

VILLAGE OF CAMPBELLSPORT SPECIFICATIONS FOR STH 67 UTILITIES

330130 - SANITARY SEWER MANHOLE INTERIOR REHABILITATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification shall govern all labor, materials, equipment and appliances necessary for the sanitary sewer manhole interior rehabilitation for the purpose of eliminating infiltration and inflow, providing corrosion protection, repair of cracks and voids and restoration of the structural integrity of the manhole as a result to the application of a monolithic fiber-reinforced structural/structurally enhanced cementitious liner to the wall, ceiling and bench surfaces of concrete, brick or any other masonry construction material.

1.2 SUBMITTALS

- A. Submit manufacturer's material data and application and installation instructions for all products used.
- B. Provide documentation that the proposed manhole rehabilitation process has a minimum 5-year history for reconstruction of sanitary sewer manholes on projects of similar size and scope.

1.3 QUALITY ASSURANCE

- A. Use, mix apply and cure all products in accordance with the manufacturer's recommendations and instructions.
- B. Provide recommended daily or lot test specimens for compressive strength and other testing per applicable ASTM standards.

1.4 MEASUREMENT AND PAYMENT

A. Measurement:

1. Measurement basis for payment for manhole interior lining shall be per vertical foot of manhole interior surface lined at 0.5-inch minimum thickness. All manholes are 4-foot diameter unless noted otherwise. Vertical distance shall be measured from lowest invert to the bottom of the manhole casting.

B. Payment:

1. Payment for manhole interior lining shall be the number of vertical feet of manhole interior surface lined times the unit price bid per vertical foot of manhole interior lining.

C. Incidentals:

1. Manhole preparation, liner application, curing and testing, and cleaning shall be considered incidental to the unit price bid per vertical foot of manhole lining.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Patching Mix:

1. A quick-setting, fiber-reinforced cementitious material for patching and filling voids and cracks.
2. Material shall have the following minimum requirements:

Compressive Strength	ASTM C-109	6 hr 1,400 psi
Shrinkage	ASTM C-569	0% at 90% R.H.
Bond	ASTM C-321	28 Day 150 psi
Cement		Sulfate resistant
Density, when applied		105 +/- pcf

B. Infiltration Control Mix:

1. A rapid setting cementitious product specifically formulated for infiltration control.
2. Material shall have the following minimum requirements:

Compressive Strength	ASTM C-109	24 hr 1,000 psi
Bond	ASTM C-321	24 hr 80 psi

C. Grouting Mix:

1. A rapid-setting cementitious grout specifically formulated for stopping very active infiltration and filling voids.
2. A rapid-setting chemical grout specifically formulated for the stopping very active infiltration.

D. Liner Mix:

1. A fiber-reinforced cementitious liner material shall be wet mixed and low pressure spray applied to form the structural/structurally enhanced monolithic liner covering all interior manhole surfaces.
2. Material shall be pre-mixed and specially formulated to withstand abrasion in sewer networks.
3. Material shall have the following minimum requirements:

Compressive Strength	ASTM C-109	28 Day >8,000 psi
Flexural Strength	ASTM C-78	28 Day 1,400 psi
Shrinkage	ASTM-596	0% at 90% R.H.

- E. Bonding Compound shall be a modified cementitious bonding compound that protects exposed reinforcement steel and enhances bond of overlay to substrate.

- F. Water shall be clean and potable

PART 3 - EXECUTION

3.1 MANHOLE PREPARATION

- A. Place covers over sewer inverts to prevent extraneous material from entering the sewer lines.

- B. Remove foreign, loose and unsound concrete and masonry material from the interior surfaces of the manhole by means of high pressure (1,500 psi minimum) water spray.
- C. Loose, unsound, and protruding concrete and masonry material not able to be removed by high pressure water spray may require the use of mason's or mechanical tools for removal.
- D. Clean the interior surfaces of the manhole with high pressure (1,500 psi minimum) water spray, using detergent, muriatic acid, antibacterial agent or other chemicals to remove grease, oil and other contaminants that would prevent good bond between the existing manhole interior surface and the liner material.
- E. Active hydrostatic leaks (infiltration) shall be stopped using the rapid-setting specially formulated infiltration control mix.
- F. Very active hydrostatic leaks (infiltration) shall be stopped using one of the rapid-setting grouting mixes specially formulated for control of very active infiltration.
- G. Clean and prepare exposed reinforcement steel, and apply and cure bonding compound, in accordance with the product manufacturer's instructions and recommendations.
- H. Prepare cracks and voids to be patched and filled, and apply and cure patching mix, in accordance with the product manufacturer's instructions and recommendations.
- I. Areas of manholes that are found to be structurally damaged and in need of repair beyond the scope of this specification shall be brought to the attention of the Engineer. A suitable repair method shall be developed for each area and submitted to the Engineer for review prior to commencing the repair.
- J. Prepare, clean and repair manhole benches and inverts in the same manner as prescribed above.

