintenance, and area restoration shall be the responsibility of the Contractor.

PART 2 PRODUCTS

2.1 WATER MAIN

A. Carrier pipe shall be high density polyethylene conforming to AWWA C906 with a DR value to give the pipe a working pressure rating of not less than 160 psi at 73 degrees Fahrenheit. A greater pressure rating may be required due to the pulling motions. The Contractor shall verify the required pressure rating based on their proposed operations.

B. Pipe dimensions shall be in accordance with ductile iron pipe sizing. Joints and fittings shall be butt fused type in accordance with ASTM D3261.

C. Pipe shall have a blue strip longitudinally along its entire length.

2.2 TRACER WIRE

A. No. 12 AWG solid multiple strand copper wire with blue plastic coating.

B. Splices shall be made with in-line spice kits.

D. Pull a minimum of three pieces of tracer wire with the pipe to ensure that at least one wire is intact after pulling operations are complete.

2.3 DRILLING FLUID

A. Drilling fluid shall be water based in accordance with permit requirements and environmental regulations.

2.4 WATER

A. Contractor shall be responsible for transporting and storing water. Obtain water in accordance with Section 01 00 00.

PART 3 EXECUTION

3.1 GENERAL

A. Excavate bore and receiving pits. Comply with requirements of Section 31 23 00.

3.2 PIPE JOINING

A. Join pipe using the butt fusion method in accordance with ASTM D2657. Fuse pipe in accordance with manufacturer's recommendations.

B. Prior to installing pipe, roll pipe to allow A/E to see entire circumference of pipe to visually verify any defects at joints.

3.3 INSTALLATION

A. Contractor shall record the coordinates of the pilot hole include horizontal and vertical locations. Maintain information onsite and make available to A/E during operations. Provide information at no less than 50 feet intervals.

B. Pilot hole shall be drilled along the alignment and at the grades shown on the plans. Acceptable tolerance for installation are plus or minus 0.5 feet vertically and 2 feet horizontally.

C. Upon completion of the pilot hole drilling, the hole shall be reamed to enlarge it to a size adequate for installation of the carrier or casing pipe.

D. Fuse pipe so that one continuous pulling operation can be used unless otherwise approved by A/E. Provide rollers or other appropriate pipe support. Do not drag piping across ground.

E. The maximum allowable tensile load imposed on the pipeline shall be calculated based on 70 percent of the specified minimum yield strength of the pipe material. If more than one value is involved for a given pull section, the lesser value shall govern. Maintain accurate records of loads throughout duration of work.

F. Buoyance modifications shall be made at the discretion of the contractor. Provide documentation on any proposed modifications to A/E prior to completing work. Contractor shall be responsible for any damage to the pipeline as a result of such modifications.

G. Contractor shall recirculate drilling fluid. Contractor shall employ best practice to maintain a full annular circulation of drilling fluids. Drilling fluid returns at locations other than entry and exit points shall be minimized. Contractor shall take steps to restore circulation. If inadvertent surfacing of drilling fluids occurs, they shall be immediately contained with hand placed barriers and collected using pumps. If amount of fluid exceeds what can be contained, drilling operations shall be immediately suspended until the volume of drilling fluid can be controlled. Cleanup and repair of areas caused by surfacing of drilling fluids shall be the responsibility of the Contractor.

H. Disposal of drilling fluids and spoils shall be the responsibility of the Contractor and shall be done in an approved location.

I. Provide tracer wire access points at no greater than 1,000 foot intervals unless otherwise approved by A/E. Bring tracer wire to ground surface in tracer wire access boxes. Comply with requirements of Section 33 11 13.

J. Disinfect and pressure test the main in accordance with Section 33 1113.

SECTION 33 05 23.16

UTILITY PIPE JACKING

PART 1 GENERAL

1.1 SUMMARY

A. Provide utility pipe jacking as shown and as specified.

1.2 RELATED SECTIONS

31 23 00	Excavation and Fill
33 11 13	Public Water Utility Distribution Piping
33 31 00	Sanitary Utility Sewerage Piping

1.3 MEASUREMENT AND PAYMENT

A. If a bid item for (Diameter) Casing is included in the Bid Schedule, it will be paid at the contract unit price per lineal foot installed. Measurement will be made horizontally from the end of the casing pipe to the end of the casing pipe. Carrier pipe will be paid separately.

1.4 SUBMITTALS

A. Submit product data on casing pipe and centering devices

B. Submit design calculations indicating the design loading, circumferential spacing and longitudinal spacing of skids or centering devices. A safety factor of two or greater shall be used in all calculations.

PART 2 PRODUCTS

2.1 CARRIER PIPE

A. Comply with the requirements of Sections 33 11 13 and 33 31 00. Provide pipe with locking joints as necessary to facilitate installation of carrier pipe within casing pipe.

2.2 CASING PIPE

A. Casing pipe shall be ASTM A53, Class B, welded steel pipe with a minimum yield strength of 35,000 psi. Minimum wall thickness shall be as shown below.

Casing Pipe Diameter (inches)	Minimum Wall Thickness under Railroad (inches)	Minimum Wall Thickness Under Highways (inches)
16	0.25	0.25
20	0.312	0.25
24	0.375	0.313
30	0.438	0.344
36	0.563	0.375
42	0.625	0.438
48	0.625	0.50

2.3 SKIDS AND CENTERING DEVICES

A. Skids shall be a minimum of three feet long, 4 inch x 4 inch nominal size, maple or approved equal with banding groves that will prevent the bands and pipe bells from coming into contact with the casing.

2.4 END SEALS

A. Flexible end seals shall be wrap around type manufactured to fit the casing and carrier pipe ODs with an adequate overlap for sealing with mastic cement. The seal shall be a minimum of 1/8 inch thick neoprene rubber fastened to the casing and carrier pipes with stainless steel bands and stainless steel screws.

PART 3 EXECUTION

3.1 GENERAL

A. Jacking pits shall be located at the Contractor's discretion within the roadway right-of-way. Provide shoring necessary to prevent damage to pavement or other adjacent improvements.

B. The diameter of the boring shall be no greater than the outside of the bell of the casing pipe plus two inches. Voids occurring between the casing and the undisturbed natural soil shall be filled with a pea gravel and water slurry or other approved non-Cementous material.

