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STANDARD SPECIFICATIONS
VILLAGE OF YORKVILLE
RACINE COUNTY, WISCONSIN
DATED: NOVEMBER 27, 2023

101. GENERAL

A. Specifications.

1. Utility Construction.

a. The “Standard Specifications for Sewer and Water Construction in Wisconsin”, Sixth Edition, December 22, 2003, with Addendum No. 1 and Addendum No. 2, will govern all utility work performed on this project and hereinafter will be referred to as the “Standard Specifications”.

(1) Delete Part I, General Conditions, from the “Standard Specifications”.

2. Road Construction.

a. The State of Wisconsin, Department of Transportation, “Standard Specifications for Highway and Structure Construction”, Current Edition, and all “Interim Supplemental Specifications”; will govern all road work performed on this project and hereinafter will be referred to as the “State Specifications”.

(1) Delete Part I, General Requirements and Covenants, from the “State Specifications”, except those sections specifically referenced in these contract documents.

(2) All references to the “Department” or “State” (The “Department” of Transportation of the “State” of Wisconsin) shall be interpreted to mean the Owner.

(3) All references to metric unit(s) shall be converted to their nearest whole equivalent Standard unit(s) (U.S. Standard) in accordance with the conversion tables shown in the Appendix of the “State Specifications”. Any necessary adjustments or interpretations shall be made by the Engineer.

3. In the event of a discrepancy between these “Special Provisions” and either the “Standard Specifications” or the “State Specifications”, these “Special Provisions” shall govern.

C. Spill Prevention and Response Procedures.

1. Contractor shall have onsite project specific spill prevention and response procedures and material safety data sheets (MSDS) for all hazardous materials onsite.

D. Alternate Materials.

1. The Contractor may furnish alternate materials in place of those specified in these Special Provisions where “or equal” is stated and when the following provisions have been complied with.

“If the Contractor wishes to substitute an alternate material as an “equal” to the material specified, he shall first submit a detailed description of such to the Engineer and Owner for their review and approval/disapproval. The Contractor shall not install any alternate materials prior to receiving approval for their use. Only those materials listed in these Special Provisions or approved as alternates may be used on this project.”

E. Work Schedule.

1. Construction Working Hours.

- a. The Contractor may only work within the times noted below unless otherwise approved by the Owner. These hours only apply to Contractor’s operations that create noise levels that could negatively affect adjacent properties.

- (1) Weekdays - 7:00 a.m. to 6:00 p.m.

- (2) Saturday - 8:00 a.m. to 5:00 p.m.

- (3) Sunday - No Work Allowed.

F. Sewer and Water Service Disruption (Notification of Property Owners).

1. The Contractor shall notify the Owner at least six (6) days prior to shutting off any sewer or water service to allow the Owner time to notify affected properties at least four (4) business days (excluding weekends and holidays) prior to shutting off the service. Coordinate the work schedule with the Owner in order to minimize inconvenience and disruption caused by the temporary discontinuance of water service. The Owner will contact/notify all property owners whose sewer or water service will be temporarily shut off as a result of Contractor’s operations. The Contractor shall not interfere with functions previously scheduled by individuals, businesses, or institutions.

102. PERMITS AND EASEMENTS

A. Permits and Approvals.

1. DNR Well Permits.

- a. The Contractor shall obtain well permits from the Department of Natural Resources if dewatering wells will be installed or operated for which the single or aggregate capacity will be in excess of 70 gallons per minute. Permits must be obtained before well construction can begin.

2. Construction Pit Dewatering Discharge Permit.

- a. The Contractor shall comply with the provisions of Chapter 283.35, Wisconsin Statutes, regulating the discharge of effluent from construction pit (trench) dewatering. These provisions provide for the removal of suspended solids from dewatering effluent prior to the direct discharge to surface waters or wetlands.

- b. The Contractor shall apply to the Department of Natural Resources for a permit to discharge effluent from construction pit dewatering. This discharge may be covered by an existing General Permit for discharging Contaminated Storm Water Runoff/Or Construction Pit Dewatering. Application forms for this permit(s) may be obtained at:

www.dnr.state.wi.us/org/water/wm/ww/gpindex/gpinfo.htm

4. Street Opening Permit.

- a. The Contractor shall obtain a street opening permit from The Village.

5. Contractor is responsible for obtaining all necessary off-site disposal permits.

- a. A fill permit is required if surplus excavated material is placed within the Village of Yorkville outside of the project limits.