3.2 LINER APPLICATION, CURING AND TESTING

- A. Prepare manhole surfaces, wet batch-mix liner material, low pressure spray apply liner mix to manhole ceiling, wall and bench surfaces and allow liner to cure in accordance with the product manufacturer's instructions and recommendations.
- B. Liner application shall be 0.5-inch minimum thickness. The application shall be completed with a minimum of two coats. The first coat shall be applied at a thickness adequate to cover the substrate and be troweled to compact the material into voids and set the bond. The second coat shall be applied to ensure complete coverage at the specified 0.5-inch minimum thickness.
- C. Inverts shall be lined with patching mix, trowel applied in one coat to 0.5-inch minimum thickness.
- D. Prepare, label and submit recommended daily or per lot test specimens for testing.

3.3 CLEANING

- A. Clean manhole interiors and remove all construction-related materials, equipment and appliances from the manholes prior to reinstatement of the manholes to service.

END OF SECTION

330131 - REHABILITATION OF EXISTING SANITARY SEWER MAINS

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification shall govern all labor, materials, equipment and tools necessary for the sanitary sewer main and lateral interior rehabilitation for the purpose of eliminating infiltration, providing corrosion protection, repair of cracks and voids, and restoration of the structural integrity of the sewer main as the result of the installation of a cured-in-place pipe.
- B. This specification shall also govern all labor, materials, equipment and tools necessary for the sanitary sewer lateral interior rehabilitation 1.5 feet from its connection to the sewer main for the purpose of eliminating infiltration, providing corrosion protection, repair of cracks and voids, and restoration of the structural integrity of the sewer lateral as the result of the installation of a chemical grout.

1.2 MEASUREMENT AND PAYMENT

A. Sewer Lining

- 1. Materials and installation as described below:
 - a. Mobilization and site preparation.
 - b. Televising of sanitary sewer to determine installed conditions.
 - c. Cleaning of existing sanitary sewers to a condition necessary for proper installation of liner.
 - d. Determining if existing service connections are active or inactive.
 - e. Placement of lining material within sanitary sewer.
 - f. Flow control, including bypass pumping, if required.
 - g. Sewer testing and internal inspections of installation.
 - h. Cleanup.
 - i. Other appurtenant and incidental work.
- 2. Measurement for Payment:
 - a. Measure sanitary sewer on straight horizontal line along centerline of sewer.
 - b. Do not include distance through manholes in measurement.
- 3. Payment:
 - a. Include cost of Work listed herein in appropriate unit price bid per linear foot.

B. Reinstating Laterals

- 1. Materials and installation as described below:
 - a. Reinstatement and reconnection of active service connections.
 - b. Other appurtenant and incidental work.
- 2. Measurement for Payment:
 - a. Measure reinstating lateral on a per each basis.
 - b. Do not include inactive or abandoned laterals.
- 3. Payment:
 - a. Include cost of Work listed herein in appropriate unit price bid per each.

1.3 REFERENCES

- A. American Society for Testing and Materials (ASTM):
1. ASTM D543 Test Method for Resistance of Plastics to Chemical Reagents
 2. ASTM D638 Test Method for Tensile Properties of Plastics
 3. ASTM D790 Test Method for Tensile Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 4. ASTM F1216 Rehabilitation of Existing Pipelines and Conduits by Inversion and Curing of a Resin-Impregnated Tube

1.4 PRODUCT, MANUFACTURER, AND INSTALLER REQUIREMENTS

- A. In order to be considered Commercially Acceptable, the Product, Manufacturer, and Installer must each demonstrate, to the Owner's satisfaction, compliance with the following requirements:
1. For a Product to be considered as Commercially Acceptable, a minimum of 100,000 feet of successful wastewater collection system installation in the U.S. must be documented to assure commercial viability. Provide such documentation. In addition, the Product shall have been in service within the wastewater collection system of the Owner (or some other city, town, or county within the State of Wisconsin) for a minimum of 60 months. The Product must be shown to comply with the requirements of this specification.
 2. For a Manufacturer to be considered Commercially Acceptable, that Manufacturer must have provided continuously for at least five years, the materials for a Commercially Acceptable Product (as defined above). For purposes of determining Manufacturer qualification, the Commercially Acceptable Product may be the proposed rehabilitation materials to the Owner, or it may be some other pipeline rehabilitation method using a Commercially Acceptable product. The Manufacturer must be able to demonstrate sufficient in-house engineering support and manufacturing quality control. Furthermore, to insure the long-term protection of the Owner, the Manufacturer shall submit three years audited financial data and must be financially sound by generally accepted accounting principles.
 3. For an Installer to be considered as Commercially Acceptable, the Installer must satisfy all insurance, financial, and bonding requirements of the Owner, and must have at least 5 years active experience in the commercial installation of the Product. In addition, the installer must have successfully installed at least 100,000 feet of the Product in wastewater collection system installations. These installations must have had a combined total of 1,000 successful internally reinstated lateral connections. Further, Installer shall not subcontract out lining of sewer. Installer submitting bid shall perform all lining.
 4. The Manufacturer and/or Installer shall submit, upon request by the Owner or the Owner's engineer, responses to the information required in this specification which are, in the sole opinion of the Owner and the Owner's engineer, acceptable, responsive and provide satisfactory proof of these qualification requirements.
 5. The Manufacturer and/or Installer shall submit copy of the license or certificate verifying the Manufacturer's or licensor's approval of the Installer.
- B. The final decision to accept or reject the product/manufacturer/installer lies solely with the Owner.