C. Prior to beginning work, Contractor shall expose all utilities which will be crossed. Verify proper clearance with all utilities. The Contractor shall be liable for all costs associated with rework associated with utility conflicts that the Contractor was responsible for identifying.

3.2 ALIGNMENT AND GRADE

A. The Contractor shall be responsible for maintaining proper line and grade of the casing pipe and shall check alignment during the boring and jacking operations at intervals that they feel necessary to maintain the proper alignment. Misalignment or variations in the elevations of the casing pipe shall be corrected at the Contractor's expense.

B. The grade of the pipe will be verified by the A/E upon completion of the jacking operations and prior to backfilling bore pits. Contractor shall assist A/E in obtaining measurements as needed.

3.3 CARRIER PIPE INSTALLATION (WITH CASING PIPE)

A. Carrier pipe, when located inside a casing, shall rest on skids or centering devices securely fastened to the pipe to prevent slipping and twisting as the carrier pipe is inserted into the casing pipe. If metal strapping is used, it shall be grade 316 stainless steel and shall be positioned and secured so it cannot come into contact with the casing pipe. Skids shall be placed circumferentially around the carrier pipe and spaced at intervals to prevent the carrier pipe bell from contacting the casing pipe.

B. If carrier pipe turns during insertion operations, the pipe shall be withdrawn and reinserted until the carrier pipe rests level on the skids.

C. Skids or centering devices shall be designed to support the full weight of the carrier pipe when full of water without imposing excessive point loading on the carrier pipe wall as determined by the pipe manufacturer. Skids or centering devices shall be placed, at a minimum, three per pipe length. Additional casing spacers may be required to support the weight of the loaded pipe.

D. Install skid or centering device within 1 foot inside each end of the casing pipe.

E. Upon completion of the insertion of the carrier pipe within the casing, the ends of the casing shall be sealed to prevent infiltration of bedding material if ends.

F. Do not fill the annual space between the casing and carrier pipe.

SECTION 33 11 13

PUBLIC WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Provide water main as shown and as specified.

1.2 RELATED SECTIONS

02 44 00 Removal or Abandonment of Utilities

07 23 13 Board Insulation

31 23 00 Excavation and Fill

1.3 MEASUREMENT AND PAYMENT

A. If a bid item for (Diameter) Water Main is included in the Bid Schedule, it will be paid per lineal foot installed. Measurements will be taken horizontally along the centerline of the main. Fittings will be paid for at the contract unit price per each size and type of fitting unless otherwise noted in the plans.

B. If a bid item for (Diameter) Water Service is included in the Bid Schedule, it will be paid per lineal foot installed. Measurements will be taken from the centerline of the water main to the end of the lateral or to the connection to the existing lateral.

C. If a bid item for (Diameter) Corp Stop, Curb Stop, and Box is included in the Bid Schedule, it will be paid per each set installed.

D. If a bid item for Hydrant is included in the Bid Schedule, it will be paid per hydrant installed. The piping included in the hydrant lead and the hydrant valve will be paid separately unless otherwise noted in the plan.

E. If a bid item for (Size) (Type) Valve is included in the Bid Schedule, it will be paid per valve installed.

F. If a bid item for Connect to Existing Water Main is included in the Bid Schedule, it will be paid per connection made on mains or services 6inches in diameter and larger. The bid item shall include locating the existing pipe. Fittings to make the connection will be paid for separately.

G. If a bid item for Water Service Reconnection is included in the Bid Schedule, it will be paid for per each reconnection made on services 4 inches in diameter and smaller. The bid item shall include locating and verifying the existing service, temporary service if required, fittings and couplings.

H. If a bid item for Water Tracer Wire Access Box is included in the Bid Schedule, it will be paid per each box installed. The bid item shall include boxes and connecting and testing the tracer wire.

1.4 EXISTING FACILITIES

A. Prior to beginning work, Contractor shall coordinate with the Village to determine the location of existing valves that may need to be operated during construction activities. See Section 01 00 00 for shut-off notice coordination requirements.

B. All existing valves will be operated by the Village Water Department. The Contractor shall not operate system valves at any time.

PART 2 PRODUCTS

2.1 DUCTILE IRON WATER MAIN

A. Ductile iron shall comply with AWWA C151, Class 52 for 6" through 10" diameter and Class 51 for 12" diameter unless otherwise shown. Pipe sections shall be straight and true circular sections.

B. Fittings shall be ductile iron mechanical joint type conforming to AWWA C110 or C153, 250 psi working pressure. Fittings shall be North American Made and designed for use with ductile iron pipe.

C. Piping and fittings shall have cement mortar lining and interior bituminous coating conforming to AWWA C104. Apply bituminous coating to exterior of piping complying with AWWA C151. Coatings shall be smooth, tough, and impervious to water.

D. Joints connecting pipe to fittings, valves, and hydrants shall be mechanical joints.

E. Joints connecting pipes to fittings, valves, and other pipes that require joint restraints shall be restrained using one of the following:

1. Joint restraint gaskets for push on joints. Field Lok Gasket or approved equal.

2. Wedge type restraining glands on mechanical joint pipe and fittings; Megalug Series 1100, Sigma One Lok, or approved equal. Standard mechanical joint retainer glands are not acceptable.

F. Do not provide electrical conductivity strapping.

2.2 PVC WATER MAIN

A. PVC Pipe shall meet the requirements of AWWA C900, Class 235, DR-18 with cast iron OD and integral elastomeric bell and spigot joints.

B. Fittings shall be ductile iron mechanical joint type conforming to AWWA C110 or C153, 250 psi working pressure. Fittings shall be Domestic (USA) made and designed for use with PVC pipe.

2.3 BOLTS

A. All bolts utilized in connections to mains, fittings, valves, and hydrants shall be Cor-Blue T-Bolts as manufactured by NSS Industries or approved equal.