6. Water Supply for Construction Purposes.

- a. When a source of water is required by the Contractor for construction purposes in the Village of Yorkville, the Contractor may obtain water from the municipal water system only upon approval of the Yorkville Water Utility. Any attempt to obtain water

without the Water Utility's approval, is subject to fines and penalties.

- b. The cost for all water used will be charged to the Contractor at the current charge back rate established by the Yorkville Water Utility.

B. Soil Boring Permit/Approval.

1. Contractors (Bidders) shall obtain permission from the Owner prior to performing subsurface investigations. Street opening or highway permits may be required for taking soil borings within streets or highways maintained by Town, County or State highway departments.
2. The Contractor is reminded to contact all utilities, as well as Diggers Hotline, before performing soil boring work.
3. Soil borings shall not be taken within existing pavement or shoulder areas without the Owner's prior permission. All boring holes shall be completely filled after the work has been completed.
4. Borehole/Drillhole Abandonment.
 - a. All boreholes shall be completely filled after the work has been completed. Drillholes (boreholes) shall be abandoned in accordance with DNR regulations. Chapter NR 812, Wisconsin Administrative Code, defines drillholes as "any excavation or opening . . . deeper than it is wide that extends more than 10 feet below the ground surface."
 - b. Section NR 812.26 specifies the procedures to be used in drillhole abandonment. Drillholes shall be filled with acceptable materials as specified in Section NR 812.26(7).
 - c. An abandonment form (Form 3300 - 5b or 5w) shall be submitted to the appropriate DNR District office for each abandoned drillhole within 30 days of completion of the work in accordance with Section NR 812.26(8).

103. NOTIFICATION OF UTILITIES

A. Utility Location and Coordination.

1. The locations of utilities shown on the Plans are from existing records and/or field locations and may not be complete or accurate. The Contractor shall contact Diggers Hotline at (800) 242-8511, as well as other utilities not served by Diggers Hotline but having facilities in the work area, at least three (3) full business days prior to construction to notify the utilities to locate their underground facilities.

2. A preconstruction meeting will be held, if required, to coordinate the work operations of the Contractor and the utility companies and resolve any conflicts that may exist.
- B. Utility Protection.
1. It shall be the responsibility of the Contractor to protect all utilities that are encountered in his work 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 on or near the line of the proposed utility or weakened by excavation for the proposed utility or within road construction grading limits. All costs of protecting existing utilities; such as tunneling, sheathing, bracing or relocation including utility company bracing and relocation charges shall be considered incidental to utility construction.

201. SANITARY SEWER CONSTRUCTION

- A. Bedding and Cover Material.
1. Sanitary sewer bedding and cover material shall conform to the appropriate sections of the “Standard Specifications”, as specified and/or modified below:
 - a. PVC pipe - Section 3.2.6(i), as modified below (Note that the bedding section is essentially Class “B” Bedding including placing a minimum of 12 inches of cover material over the top of the pipe.):
 - (1) Crushed pea gravel will not be allowed for use as bedding material. Cover material shall be the same material as used for bedding and shall conform to Section 8.43.2(a).
 - (2) Delete the following sentence from Paragraphs 3.2.6(b)2 and 3.2.6(i)1:

“If crushed stone chips or other materials conforming to Section 8.43.2(a) are used as cover material, no compaction or staging is required.”
 - (3) Placement and Compaction.
 - (a) Place bedding material to the springline of the pipe and compact prior to placing cover material. Compaction of bedding material at the level of the pipe springline shall include working bedding material under the haunches of the pipe using shovels

or other suitable methods. The Contractor shall take care to completely work bedding material under the haunches of the pipe to provide adequate side support.

- (b) Place and compact cover material in one or more lifts after compacting bedding material. Place a minimum of 12 inches of cover material over the pipe.
- (c) Refer to Subsection 607.B of these Special Provisions for requirements for recompacting Class “B” bedding disturbed by trench boxes.

2. Limestone Bedding Material.

- a. Amend Section 8.43.2(a) of the “Standard Specifications” to read in part:

“Crushed stone chips, bedding material, shall be made from crushing sound limestone only.”