1.5 SUBMITTALS

A. Product Data:

1. Liner Pipe Thickness Design.

- a. Liner Pipe Thickness Design shall be in accordance with Appendix XI of ASTM F1216. The existing pipe shall not be considered as providing any structural support to the liner pipe. In the liner thickness calculations, the minimum ovality of the host pipe shall be 5 percent, the enhancement factor (K) shall not be greater than 7.0, the minimum safety factor shall be 2.0, and the flexural modulus of elasticity shall be reduced 50% for Cured-in Place-Pipe.
- b. No liner shall be installed until it has been approved for installation.
- c. No liner will be approved for installation until liner thickness calculations have been submitted and reviewed for conformance with the specifications and installation requirements.

B. Installer:

1. Proposed plan for bypassing sewage during liner installation.

C. Post Lining Submittals:

1. Testing results per section 3.5.
2. CCTV tapes and reports per section 3.5.D.

1.6 QUALITY ASSURANCE

A. Corrosion:

1. Fabricate finished liner from materials which, when cured, will be chemically resistant to withstand internal exposure to domestic sewage.

B. Manhole Connections:

1. All manhole connections shall be water tight.

C. Testing:

1. Test finished pipe liner in accordance with section 3.5.C.

PART 2 - PRODUCTS

2.1 CURED IN PLACE PIPE LINER (CIPP)

A. Materials:

1. Liner Bag: Polyester resin for general chemical applications.
 - a. Resin shall not contain fillers, except those required for viscosity control or fire retardance. Up to 5% by mass thixotropic agent that will not interfere with visual inspection may be added for viscosity control.
 - b. Resins may contain pigments, dyes, or colorants that will not interfere with visual inspection of cured liner.

- c. Vinyl or Epoxy resin may be required by CONTRACTOR, if conditions are deemed to warrant their use.
2. Reinforcing Material:
- a. Needle interlocked polyester felt formed into sheets of required thickness.
 - b. Felt tubes may be made of single or multiple layer construction, with any layer not less than 1.5 mm thick.
 - c. Mechanical strengthener membrane or strips may be sandwiched in between layers where required to control longitudinal stretching.
 - d. Polyurethane membrane used during inversion of tube may be left on internal surface of liner after curing.
 - e. Minimum thickness of bonded polyurethane membrane and inner liner, if used, shall be 0.25 mm, 5%, and shall not affect structural dimension requirements of cured liner.
3. Felt Content:
- a. Content shall ensure cured thickness of liner as specified.
 - b. Thickness of cured liner to be as specified (+10% - 4%) and shall not include thickness of polyurethane inner liner.
4. Resin Content:
- a. 10 to 15% by volume greater than volume of felt in liner bag.
5. Cured liner shall conform to minimal structure standards listed:

	Standard	Value
Tensile Strength	ASTM D638	3,000 psi
Flexural Modulus of Elasticity	ASTM D790	250,000 psi
Flexural Strength	ASTM D790	4,500 psi

- 6. Fabricate liner to size that when installed, will fit internal circumference of pipe, allowance shall be made for circumferential stretching during insertion.
- 7. The outside of the tube shall have yardage or footage markers along its full length at regular intervals not to exceed five (5) feet.

B. Design:

- 1. Cured liner shall conform to minimum standards of ASTM 1216.

PART 3 - INSTALLATION

3.1 EXAMINATION

- A. Examine tapes of condition of pipe interior before starting work.

3.2 PREPARATION

- A. Prior to liner installation sufficiently clean roots and other debris from sewer line to provide for proper installation of product.
- B. If offset joints or collapsed pipe sections are present that will prevent insertion of the liner, notify the Engineer immediately. Repairs for these conditions are not part of the

scope of this project and will be completed only after written authorization is issued by the Engineer.

C. Sewage Bypassing:

1. Provide for flow of sewage around sections of pipe to be lined.
 - a. Pump or bypass lines shall be of adequate size and capacity to handle flow.
 - b. Coordinate bypassing operations with owner.