2.4 TRACER WIRE

A. No. 10 AWG solid multiple strand copper wire with blue plastic coating.

B. Splices shall be made with in-line spice kits.

C. Provide grounding rod at lateral. Rod shall be 3/8 inch diameter and 12 inches long.

D. Create branch connections utilizing splice bolts.

2.5 POLYETHYLENE WATER SERVICE PIPING

A. Polyethylene water service shall be PE 3408, SR 9, seamless water tubing conforming to AWWA C901 and ASTM D3350.

B. Polyethylene water services shall be a minimum of 1 inch diameter.

2.6 TRACER WIRE

A. No. 10 AWG solid multiple strand copper wire with blue plastic coating.

B. Splices shall be made with in-line spice kits.

C. Provide grounding rod at lateral. Rod shall be 3/8 inch diameter and 12 inches long.

D. Access boxes shall be non-traffic rates, ABS plastic access box with cast iron rim and lid. Provide with flared base, 2.5" diameter, minimum length of 18". Lids shall be located and opened with standard pentagon head key wrench and labeled "WATER". Lids shall have two stainless steel terminals screws for attachment of tracer wire to the bottom side of the lid. Boxes shall be manufactured by CP Test Services- Valvco, Inc or approved equal.

2.7 GATE VALVES (4 inch through 10 inch DIAMETER)

A. Resilient seated type conforming to AWWA C509 or AWWA C515, designed for continuous cold hydrostatic working pressure of 150 psi and shop tested to 300 psi. Valves shall be furnished with mechanical joints with rubber gaskets, cast iron or ductile iron body, bronze mounted, double disc, parallel seat, non-rising stem, O-Ring packing, 2 inch square operating nut opening counterclockwise. Gate Valves shal be domestic (USA) made.

B. Valves shall be Mueller A2370, or approved equal.

2.8 BUTTERFLY VALVES (12" AND LARGER DIAMETER)

A. Butterfly valves shall comply with AWWA C504, Class 235 designed for continuous cold hydrostatic working pressure of 150 psi and shop tested to 300 psi. Valves shall be furnished with mechanical rubber gasket joints, cast iron body for buries service, 2 inch square operating nut opening counterclockwise. Operating nut to be placed on the North side and East side of water main. Butterfly Valves shall be domestic (USA) made.

B. Valves shall be Mueller "Lineseal III" or approved equal.

2.9 VALVE BOXES

A. Valve boxes shall be three-piece cast-iron valve boxes consisting of a base, screw type center (5.25" shaft diameter) and top section with cover marked Water. Extension sections shall be provided as needed. Valve Boxes shall be domestic (USA) made.

B. Valve boxes shall be Tyler 6860 series except for 6" valves which shall be Tyler 664-S. Equals will be considered if Domestic (USA) made.

C. Provide valve box adapter to prevent settling and shifting of valve box. Provide adaptors by Adaptor Inc or approved equal.

D. All valves installed at greater than 8-foot depth shall be provided with valve stem extensions to bring the operating nut to a depth less than 8 feet. The extension shall be secured to the operating nut with at least 2 set screws drilled into the nut. Provide a centering ring at the top of the extension.

2.10 TAPPING VALVES

A. Tapping valves shall meet the requirements for gate valves specified in this section. One end of the flanged connections shall have an alignment lip to attach to a tapping sleeve.

B. Provide stainless steel tapping sleeves suitable for pipe material being tapped.

C. Taps shall be made in the presence of the Village of East Troy DPW. Provide at least 8 hours notice prior to completing tap.

2.11 CUT IN VALVES

A. Cut in valves shall meet the requirements for gate valves specified in this section. Valves shall be selected based on existing pipe material.

B. Provide cut in sleeve supplied by manufacturer of valve.

2.12 HYDRANTS

A. Hydrants shall be dry barrel type conforming to AWWA C502. Provide with 5 ¼" bottom valve and 6 inch mechanical joint inlet connection, O-Ring packing, safety flange construction, designed for an operating pressure of 150 psi and shop tested to 300 psi.

B. Hydrant shall have two 2-1/2 inch hose nozzles with National Standard fire house coupling screw threats and nut type nozzle caps with gaskets and chains and one 4-1/2 inch pumper nozzle with factory integrated Storz-Lok 125 quick connect fitting.

C. Hydrants shall have a 1-1/2 inch pentagon operating nut opening counterclockwise.

D. Hydrants shall be Mueller "Super Centurion 250", Model A-423. Hydrants shall be domestic (USA) made.

E. Hydrants shall be furnished for the depth of bury shown on the Plans. Hydrants requiring greater than 7 ½ feet of bury shall be furnished with 7 ½ foot hydrants with extensions as required. Hydrant extensions shall be compatible with the hydrant barrel and stem sections and shall be installed at the top of the barrel section. One Extension per hydrant.

F. Hydrants, including barrel extensions, shall be painted the colors listed below as determined by their connection to the corresponding size of water main pipe. The finish coat shall be epoxy.

4"	Red
6"	Yellow
8"	Medium Blue
10"	Medium Green
12"	Medium Green

2.13 WATER SERVICE PIPING

A. Polyethylene water service shall be PE 3408, SR 9, seamless water tubing conforming to AWWA C901 and ASTM D3350 for 3 inch diameter and smaller services.

B. Services 4" diameter and larger shall comply with the water main material requirements.

2.14 CORP, CURB STOP, AND BOX

A. Corporation stops for 1 inch water services shall be Mueller H-15000 flare type of H-15008 compression type. Corporation stops between 1.25 inches and 2 inches shall be Mueller H-15013 compression type.

B. Install all corporation stops using stainless steel double strap service clamp with epoxy coated ductile iron saddle.

C. Curb Stops shall be Mueller Mark II Oriseal Valves, Minneapolis Pattern, H-15154 (flare

D. type), or H-15155 (compression type) for 1 inch water services. For 1.25 inches through 2 inches services, use Mueller ball curb valves, Minneapolis pattern, B-25154 (flare type) or B-25155 (compression type).

E. Curb boxes shall be extension type with Minneapolis pattern base, Mueller H-10388 for 1 inch and H- 10302 from 1.25 inches through 2 inches. Curb box covers shall have integral tracer wire connection screw. Provide extension rod to extend within 1 foot of the ground surface.

2.15 POLYETHYLENE ENCASEMENT

A. Polyethylene encasement shall comply with the requirements of AWWA C105. Film shall be Class C, black with a nominal thickness of 8 mil. Utilize thermoplastic, waterproof tape with a minimum thickness of 8 mils and width of 1" to attach encasement and seal joints.