B. Laterals.

1. Connections to the Main Sewer.

- a. Building sewer (lateral) connections to the main sewer 18” in diameter or less shall be made with wyes except as noted below. The ends of laterals shall be plugged in accordance with Paragraph 3.2.5(f) of the “Standard Specifications”.
 - (1) The cost of installing wyes or tees shall be included in the price(s) bid for sanitary sewer lines.
 - (2) All lateral connections to new flexible pipe shall be made with factory fabricated or injection molded in-line wyes unless otherwise approved by the Engineer.
- b. Place wyes at a typical vertical angle of 45° to the horizontal except install wyes flat or level when the Plans state to install laterals as low as possible.
- c. Building sewer (lateral) connections to main sewer 21” diameter and larger shall be made with INSERTA-TEE brand three-piece service connection or approved equal.

2. Grade.

- a. Install sewer laterals at a typical 2.08% (1/4"/ft.) grade unless shown otherwise on the Plans. Minimum lateral grade is 1.04% (1/8"/ft.).
- b. The Contractor shall provide the Village (Owner) with the as-built invert elevation(s) for all laterals at the right-of-way line.

3. Marker Stakes.

- a. The Contractor shall furnish and install a marker stake over the end of each lateral installed. The marker shall be a minimum 2" x 4" x 4' wooden plank or as approved by the Engineer. The marker shall be placed vertically with its top flush with the surface grade. Place a spike or other durable magnetic material in the top of the marker stake to aid in future relocation. The cost of marker stakes shall be included in the unit price(s) bid for laterals.
 - (1) New Subdivisions and Industrial Parks. Place two marker stakes at the end of each lateral installed. Bury one stake vertically with its bottom at the top of the sewer bedding material and place the second stake as indicated above.
 - (2) Place marker stakes over the top of risers where laterals will be constructed in the future. Place the top of stakes 3 feet below the surface grade.

4. Risers.

a. Shallow Sewers.

- (1) Use the following methods for constructing risers up to 6 feet in height and/or for mains not exceeding 16 feet in depth measured from the flowline of the sewer.
 - (a) Flexible Riser to Flexible Sewer Main 8" Through 18" Diameter (Shallow Sewers).
 - 1) Risers on shallow flexible gravity sewer mains shall be constructed of flexible gravity sewer pipe in accordance with File No. 10E of the "Standard Specifications".
 - 2) Riser connections shall be made with factory fabricated or injection molded in-line tees. Do not use saddles for riser connections.

(b) Flexible Riser to Flexible Sewer Main 21" Diameter and Larger (Shallow Sewers).

1) Risers on shallow flexible gravity sewer shall be connected to the main with INSERTA-TEE brand three-piece service connection or approved equal. The service connection shall include a PVC hub conforming to the requirements of ASTM D3034-SDR 26, rubber sleeve conforming to ASTM C477, and stainless steel band.

b. Deep Sewers.

(1) Use the following methods for constructing risers greater than 6 feet in height and/or for mains exceeding 16 feet in depth measured from the flowline of the sewer.

(a) Flexible Riser to Flexible Sewer Main (Deep Sewers).

1) Risers on deep flexible gravity sewer mains shall be constructed of flexible gravity sewer, ASTM 3034-SDR 26, encased within a corrugated polyethylene drainage tubing conforming to ASTM F405 in accordance with the details in the Appendix.

a) On sewer sizes 8" through 18", riser connections shall be made with factory fabricated or injection molded in-line tees. The use of saddles is not allowed.

b) On sewer 21" in diameter and larger riser connections shall be made with INSERTA-TEE brand service connection. The service connection shall include a PVC hub conforming to the requirements of ASTM D3034-SDR 26, rubber sleeve conforming to ASTM C477 and stainless steel band.

(b) Flexible Pressure Pipe Riser to Rigid Tee Installed on Flexible Main (Deep Sewers).

1) Risers on deep flexible gravity sewer mains shall be constructed of flexible pressure pipe

connected to a rigid tee in accordance with the details in the Appendix.

(c) Flexible Riser to Flexible Main (Deep Sewers).

1) Risers on deep flexible gravity sewer mains (diameters of 15", 18", 21" and 27") shall be constructed of flexible gravity sewer pipe encased within a corrugated polyethylene drainage tubing conforming to ASTM F405 in accordance with the details in the Appendix.

a) Also, use this riser method only for 15", 18", 21" and 27" sewer mains. Use Method (b) above whenever ductile iron tees are available.

2) Riser connections shall be made with injection molded in-line tees (if available) or with factory fabricated PVC tees where injection molded tees are not available.

5. Cleanouts.

a. All laterals exceeding 100 feet in length shall have cleanouts installed on them. Cleanouts shall be placed at 100 foot maximum spacings as shown on the Plans.