3.3 INSTALLATION

A. Preparation of Liner:

1. Resin Impregnation (CIPP):
 - a. Designate location where uncured resin in original containers and unimpregnated liner will be vacuum impregnated prior to installation. Installer shall allow engineer to inspect materials and "wet out" procedure.
 - b. Resin and catalyst system compatible with requirements of this method shall be used. Quantities of liquid thermosetting materials shall be to manufacturer's standards to provide lining thickness required.
 - c. Liner tube shall be impregnated with resin not more than 24 hrs. before proposed time of installation and stored out of direct sunlight at temperature less than 40 degrees Fahrenheit (4 degrees Celsius)
 - d. Transport resin impregnated liner to site immediately prior to inversion in suitable light-proof container with temperature maintained below 40 degrees Fahrenheit (4 degrees Celsius).
2. Insertion of Liner:
 - a. Insert liner through an existing manhole or other access by means of an inversion process and application of hydrostatic head sufficient to fully extend liner to next designated manhole or termination point or by means of winching the liner through the last pipe to the next designated manhole or termination point. Lubricant may be used.
3. Curing Liner:
 - a. After installation is complete, provide heat source and recirculation equipment. Equipment shall be capable of delivering hot water or steam throughout section to uniformly raise the skin temperature above that which is required to effectively cure resin and cure the liner.
 - b. Provide heat source with suitable monitors to gauge temperature of incoming and outgoing water/steam supply. Place second gauge between impregnated liner and pipe invert at remote manhole to determine temperatures during cure.
 - c. Initial cure shall be complete when inspection of exposed portions of liner are hard and round and remote temperature sensor indicates that temperature has reached required levels.
 - d. Cool hardened liner to temperature below 100 degrees F. Cool down by introduction of cool water or air into the liner. In the case of CIPP care shall be taken in release of static head so that vacuum will not be developed that could damage newly installed liner.
 - e. Reconstruct benches and channels in manholes with grout to match new

invert elevations.

3.4 CONNECTIONS

A. Service Connections:

1. Locations:
 - a. Determine service connection locations from television inspection video tapes completed prior to lining.
2. Reinstatements:
 - a. Reinstatements and reconnect service connections unless service connection is deemed to be inactive.
 - b. Reconnect services without excavation by television camera and cutting device that re-establishes services for minimum of 95% of the flow capacity.
 - c. Sanitary services shall not be out of service for more than 12 hours during lining process.

3.5 FIELD QUALITY CONTROL

A. Finished liner:

1. Liner shall be continuous over entire length of insertion run and be as free as commercially practicable from visual defects such as foreign inclusions, dry spots, pinholes and delamination's.
2. Liner shall conform to shape of pipe existing before installation and not be out of round by more than 15%.

B. Liner Thickness:

1. Cured liner shall be accurately measured and shall not be more than 5% less than thickness specified.

C. Testing:

1. CIPP Liners
 - a. Test in accordance with ASTM D790.
 - b. Specimens tested shall be actual thickness of fabricated liner.
 - c. Do not machine specimen on surface.
 - d. Make test with smooth (inner) face in compression using 5 specimens.

D. CCTV Examination:

1. Televis interior of pipe after completion of Work and provide tape to OWNER.
2. Use pan and tilt color 3 lux camera to view the sewer service lateral connections.

3.6 CLEANING AND RESTORATION

- #### A.
- At completion of work, remove rubbish, debris, dirt, equipment and excess material from site. Clean and restore adjacent surfaces soiled by and during course of work.

END OF SECTION

330523 – PIPE BURSTING SANITARY SEWERS

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification shall govern all labor, materials, equipment and tools necessary for the rehabilitation or replacing existing sewer pipelines by installation of high density polyethylene pipe for sewer force main and laterals using pipe bursting methods as identified on the drawings, and replacing with new pipe.
- B. The contractor shall be trained by the respective manufacturer of the pipe bursting equipment in the use of that machinery. The contractor shall provide certification from the manufacturer that the contractor has been trained and is proficient in the use of the equipment. Only the contractor's employees trained and certified by the manufacturer shall be allowed to operate the equipment during the project.

1.2 MEASUREMENT AND PAYMENT

A. Force Main Pipe Bursting

- 1. Materials and installation as described below:
 - a. Mobilization and site preparation.
 - b. Placement of lining material within sanitary sewer.
 - c. Flow control, including bypass pumping.
 - d. Sewer testing and internal inspections of installation.
 - e. Cleanup.
 - f. Other appurtenant and incidental work.
- 2. Measurement for Payment:
 - a. Measure sanitary sewer force main on straight horizontal line along centerline of sewer.
- 3. Payment:
 - a. Include cost of Work listed herein in appropriate unit price bid per linear foot.

B. Lateral Pipe Bursting

- 1. Materials and installation as described below:
 - a. Mobilization and site preparation.
 - b. Placement of lining material within sanitary sewer.
 - c. Flow control.
 - d. Sewer testing and internal inspections of installation.
 - e. Cleanup.
 - f. Other appurtenant and incidental work.
- 2. Measurement for Payment:
 - a. Measure lateral on a per lineal foot basis from wye to point of connection to existing building lateral to remain.

3. Payment:
 - a. Include cost of Work listed herein in appropriate unit price bid per lineal foot.

C. Lateral Reinstatement at Sewer Main

1. Materials and installation as described below:
 - a. Reconnection of active service connections to sewer main after pipe bursting lateral.
 - b. Other appurtenant and incidental work.
2. Measurement for Payment:
 - a. Measure reconnection of lateral at sewer main after pipe bursting lateral on a per each basis.
 - b. Do not include inactive or abandoned laterals.
3. Payment:
 - a. Include cost of Work listed herein in appropriate unit price bid per each.