PART 3 EXECUTION

3.1 GENERAL

A. In addition to joint restraints, provide buttresses at all locations of restraints.

B. All hydrant leads shall be ductile iron or PVC.

3.2 LAYING OF WATER MAIN

A. Minimum depth of cover for water main and services is shown on the Drawings. Additional depth may be required to clear other utilities. When water main and services cross over or under sewers or force main, maintain vertical clearance as required by State and local codes. Do not provide vertical offsets upward that may cause the depth of cover to be less than 6 feet.

B. Contractor shall determine the required pipe profile to meet depth of cover requirements. If water main and services are installed prior to sewer on the project and conflicts are discovered, Contractor shall adjust the water pipe at no additional costs.

C. Lay pipe immediately after preparation of trench and bedding.

D. Lower pipe into trench with appropriate equipment. Do not drop or roll pipe into trench.

E. Lay pipe uniformly to grade and line on the prepared bedding. Clear any debris and dirt from interior end of pipes prior to making connections.

F. Pipe shall be bedded by hand to 12 inches cover before laying subsequent pipe.

G. When work is not being performed, close ends of pipe so that no water, debris, or other substances will enter the pipe.

H. When water main passes under sewers, center pipe under crossing so that joints are as far from the sewer as possible.

I. Follow the manufacturer's recommendations for joining pipe. For push on joints, joint surfaces should be thoroughly cleaned and wiped before joining pipe. Lubricant shall be nontoxic material recommended by pipe manufacturer. For mechanical points, brush and clean surfaces before joining. Clean gasket with soapy water before installation.

J. The Contractor shall install water main at the grades shown on the Plans with no high points except those indicated. If a high point which could trap air is created due to a variance from the plan, the Village reserves the right to order the Contractor to relay the water main that was placed at the wrong grade or to install an air release. Any rework or air release work caused due to a variance from the plan shall be at the expense of the Contractor.

K. Insulate water mains and shown and in all locations where the depth of cover is less than 5 feet.

3.3 VALVE INSTALLATION

A. Install valves where shown. Provide valve boxes for each buried valve unless shown to be located inside a manhole.

3.4 HYDRANT INSTALLATION

A. Install hydrant auxiliary valve 3 feet in front of hydrants unless otherwise directed by the Village DPW.

B. Restrain hydrants with thrust blocking and by anchoring to the main. Provide joint restraints on the entire length of pipe between main and hydrants.

C. Temporarily cover new hydrants during construction with polyethylene bags, securely fastened in place until the water main has been tested and placed into service.

3.5 POLYETHELENE ENCASEMENT

A. Polyethylene encasement shall be installed when ductile iron water main or fittings are installed within organic soil, known contaminated areas, or crossing cathodically protected pipelines.

3.6 TRACER WIRE

A. Install continuous tracer wire for full length of PVC water main. Attached tracer wire to main at a spacing not greater than once every 5 feet and at every fitting.

B. Bring tracer wire to ground surface at property line or at back of hydrant. Attached to curb box for service laterals or provide tracer wire access box at hydrants. Attach wire to screw on bottom of lid. Provide sufficient slack in tracer wire so that lid can be lifted approximately 18 inches from access box with wire intact.

C. Prior to final acceptance, energize tracer wire and verify that the lateral can be located using tracing equipment. If lateral can't be located, dig up and replace tracer wire.

D. Splice branch tracer wire to the main tracer wiring by exposing the main line tracer wire (do not cut), connect the brass splitter bolt to the main tracer wire, seal the connection with electrical tape and wrap with 2 layers of polyethylene adhesive tape 1.5 inch wide by 8 mils thick.

E. Attach tracer wire at the springline of the main or lateral and tape to the pipe at 5 foot intervals.

3.7 JOINT RESTRAINTS

A. Provide joint restraints for all fittings, valves, and hydrants and between pipe sections as shown below.

B. Restrain all joints located in vaults or manholes.

C. Restrain all 4 inch diameter and larger water service piping from the main to the right of way line.

RESTRAINED PIPE LENGTH TABLE
Minimum Length Requiring Restraint in Feet[1]

Fitting Type	4-Inch	6-Inch	8-Inch	10-Inch	12-Inch
11.25-Degree Bend	10	10	10	10	10
22.50-Degree Bend	10	10	10	10	10
30-Degree Bend	10	10	10	10	10
45-Degree Bend	10	10	10	18	18
60-Degree Bend	10	10	18	18	18
90-Degree Bend	18	18	27	27	36
45-Degree Vertical Offset	18	18	27	27	36
Tee	10	10	10	10	10
Dead End	18	27	36	45	55
Valve	18	27	36	45	55

- Minimum length of pipe in feet to be tied together in each required direction from the fitting listed. This table is only applicable where depth of cover is 6 feet or greater and test pressure does not exceed 150 psi. Notify A/E if specified requirements or actual conditions for project are outside these ranges.

3.8 WATER SERVICE INSTALLATION

A. Install water service connections as shown and in accordance with local and State plumbing codes.

B. Make necessary taps on water main and install corporation stops. Provide service free of splices from corporation stop to property line.

C. Install curb stop five feet from the back of curb unless otherwise shown. Extend the water service piping to the right-of-way line and pinch the end of the tubing closed.

D. Where locations of services are not shown on the plans, locate water services at the center of vacant lots and outside of existing driveways.

E. Auger water service piping under existing pavement and shoulders.

F. Do not connect services to the water main until the main has been tested and safe water samples obtained.

G. Insert the corporation stop into the water main while the main is in service and under pressure. Don't backfill the water service trench until after the service has been checked for leaks and the service line flushed.

H. Insulate any water services with a depth less than 6 feet.

I. Provide double strap service clamps for tapping PVC water main. Clamps shall be a minimum of 2 inches wide for 1 inch water services and 3 inches minimum width for services 1.25 inch to 2 inch diameter. Locate taps a minimum of 2 feet from the end of the pipe sections and a minimum of 18 inches apart.

J. Tap main with shell cutter with internal teeth. Do not use standard drill and tap for tapping under pressure.

K. Place Teflon tape on corporation stop threads prior to installation.

L. Where new water services will cross existing mains, pass water service under existing main.

M. Water services shall be a minimum of 6 feet deep at the curb stop. Provide an extension rod to extend within 1foot of the ground surface.

N. Locate the curb stop 1inch-2 inches below the ground surface in grass or ¼ inch – ½ inch below the finished grade in pavement, driveway, or sidewalks.