D. Lateral Reconnection to Existing Lateral Outside of Building

1. Materials and installation as described below:
 - a. Reconnection of laterals that have been restored with pipe bursting to existing lateral within one (1) foot of building foundation wall.
 - b. Other appurtenant and incidental work.
2. Measurement for Payment:
 - a. Measure reconnection of laterals that have been restored with pipe bursting to existing laterals at outside of buildings on a per each basis.
 - b. Do not include inactive or abandoned laterals.
3. Payment:
 - a. Include cost of Work listed herein in appropriate unit price bid per each.

E. Lateral Reinstatement to Existing Lateral Inside of Building

1. Materials and installation as described below:
 - a. Reconnection of laterals that have been restored with pipe bursting to existing laterals inside existing buildings.
 - b. Other appurtenant and incidental work.
2. Measurement for Payment:
 - a. Measure reconnection of laterals that have been restored with pipe bursting to existing laterals inside of existing buildings on a per each basis.

- b. Do not include inactive or abandoned laterals.
- 3. Payment:
 - a. Include cost of Work listed herein in appropriate unit price bid per each.

1.4 PRODUCT, MANUFACTURER, AND INSTALLER REQUIREMENTS

- A. In order to be considered Commercially Acceptable, the Product, Manufacturer, and Installer must each demonstrate, to the Owner's satisfaction, compliance with the following requirements:
 - 1. For a Product to be considered as Commercially Acceptable, a minimum of 3,000 feet of successful wastewater collection system installation in the U.S. must be documented to assure commercial viability. Provide such documentation. In addition, the Product shall have been in service within the wastewater collection system of the Owner (or some other city, town, or county within the State of Wisconsin) for a minimum of 60 months. The Product must be shown to comply with the requirements of this specification.
 - 2. For an Installer to be considered as Commercially Acceptable, the Installer must satisfy all insurance, financial, and bonding requirements of the Owner, and must have at least 5 years active experience in the commercial installation of the Product. In addition, the installer must have successfully installed at least 3,000 feet of the Product in wastewater collection system installations. Further, Installer shall not subcontract out pipe bursting of sewer. Installer submitting bid shall perform all pipe bursting.
 - 3. The Manufacturer and/or Installer shall submit, upon request by the Owner or the Owner's engineer, responses to the information required in this specification which are, in the sole opinion of the Owner and the Owner's engineer, acceptable, responsive and provide satisfactory proof of these qualification requirements.
- B. The final decision to accept or reject the product/manufacturer/installer lies solely with the Owner.

1.5 SUBMITTALS

- A. Product Data:

Shop drawings, catalog data, and manufacturer's technical data showing complete information on material composition, physical properties, and dimensions of new pipe and fittings. Include manufacturer's recommendations for handling, storage, and repair of pipe and fittings damaged.
- B. Installer:
 - 1. Proposed plan for bypassing sewage during pipe bursting of force main.
 - 2. Certifications of personnel involved in Butt Fusion Welding.
- C. Post Pipe Bursting Submittals:
 - 1. Testing results per section 3.5.

PART 2 - PRODUCTS

2.1 HDPE PIPE

A. Materials:

1. Polyethylene Plastic

- a. Pipe shall be High Density Polyethylene Pipe (HDPE) and meet applicable requirements of ASTM F14.
- b. HDPE pipe and fittings will be used in accordance with the material specifications. All additional appurtenances (manholes, tees, gaskets, etc.) will meet the material specifications. All pipe installed by pipe bursting will be joined by butt fusion, electro fusion, or full circle repair clamp as detailed in paragraph B (Pipe Joining) of this section.
- c. HDPE pipe will be produced from resins meeting the requirements of ASTM D1248, designation PE3408, ASTM D3350 cell classification PE345444C, and will meet the requirements of AWWA C901 and C906. HDPE pipe will meet the minimum stability requirements of ASTM D3350. Pipe will be legibly marked at intervals of no more than five feet with the manufacturer's name, trademark, pipe size, HDPE cell classification, appropriate legend such as SDR 19 or SDR 17, ASTM D3035, AWWA C901 or C906, date of manufacture and point of origin.
- d. All pipe shall be made of virgin material. No rework material except that obtained from the manufacturers own production of the same formulation shall be used.
- e. The pipe shall be homogeneous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
- f. Pipe color shall be solid black unless otherwise specified in these contract documents.
- g. HDPE Pipe shall be Iron Pipe Size (IPS) unless otherwise specified in these contract documents.
- h. Dimension Ratios: The minimum wall thickness of the HDPE pipe shall be DR 17 for sewer laterals and DR 11 for force main.
- i. Pipe joints shall be butt-fusion thermal welded.
- j. Terminal sections may also be joined by Electrofuse Couplings by Central Plastic Company, Friatec, or approved equal. Terminal sections may also be joined by Full Circle Repair Clamps by Smith Blair, JCM, or approved equal.

B. Equipment

The pipe bursting unit shall be designed and manufactured to force its way through the existing line by fracturing the pipe and compressing the broken pieces into the surrounding soil as the equipment progresses. The bursting unit shall generate sufficient force to burst and compact the existing pipeline. In each case the pipe bursting unit shall pull the polyethylene pipe with it as it moves forward.

PART 3 - INSTALLATION

3.1 GENERAL

- A. The Contractor shall provide flow diversion with pumps adequate in size and capacity to handle all flows generated during the pipe burst process. All costs for bypass pumping shall be incidental unless specific pay items for this work are included in the

pay schedule.

- B. Excavation of insertion pits shall be at locations determined by the Contractor. Before any excavation is done for any purposes, the Contractor shall contact the appropriate One Call agency for determining field locations of existing utilities.
- C. Insertion pits shall be of sufficient length to allow the bursting head and new HDPE pipe to enter the host pipe at an angle that will maintain the grade of the existing sanitary sewer.

3.2 PREPARATION

- A. Prior to pipe bursting sufficiently clean roots and other debris from sewer line to provide for proper installation of product.
- B. If offset joints or collapsed pipe sections are present that will prevent pipe bursting, notify the Engineer immediately. Repairs for these conditions are not part of the scope of this project and will be completed only after written authorization is issued by the Engineer.
- C. Sewage Bypassing:
 - 1. Provide for flow of sewage around sections of pipe to be pipe burst.
 - a. Pump or bypass lines shall be of adequate size and capacity to handle flow.
 - b. Coordinate bypassing operations with owner.

3.3 INSTALLATION

- A. The polyethylene pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak proof joint. Threaded or solvent-cement joints and connections are not permitted. All equipment and procedures used shall be in compliance with the manufacturer's recommendations. Fusing shall be accomplished by personnel certified as fusion technicians by a manufacturer of HDPE pipe and/or fusing equipment.
 - 1. The butt-fused joint shall be in true alignment and shall have uniform rollback beads resulting from the use of proper temperature and pressure. The joint shall be allowed adequate cooling time before removal of pressure. The fused joint shall be watertight and shall have tensile strength equal to that of the pipe. All defective joints shall be cut out and replaced at the expense of the Contractor. Service connections to the HDPE pipe shall be made with materials submitted and approved in accordance with Part 2. Materials.
 - 2. An appropriate relaxation period shall be allowed prior to making service connections and connecting to adjacent pipes. The relaxation period shall be appropriate with and dependent upon site conditions, as determined by Contractor.
 - 3. If concrete encasements are encountered, a point repair shall be performed to excavate and break out concrete prior to the bursting operation to allow the steady and free passage of the pipe bursting head, with approval from the Owner/Engineer. Separate payment for this work will be made and it is not considered incidental to the pipe bursting process.

4. The new HDPE pipe shall be inserted immediately behind the bursting head in accordance with the manufacturer's recommended procedures. The bursting tool shall be specifically designed and manufactured for the type of insertion process being used. It shall be utilized to guide and assist the bursting head during the operation. A pushing machine may be utilized to aid pipe insertion from the rear.

3.4 CONNECTIONS

A. Force Main Connections:

1. Reinstatements:

- a. Reconnect new force main with mechanical joints.
- b. Contactor shall minimize the time out of service and provide bypass pumping during pipe bursting process.

B. Service Connections:

1. Reinstatements:

- a. Reinstatements and reconnect service connections to the sewer main before sewer main is slip lined.
- b. Reconnect service to existing building plumbing inside existing buildings when directed by the Village of Campbellsport. Floor that needs to be excavated to reconnect to existing plumbing shall be saw cut and restored new concrete patch. All excess materials shall be removed, and construction debris, dirt, and equipment removed.
- c. Reconnect service to existing building plumbing one (1) foot outside existing buildings when directed by the Village of Campbellsport. Excavated to reconnect to existing plumbing, backfill and compact excavation, and restore landscaping disturbed during construction. All excess materials shall be removed, and construction debris, dirt, and equipment removed.
- d. Sanitary services shall not be out of service for more than 12 hours during lining process.

3.5 FIELD QUALITY CONTROL

A. Testing:

1. After the new HDPE pipe is installed and connected to remaining pipe, the line shall be inspected by CCTV. PACP Post-CCTV video shall be submitted to the Engineer or Owner for approval and acceptance of line.

3.6 CLEANING AND RESTORATION

- A. At completion of work, remove rubbish, debris, dirt, equipment and excess material from site. Clean and restore adjacent surfaces soiled by and during course of work.