3.9 CONNECTION TO EXISTING MAINS

A. Contractor shall coordinate all connections to existing mains with the Owner. Provide 72 hours' notice to Owner prior to shutting off water.

B. Contractor shall notify property owners a minimum of 24 hours prior to shutting off water service. Failure to provide 24 hours' notice will result in Owner preventing the connection until a minimum of 24 hours' notice is given.

C. Water service for residents shall not be shut down for a period longer than 8 hours, nor before 8:30 or after 4:30 p.m. or on weekends. Water service for businesses shall not be shut down for a period longer than 2 hours unless satisfactory arrangements have been made with the business owner.

D. Trapped air at intersecting mains shall be bled off by tapping the main or flushing intersecting mains.

3.10 HYDRANT RELOCATION

A. Relocate hydrants as shown on the Plans. Existing hydrant leads and valves shall be abandoned in accordance with Section 02 44 00.

B. The Contractor shall allow the Owner to inspect and repair, if necessary, salvaged hydrants prior to them being reinstalled. The Village will furnish new hydrants to install if repair of existing hydrant will interfere with the Contractor's work.

C. The Contractor shall provide barrel extensions as required on salvaged hydrants.

3.11 DISINFECTION

A. Throughout installation, place calcium hypochlorite granules or tablets in main in accordance with AWWA C651. Upon completion, fill the main with water and allow to stand for 24 hours. Operate intermediate valves during this time.

B. After 24 hours, flush the main and test water for coliform bacteria. In accordance with NR810.09(4)(b), "at least one bacteriological safe sample shall be obtained before waterworks are placed into service…When new distribution systems or extensions on a number of streets are installed, bacteriological samples shall be taken at representative locations to establish that all of the improvements are free of contamination" If test shows the presence of coliform bacteria, re-chlorinate main and repeat test until satisfactory results are obtained.

C. Contractor shall provide all fittings, taps, and work associated with sampling and chlorination.

D. All piping installed outside of water main test segments shall be disinfected by swabbing with a 1% sodium hypochlorite solution. The entire interior surface of all pipes and fittings shall be swabbed.

3.12 PRESSURE TESTING

A. Pressure and leak test each section of the water line in accordance with AWWA C600. The test shall be conducted at 2 times the standard operating pressure of the water main. Pressure test for a minimum duration of 2 hours. Allowable leakage shall be calculated in accordance with AWWA C605 where

$$(L)=SD(P)^{1/2}/133,200$$

Where L=allowable leakage in gallons per hour

S=length of pipe tested in feet

D= nominal diameter of the pipe in inches P=average test pressure in psi

B. If test results in higher leakage, Contractor shall locate and repair defects until leakage is within the allowable limits.

C. Contractor shall provide all equipment for testing.

3.13 WATER METERS- RESIDENTIAL

A. All meters 1 inch diameter and smaller shall be installed with a meter horn.

B. Any meter larger than 1 inch diameter shall have a bypass installed around the meter. If a backflow prevention device is to be installed, the bypass shall terminate upstream of the backflow prevention device.

C. Set meters a minimum height off the floor equal to twice the length of the meter.

D. The meter shall be located a maximum of 2 feet from where the water service enters the building unless otherwise approved by the Village DPW.

E. Provide ball valves on each side of the meter.

F. Meters will be provided by the Village.

3.14 WATER METERS- COMMERICAL, INDUSTRIAL, AND PUBLIC

A. All meters 1 inch diameter and smaller shall be installed with a meter horn.

B. Any meter larger than 1 inch diameter shall have a bypass installed around the meter. If a backflow prevention device is to be installed, the bypass shall terminate upstream of the backflow prevention device.

C. Set meters a minimum height off the floor equal to twice the length of the meter.

D. The meter shall be located a maximum of 2 feet from where the water service enters the building unless otherwise approved by the Village DPW. The meter shall be located in a separate room with an exterior keyed door. The meter room shall only be accessible to the building owner and Village.

E. The pipe material within 2 feet of each side of the meter shall be metal. Provide pipe support within 6 inches of each side of the meter.

F. The meter shall be installed with ball valves on each side.

3.15 ABANDONMENT OF EXISTING WATER SERVICES

A. Water services shown to be abandoned shall be turned off at the corporation. The contractor shall either disconnect the lateral at the corp or cut the lateral within 6 inches of the main and crimp the end.

B. Contractor shall remove the curb stop and box or cut the top of the box off at least 3 inches below the ground surface.

B. All abandonment shall be done in the presence of the Village DPW. Do not backfill until approval is given by the DPW.

SECTION 33 31 00

SANITARY UTLITY SEWERAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Provide sanitary sewer as shown and as specified.

1.2 RELATED SECTIONS

07 23 13 Board Insulation

31 23 00 Excavation and Fill

33 01 30.16 TV Inspection of Sewer Pipelines

33 05 13 Manholes and Structures

1.3 MEASUREMENT AND PAYMENT

A. If a bid item for (Diameter) Sanitary Sewer is included in the Bid Schedule, it will be paid per lineal foot installed. Measurements will be taken horizontally from the center to center of manholes or to the end of the sewer, if it does not terminate in a manhole.

B. If a bid item for (diameter) Wyes is included in the Bid Schedule, it will be paid per each wye installed.

C. If a bid item for (diameter) Sanitary Lateral is included in the Bid Schedule, it will be paid per lineal foot installed. Measurements will be taken horizontally from the center of the sewer main to the end of the lateral. Cost shall include any fittings including bends and cleanouts.

D. If a bid item for Reconnect Sanitary Lateral is included in the Bid Schedule, it will be paid per reconnection made. The bid item shall include locating and verifying the size and material of the lateral, maintaining sanitary service, and pipe coupling.

E. If a bid item for Connect to Existing Sanitary Sewer is included in the Bid Schedule, it will be paid per connection made. The bid item shall include locating the existing main, coring existing manholes, and necessary fittings.

F. If a bid item for Sewer Tracer Wire Access Box is included in the Bid Schedule, it will be paid per each box installed. The bid item shall include boxes and connecting and testing the tracer wire.

PART 2 PRODUCTS

2.1 PVC SEWER PIPE (4 Inch TO 15 Inch DIAMETER)

A. ASTM D3034, Type PSM, SDR-35 poly vinyl chloride, green in color

B. Joints shall be bell-spigot, elastomeric gasket type meeting ASTM D3212.

2.2 PVC SEWER PIPE (18 Inch to 27 Inch DIAMETER)

A. ASTM F679, Type T-1 with a minimum pipe stiffness of 46 psi, green in color

B. Joints shall be bell-spigot, elastomeric gasket type meeting ASTM D3212.

2.3 PVC SEWER PIPE (WITHIN 50 FEET OF PRIVATE WELL OR 200 FEET OF A MUNICIPAL WELL)

A. AWWA C-900, Class 235, DR-18, Cast iron OD.

B. Joints shall be bell and spigot

2.4 WYES

A. Wyes shall be 4 inch diameter unless otherwise shown, in-line, factory injection molded or fabricated.

B. Where wyes will not be connected, provide manufacturer's standard plug, suitable to withstand leakage test. Plug shall prevent water infiltration.

2.5 LATERALS

A. Lateral piping shall meet the requirements for PVC pipe unless otherwise indicated. Joints shall be gasket or solvent weld type.

B. Provide a minimum 6 inch laterals unless otherwise shown larger.

2.6 PIPE COUPLINGS

A. For gravity sewer, ASTM C1173, rubber or elastomeric sleeve. Provide stainless steel bands and hardware.

B. Utilize couplings designed for the pipe material being joined.

2.7 LATERAL CONNECTIONS TO EXISTING MAINS

A. Lateral connections to existing sewers shall be made by cutting in a new wye, installing a minimum of 2 feet of pipe on each side of the wye, and connecting with Ferncos with stainless steel bands and clamps unless otherwise approved by A/E.

2.8 MANHOLE CONNECTIONS

A. Pipe connections shall be made with flexible watertight connectors; use Kor-N-Seal, Link-Seal, or approved equal.

B. All clamps, bolts, etc. shall be stainless steel.

2.9 TRACER WIRE AND ACCESS BOXES

A. No. 10 AWG solid multiple strand copper wire with green plastic coating.

B. Splices shall be made with in-line spice kits.

C. Provide grounding rod at lateral. Rod shall be 3/8 inch diameter and 12 inches long.

D. Access boxes shall be non-traffic rates, ABS plastic access box with cast iron rim and lid. Provide with flared base, 2.5 inch diameter, minimum length of 18 inches. Lids shall be located and opened with standard pentagon head key wrench and labeled "SEWER". Lids shall have two stainless steel terminals screws for attachment of tracer wire to the bottom side of the lid. Boxes shall be manufactured by CP Test Services- Valvco, Inc or approved equal.

E. Create branch connections utilizing splice bolts.

PART 3 EXECUTION

3.1 LAYING OF PIPE

A. When practical, begin at lowest grade. Lay with bell end upstream.

B. Core into and connect to existing manholes as necessary. Connection to existing manhole shall be made using a round core just large enough for insertion of pipe. Cutting a square hole using a saw will not be allowed.

C. Notify A/E if adjustments to inverts must be made due to elevation of existing sewer at connections to existing sanitary sewer.

D. Lay pipe immediately after preparation of trench and bedding.

E. Lower pipe into trench with appropriate equipment. Do not drop or roll pipe into trench.

F. Lay pipe uniformly to grade and line on the prepared bedding. Clear any debris and dirt from interior end of pipes prior to making connections.

G. Pipe shall be bedded by hand to 12 inches cover before laying subsequent pipe.

H. When work is not being performed, close ends of pipe so that no water, debris, or other substances will enter the pipe.

I. Do not pump water from dewatering operations into sanitary sewer.

J. Lubricate joint gasket before setting gasket.

K. When pipe is not gasket type, use methy-ethyl-keytone (MEK) to clean pipe. Use solvent cement approved by manufacturer, brush solvent on pipe and apply to inside of bell. Immediately make joint by inserting the spigot end into the bell and rotating ¼ turn to distribute the cement.

L. Place temporary plugs in downstream manholes and pipes to prevent groundwater and debris from entering sewer system. Any damage to system caused by water or debris shall be repaired at the Contractor's expense.

M. Protect pipes against flotation in areas of high groundwater.

N. Insulate pipes whenever depth of cover is 5 feet or less or as directed by A/E. Insulate in accordance with Section 07 23 13.

3.2 WYE INSTALLATION

A. Install wyes at locations shown on the drawings or as directed by A/E. Install wyes at a 45-degree upward angle from the main unless otherwise specified.

B. Construct risers in accordance with the Drawings.

3.3 LATERAL INSTALLATION

A. Install laterals in accordance with local plumbing code and Wisconsin Administrative Code SPS 382.30.

B. Lay laterals in accordance with the Drawings.

C. If lateral length is greater than 100 feet, install cleanouts as shown on the Drawings.

D. Provide marker stakes at the end of each lateral installed. The marker shall be a minimum of 2 inches by 4 inch by 8 foot wooden post. Place marker vertically with its top flush with the ground. Place a spike with large washer (magnetic) in top of marker post.

E. In new subdivisions, place two marker posts at the end of each lateral installed. Bury one vertically with its bottom at the top of the sewer bedding materials and the second as indicated

F. above.

G. Contractor shall lay all laterals such that there is no less than 4 inches of clearance to storm sewer. If minimum clearance cannot be met, notify A/E prior to laying lateral.

H. Contractor shall lay all laterals such that there is no less than 6 inches of clearance when the lateral passes under a water main or 18 inches of clearance when the lateral passes over a water main.

3.4 ABANDONING LATERALS

A. Abandon laterals by removing the wye from the main. Install a section of new main with Ferncos at each end. Ferncos shall be equipped with stainless steel bands and clamps.

B. Backfill lateral excavation with slurry in accordance with Section 31 23 00.

C. Abandonments shall be done in the presence of the Village DPW. Do not backfill until approval is granted by the Village.

3.5 CONNECTION TO EXISTING MANHOLES

A. Field tapped holes for connecting sewer main to existing manholes shall be made by coring the manhole except that connections to brick or block manholes may be made by cutting the opening.