END OF SECTION

SECTION 333123 - SANITARY SEWER FORCE MAIN

PART 1 – GENERAL

1.1 DESCRIPTION

- A. Work Under This Section Shall Include:
1. Sanitary sewer force main and air release valve installation
 2. Materials
 3. Restoration
 4. Testing

1.2 REFERENCE STANDARDS

- A. ASTM: American Society for Testing and Materials
- B. AASHTO: American Association of State Highway and Transportation Officials
- C. Standard Specification for Sewer & Water Construction in Wisconsin
- D. Wisconsin Department of Transportation
- E. AWWA: American Water Works Association

1.3 SUBMITTALS

- A. Provide Shop Drawing for the following:
1. Pipe
 2. Fittings
 3. Valves
 4. Manholes:
 - a. Precast structure
 - b. Frames, covers, gasketed pipe openings, and joint seals
 5. Flexible couplings

1.4 MEASUREMENT AND PAYMENT

- A. Force Main Sewer (Open Cut)
1. Measurement:
 - a. Force main sewer shall be measured along the centerline of the pipeline with no deductions for manholes.
 2. Payment: shall be made by the unit price per linear foot and include:
 - a. Pipe material, equipment and labor
 - b. Stripping and stockpiling topsoil
 - c. Traffic and dust control
 - d. Loading, hauling and disposal of street surfacing and curb & gutter in trench area
 - e. Dewatering and excavation
 - f. Pipe bedding and initial cover material
 - g. Loading, hauling and disposal of surplus excavated material
 - h. Backfilling and compaction

- i. Couplings
- j. Quality control testing

B. Air Release Manholes

1. Measurement: shall be made per each installed.
2. Payment: shall be made by the unit price per each installed and include:
 - a. Dewatering and excavation.
 - b. All labor, equipment, precast components, pipe material, valves, steps, and frame and cover.
 - c. Gasketed pipe openings and joint seals.
 - d. Adjusting rings and plastic cement sealer.
 - e. Stripping and stockpiling topsoil.
 - f. Traffic, dust and erosion control.
 - g. Loading, hauling, and disposal of surplus excavated material.
 - h. Aggregate bedding.
 - i. Backfilling and compaction.

C. Plug Valves

1. Measurement: shall be made per each installed.
2. Payment: shall be made by the unit price per each installed and include:
 - a. Dewatering and excavation.
 - b. All labor, equipment, valves, and restraints.
 - c. Stripping and stockpiling topsoil.
 - d. Traffic, dust and erosion control.
 - e. Loading, hauling, and disposal of surplus excavated material.
 - f. Aggregate bedding.
 - g. Backfilling and compaction.

PARTS 2 – PRODUCTS

2.1 PIPE MATERIAL

A. Ductile Iron Force Main Pipe

1. Conform with AWWA C150 and C151
2. Coatings and linings
 - a. Exterior: asphaltic coating 1 mil thick
 - b. Interior: standard thickness of cement mortar conforming to AWWA C104
3. Mechanical joint pipe
 - a. Class: 52
 - b. Pressure rating
 - 1) 3 through 24 inch: 350 psi
 - 2) 30 through 54 inch: 300 psi
 - c. Joint
 - 1) Conform to AWWA C111
 - 2) Connect joint with a ductile or gray iron follower gland and 304 stainless steel tee-head bolts and hexagon nuts.
4. Flange joint pipe

- a. Class: 53
- b. Pressure rating: 250 psi
- c. Joint
 - 1) Conform with AWWA C115
 - 2) Connect with a bolted ductile iron flange.
 - 3) Gasket: Full face sheet rubber ring, minimum 1/8 inch thick

2.2 MANHOLES

A. Precast Manholes

- 1. Conform to ASTM C478 for precast components.
- 2. Joints: Flexible boot connector conforming to ASTM A666 and ASTM C923.
- 3. Gasket: 1¼ inch thick butyl conforming to AASHTO M198.

B. Manhole Steps

- 1. Shall be a ½ inch diameter Grade 60 steel reinforcement rod conforming to ASTM A615.
- 2. Encapsulated in copolymer polypropylene.
- 3. Steps shall be as manufactured by M.A. Industries, Inc., or engineer approved equal.

C. Castings

- 1. Conform to ASTM A48, Class 35.
- 2. Shall be AASHTO H-20 rated.
- 3. Lid shall be a non-rocking with concealed pick holes and self-seal gasket.
- 4. Use Neenah R-1500 or engineer approved equal.

D. Manhole adjustment rings

- 1. 4" thickness and larger shall be precast concrete rings conforming to ASTM C478.
- 2. Less than 4" thickness shall be made of a composite recycled rubber.
- 3. Composite recycled rubber rings shall be Infra-Riser, or engineer approved equal.

E. Air Release Valve Assembly

- 1. Valve shall be a combination air/vacuum release type conforming with AWWA C512. Inlet and outlet size shall be two (2) inch and air release orifice diameter shall be 3/32 inches. Maximum working pressure shall be 300 psi.

F. Plug Valve

Plug valve shall be plug valves with square nut operators. Valve body shall be epoxy coated cast iron, gate and stem shall be stainless steel with EPDM seat and rated for 200 psig. Plug valves shall be provided with valve box and adaptor. Valves shall have Acrylonitrile-Butadiene (NBR) Seat and nickel coated Ductile-Iron plug, and stem shall be made of stainless steel.

Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1) Conbraco Industries, Inc.; Apollo Valves.
- 2) Crane Co.; Crane Valve Group;
- 3) DeZurik Water Controls.
- 4) Milwaukee Valve Company.