B. Place bolt heads on Link-Seals on inside of manhole.

C. Pour new flowlines in existing manholes if changed by new connection.

3.6 TRACER WIRE

A. Install continuous, unspliced tracer wire over each PVC lateral from the wye to the marker post. Ground wire adjacent to the wye using the grounding rod. Loop tracer wire around wye and attach wire to top of pipe at approximate 5 foot intervals.

B. Bring tracer wire to the ground surface at property line in tracer wire access box. Locate boxes flush with ground surface. Attach wire to screw on bottom of lid. Provide sufficient slack in tracer wire so that lid can be lifted approximately 18 inches from access box with wire intact.

C. Prior to final acceptance, energize tracer wire and verify that lateral can be located using tracing equipment. If lateral can't be located, dig up and replace tracer wire.

D. Splice branch tracer wire to the main tracer wiring by exposing the main line tracer wire (do not cut), connect the brass splitter bolt to the main tracer wire, seal the connection with electrical tape and wrap with 2 layers of polyethylene adhesive tape 1.5 inch wide by 8 mils thick.

E. A tracer wire access box shall be located at the house (by the homeowner) over the sewer line. Comply with all requirements of this section regarding tracer wire and access boxes.

3.7 LEAKAGE TESTING

A. Provide leakage testing on all sewers using infiltration, exfiltration, or air testing. Infiltration may be used when the groundwater is 2 feet or greater above the top of the pipe. Exfiltration testing shall be performed with a minimum of 2 feet of head above the top of the pipe. Air test shall conform to ASTM F1417. Submit testing procedures for approval.

B. Infiltration or exfiltration shall not exceed 200 gallons per day per inch diameter per mile of sewer when tested for a minimum of 1 hour. Infiltration between adjacent manholes shall not exceed 250 percent of the rate allowed for the entire project. Manhole allowances shall be computed using vertical length of the manhole below the ground water expressed as equivalent diameter

C. sewer.

D. Furnish test plugs, air compressor, pressure gauges, and experienced personnel to perform tests. Test pressure shall be 3.5 psig with length of test and allowable air loss in accordance with ASTM F1417. Contractor shall seal and brace wyes, tees, laterals, and plugs to withstand at least 5 psig.

E. Repair visible leaks even if infiltration limits are met.

3.8 ALIGNMENT AND GRADE

A. Verify alignment and grade by lamping. If pipe shows poor alignment, offset or open joints, sags, or other defects, the Contractor shall repair the work prior to final acceptance.

3.9 DEFLECTION TESTING

A. Perform deflection testing on all PVC piping after final backfill is placed and all laterals are installed. Deflection shall be limited to 5 percent of the inside pipe diameter if tested within 30 days of placement of final backfill. Maximum deflection shall not exceed 7.5 percent of the inside pipe dimeter when testing occurs more than 30 days after placement of final backfill. Contractor shall supply a rigid ball, mandrel, or other approved device of proper size. Manually pull device through pipe. Failure to pass freely shall be cause for rejection of pipe.

B. Piping shall not be deflection tested until at least 14 days after backfill is placed for the main and laterals when the depth of cover on the main exceeds 15 feet.

3.10 TELEVISING

A. Comply with the requirements of Section 33 01 30.16.

3.11 PRESSURE TESTING

A. For sewers passing within 200 feet of a municipal well, the main shall be pressure tested in accordance with AWWA C605. Test pressure shall be 100 psi. If allowable leakage is exceeded, the Contractor shall locate and repair the defects and retest the pipe until within the specified limit.

SECTION 33 41 00

STORM UTLITY DRAINAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Provide storm sewer as shown and as specified.

1.2 RELATED SECTIONS

07 23 13 Board Insulation

31 23 00 Excavation and Fill

33 01 30.16 TV Inspection of Sewer Pipelines

33 05 13 Manholes and Structures

1.3 MEASUREMENT AND PAYMENT

A. If a bid item for (Size) (Class) RCP Storm Sewer is included in the Bid Schedule, it will be paid per lineal foot installed. Measurements will be taken horizontally from the center to center of manholes or to the end of the sewer, if it does not terminate in a manhole or inlet.

B. If a bid item for (Size) Inlet is included in the Bid Schedule, it will be paid per each inlet installed. The bid item shall include the inlet structure, piping connection, adjusting rings, and casting.

E. If a bid item for Connect to Existing Sanitary Sewer is included in the Bid Schedule, it will be paid per connection made. The bid item shall include locating the existing main, coring existing manholes, and necessary fittings.

PART 2 PRODUCTS

2.1 REINFORCED CONCRETE PIPE

A. ASTM C76 with mortar or rubber gasket joints conforming to ASTM C443.

B. Pipe shall be of the class indicated on the Drawings.

2.2 D-LOAD REINFORCED CONCRETE PIPE

A. ASTM C655 with rubber gasket joints conforming to ASTM C443.

B. Minimum wall thickness shall be as required for “C” wall design in accordance with ASTM C76.

2.3 REINFORCED CONCRETE HORIZONTAL ELLIPTICAL PIPE

A. ASTM C507 with mortar or rubber gasket joints conforming to ASTM C443.

B. Pipe shall be of the class indicated on the Drawings.

2.4 SUMP PUMP LATERALS

A. PVC, ASTM D2241, SDR-26 with solvent cement joints and Schedule 40 fittings or PVC ASTM D1785, Schedule 40 with solvent cement joints.

2.5 INLET/OUTLET GRATES

A. Prefabricated of the size and configuration shown, hot-dipped galvanized coating

2.6 DRAIN TILE

A. PVC meeting ASTM D-3034, SDR-35 with rubber gasket joints.

PART 3 EXECUTION

3.1 LAYING OF PIPE

A. When practical, begin at lowest grade. Lay with bell end upstream.

B. Core into and connect to existing manholes as necessary.

C. Notify A/E if adjustments to inverts must be made due to elevation of existing sewer at connections to existing sewer.

D. Lay pipe immediately after preparation of trench and bedding.

E. Lower pipe into trench with appropriate equipment. Do not drop or roll pipe into trench.

F. Lay pipe uniformly to grade and line on the prepared bedding. Clear any debris and dirt from interior end of pipes prior to making connections.

G. Pipe shall be bedded by hand to 12 inches of cover before laying subsequent pipe.

H. When work is not being performed, close ends of pipe so that no water, debris, or other substances will enter the pipe.

I. Place temporary plugs in downstream manholes and pipes to prevent groundwater and debris from entering sewer system. Any damage to the system caused by water or debris shall be repaired at the Contractor's expense.

J. Protect pipes against flotation in areas of high groundwater.

K. Secure the last two pipe sections, including end sections, at all storm sewer outfalls using joint ties.

L. Reconnect sump pump discharges shown on plans or located in the field.

3.2 CONNECTION TO EXISTING MANHOLES

A. Field tapped holes for connecting sewer main to existing manholes shall be made by coring the manhole except that connections to brick or block manholes may be made by cutting the opening.

B. Place bolt heads on Link-Seals on inside of manhole.

C. Pour new flowlines in existing manholes if changed by new connection.

3.3 INLET/OUTLET GRATES

A. Install inlet and outlet grates as shown. Attach grates to end section approximately 3 inches from end of the pipe unless otherwise shown.

3.4 FIELD TILE RECONNECTIONS

A. Replace field tile damaged during construction to at least 2 feet outside of mainline trench disturbance.

B. Utilize fittings suitable for joining pipe materials. The size of new pipe shall be equal to or greater than the tile.

C. Reconnect all damaged tile the day that the disturbance occurs.

3.5 TELEVISING

A. Comply with the requirements of Section 33 01 30.16.

3.6 DISCHARGE STENCILING

A. Adjacent to each catch basin on the top of curb, stencil “This Storm Sewer Drains to a_____.” (Lake, stream, wetland, etc.). Use White epoxy paint.

B. Stencils are available from the Village.

SECTION 33 42 00

CULVERTS

PART 1 GENERAL

1.1 SUMMARY

A. Provide culverts as shown and as specified.

1.2 RELATED SECTIONS

31 23 00 Excavation and Fill

1.3 SUBMITTALS

A. Submit product data on culverts and end sections.

1.4 MEASUREMENT AND PAYMENT

A. If a bid item for (diameter) Culvert is included in the Bid Schedule, it will be paid for at the unit price per lineal foot installed. Measurement will be taken horizontally from end of culvert to end of culvert prior to installation of endwalls.

B. If a bid item for (diameter) Endwall is included in the Bid Schedule, it will be paid for at the contract unit price per each endwall installed.

PART 2 PRODUCTS

2.1 CULVERT PIPE

A. Corrugated steel pipe conforming to AASHTO M36/ASTM A760.

2.2 ENDWALLS

A. Prefabricated end sections made of the same material as the culvert pipe.

2.3 GEOTEXTILE FABRIC- TYPE HR

A. Geotextile having a minimum grab tensile strength of 305 pounds, minimum puncture strength of 100 pounds, maximum apparent opening size of No. 30 and a minimum permittivity of 0.40 s^{-1}

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide temporary drainage as required to maintain drainage throughout the project.

B. Remove existing culvert pipe and appurtenances to the limits shown. Do not over-excavate or disturb areas outside the construction limits.

C. Install culvert ant the locations and elevations shown. Notify A/E of any changes required after existing facilities are uncovered.

D. If hard pan, boulders, or fragmented base material exists, bed the pipe on no less than 6" of granular bedding.

E. Unless otherwise shown on the plans, if laying 2 or more pipe adjacent to each other, separate them by a distance of no less than ½ of the pipe diameter with a maximum separation distance of

18 inches. For pipes with attached endwalls, separate the pipes such to provide a minimum separation of 6 inches between the endwalls.

F. Backfill culverts and endwalls in accordance with Section 31 23 00. Backfill in accordance with manufacturer's recommendations to ensure that culvert is not deformed during backfill operations.

G. Relay or replace culvert with a deflection greater than 5%.

3.2 SALVAGING EXISTING CULVERTS

A. If culverts are not shown to be replaced but conflict with work, the Contractor shall remove and reinstall the existing culvert at the original line and grade. Notify A/E if condition of culvert does not allow reinstallation.

SECTION 33 46 16

SUBDRAINAGE PIPING

PART 1 GENERAL

1.1 SUMMARY

A. Provide subsurface drainage as shown and as specified.

1.2 MEASUREMENT AND PAYMENT

A. When a bid item for (diameter) underdrain is included in the Bid schedule, it will be paid at the contract unit price per lineal foot installed. Payment shall include all costs for furnishing and installing underdrain piping including trenching, pipe, fittings, geotextile, backfill, connection to existing storm sewer, and all associated work.

1.3 SUBMITTALS

A. Furnish product data on piping and geotextile.

PART 2 PRODUCTS

2.1 PIPING

A. Corrugated polyethylene drainage pipe conforming to AASHTO M252, type CP and AASHTO M294, type CP with class 2 perforations.

B. Fittings shall conform to AASHTO M252 or AASHTO M294.

2.2 GEOTEXTILE FABRIC

A. Use a geotextile fabric of knitted, woven, or non-woven fibers of polyester, polypropylene, stabilize nylon, polyethylene, or polyvinylidene chloride. Do not use silt film woven fabrics. The fabric shall have a minimum grab tensile strength of 35 pounds in accordance with ASTM D4632 and an apparent opening size of No. 30-200 in accordance with ASTM D4751. The minimum permittivity shall be 1.35 s^{-1}.

B. Used knitted fabrics constructed from continuous yarn. Non-woven fabrics may be needle punched, heat bonded, resin bonded, or combination of these types. Use woven fabrics construction from monofilament or multifilament yarns.

C. Geotextile fabric shall be shipped in a protective covering that does not exposed fabric to sunlight. Maintain protective covering until fabric is utilized in the Work.

PART 3 EXECUTION

3.1 INSTALLATION

A. Construction trenches from the underdrain as near as possible to those shown on the plans. If necessary, contact A/E for any field modifications that may be necessary.

B. Wrap the geotextile fabric securely around the pipe underdrain along its entire length in a way that allows no water to enter the underdrain without first passing through the fabric.

C. Overlap all fabric joints and splices a minimum of 18 inches.

D. Install piping at the line and grade shown on the plan. Install perforations within the bottom 1/3 of the pipe.

E. Backfill pipe in accordance with Section 31 23 00 using washed stone. Place a minimum of 6" of washed stone over the top of pipe before backfilling with granular backfill.

E. Plug end of pipe with plugs manufactured from the same material as the pipe.