2.3 PIPE BEDDING

- A. Shall be 3/4" crushed aggregate, ASTM D448 Gradation No. 67 (Wisconsin DOT coarse aggregate No.1).
- B. Loss due to sulfate soundness test shall not exceed 10%.
- C. Loss due to abrasion test shall not exceed 40%.

2.4 SELECT BACKFILL

- A. Sand: Well-graded, unwashed bank run or crushed bank run free from clay lumps, organic matter, and other deleterious materials with a gradation as follows:

Sieve Size	% Passing By Weight
3/4"	100
No. 4	90 - 100
No. 10	45 - 90
No. 40	15 - 45
No. 200	0 - 10

PART 3 - EXECUTION

3.1 SEWER FORCEMAIN INSTALLATION

- A. Grade and alignment shall be established with laser equipment and as shown on plans.
- B. Bed pipe on a minimum of 4 inches of crushed aggregate conforming to ASTM D448 Gradation No. 67(Wisconsin DOT coarse aggregate No.1), compacted to 95% Standard Proctor Density. The bedding material shall be brought 12 inches above pipe.
- C. Initially cover remainder of trench with clean earth fill compacted to 95% Standard Proctor Density. Clean earth fill shall be void of the following:
 - 1. Gravel larger than 1-1/2 inches
 - 2. Organic content
 - 3. Silty clays with high plasticity
 - 4. Manmade rubble
 - 5. Fill contaminated with hazardous waste
- D. Pipe Laying
 - 1. Conform with section Trenching, Backfilling, and Compaction of Sanitary Sewer and Watermain.
 - 2. Lay pipe upgrade with spigot pointing in direction of flow.
 - 3. Provide reaction blocking and restraints at all bends and tees.

3.2 MANHOLES

- A. Installation
 - 1. Place manholes on a minimum of 6 inches of crushed aggregate conforming to ASTM D448 Gradation No. 67 (Wisconsin DOT coarse aggregate No.1), compacted to 95% Standard Proctor Density.

2. Establish flowline and rim elevations from grade stake provided.
3. Furnish manholes in 4-foot diameter (standard diameter) when dimensions are not shown.
4. Manholes shall be precast construction, unless shown otherwise.
5. Provide manhole riser sections in a combination of lengths which will minimize the number of joints.
6. Seal manhole joints with 1¼ inch thick butyl tape conforming to AASHTO M198.
7. Wrap barrel section joints and adjustment rings on the exterior of the manhole with a 6" wide butyl rubber seal tape.
8. Set casting frames and adjusting rings with a ½ inch thick butyl tape conforming to AASHTO M198. Pitch castings to match street crowns.
9. Pipe shall enter manholes through a flexible, watertight gasket or connector manufactured in accordance with ASTM C923.
10. The following shall be filled with a non-shrink grout and finished smooth:
 - a. Barrel section and adjustment ring interior joints.
 - b. Lift holes.
 - c. Annular space around pipes: interior bottom half only.

3.3 FIELD QUALITY CONTROL

A. Pressure and leakage test shall be conducted once the following conditions prevail:

1. Backfill to a minimum two feet over the pipe
2. Reaction backing and restraints shall be in place
3. Fill with water
 - a. Fill force main with water slowly, expelling air completely from the pipeline.
 - b. Where permanent air vents are not located at all high points or dead ends, Contractor shall install corporation cocks at such points so that air can be expelled as the line is filled with water.
 - 1) Close all these corporation cocks before applying pressure or leakage tests.
 - 2) At the conclusion of the leakage and pressure test, the corporation cocks shall be removed and plugged, or left in at the discretion of the Owner.
4. Pressurize to normal working pressure.
 - a. After test connections are made and pipeline is filled with water, the pipeline shall be subjected to water pressure normal for that segment of the system being tested.
 - b. Inspect piping connects for leaks after a minimum of 120 minutes.
 - c. Repair any leaks and repeat test. The minimum test pressures specified above may require that the installed system be tested in several segments in order to attain the proper pressure.
 - d. Test period shall be one (1) hour with no visible leaks occurring.
 - e. Pressure during test period shall be maintained within plus or minus five (5) pounds of the required test pressure by adding water with the test pump.
5. Leakage Test
 - a. Leakage test shall be conducted after satisfactory completion of the pressure test.
 - b. At the option of the Contractor, pressure and leakage tests may be run concurrently. This option must have the approval of the Engineer. If this

option is agreed upon, then the test pressures required for pressure tests shall prevail for both pressure and leakage tests.

- c. When leakage test is conducted after satisfactory completion of the pressure test, the test section shall be subjected to 150 pounds per square inch gauge pressure at the highest elevation of the section of the main being tested.
- d. Leakage is defined as the quantity of water to be supplied to the newly laid pipe, or any valved section of it, necessary to maintain the specified leakage test pressure after the main has been filled with water and the air expelled.
- e. Leakage shall not exceed the number of gallons per hour as determined by the following formula: $L = SD\sqrt{P / 133,200}$

When:

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

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

3.4 REPAIRS

- A. Contractor shall repair all visible leaks, defects and pipeline which failed testing.
- B. After repairs are made, retest and re-televiser repaired sections.

END OF SECTION