C. Connections to Existing Sewers and Manholes.

1. Sewer Stub Connections.

a. Sewer connections to existing sewer stubs of different type of material or joint shall be made with approved watertight adaptors.

2. Manhole Connections.

a. Sewer connections to existing manholes shall be made in accordance with Section 3.5.7 of the "Standard Specifications". Field tapped holes for connecting sewer pipe to manholes shall be made by coring the manhole except that connections to brick or block manholes may be made by punching out the opening. Flexible pipe connections shall be made with flexible watertight connectors, Kor-N-Seal as manufactured by Trelleborg Pipe Seals Milford, Inc. or Link-Seal as manufactured by PSI, Inc. All clamps, bolts, etc. of pipe to manhole seals shall be stainless steel. If Link-Seal connectors are used, the bolt heads shall be placed on the inside of manholes.

not be allowed for initial testing regardless of the time elapsed after backfilling.

- (2) All sections failing to pass the test shall be repaired and retested, however, if at least 30 days have elapsed since the pipe was placed and backfilled, the Contractor will be allowed to retest the sewer line using a 92.5% mandrel.

2. Mandrels.

- a. Go-no go mandrels shall conform to the requirements of File Nos. 30 and 30A thru 30E of the “Standard Specifications”.

G. Leakage Testing.

1. Low Pressure Air Test.

- a. Amend Paragraph 3.7.1 of the “Standard Specifications” to read in part: “Sanitary sewers less than or equal to 36 inches in diameter shall be tested for leakage using the low pressure air test. The length of laterals included in the test section shall be included in determining the test time.”

2. Water Infiltration or Exfiltration Tests.

- a. Sanitary sewers greater than 36 inches in diameter shall be tested for leakage using either the water infiltration or the water exfiltration test depending upon the groundwater level in accordance with Chapter 3.7.0 of the “Standard Specifications”.

H. Sewer Stub Inspection.

1. All sewer stubs shall be visually inspected by lamping. Long sewer stubs shall be lamped from both ends of the pipe as required.
2. The pipe shall be inspected for leakage, excessive deflection, offset joints, or any other unacceptable condition. The Contractor shall furnish an adequate light and provide safe access to both ends of the pipe. All leaking joints and other defects shall be corrected. All costs associated with correcting any unacceptable conditions shall be paid for by the Contractor.
3. Existing Stubs.
 - a. The Contractor shall inspect existing stubs as specified in Paragraphs 1 and 2 above.
 - b. In addition to the visual inspection, the Contractor may test the existing stub(s) for leakage and deflection to insure that defects in the existing stub do not adversely affect the testing of the new

adjoining sewer. Note that existing stubs will be tested with the new sewer when the new sewer line is tested.

- c. All testing costs will be paid for by the Contractor. Repair costs for existing sewer stubs will be paid for on a time and material basis.

I. Televising Sewers.

1. The Contractor is responsible for cleaning and televising all public sanitary sewers, at no cost to the Owner.
2. The debris removed from the sewers will be left on the project site and will be the responsibility of the Contractor to dispose of.
3. All defects (i.e., bad joints, cracked pipe, infiltration, standing water, etc.) shall be corrected and any dirt, gravel, or foreign material removed from the sewer prior to acceptance by the Owner.
4. All lines that were either repaired or cleaned prior to acceptance by the Owner must be re-televised.

J. Tracer Wire.

1. See Section 635 of these Special Provisions for tracer wire requirements.

205. SANITARY SEWER MATERIALS

A. Sanitary sewer pipe material shall be polyvinyl chloride (PVC), “Fiberglass” Reinforced Polymer Mortar (FRPM), ductile iron, or prestressed concrete pressure pipe conforming to the following:

1. Polyvinyl chloride (PVC) sewer pipe (4 inch through 15 inch diameter) meeting the requirements of ASTM D3034, SDR 35, with a minimum pipe stiffness of 46 psi and having integral bell type flexible elastomeric joints meeting the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. PVC material shall have a cell classification of 12454B, 12454C, 12364C or 13364B, except that 12364C and 13364B shall have a minimum modulus of elasticity of 500,000 psi. (Option: SDR 26 with a minimum pipe stiffness of 115 psi.)

a. Risers.

- (1) Riser pipe material shall conform to the requirements of Subsection 201.B.5 of these Special Provisions.
2. Polyvinyl chloride (PVC) large diameter solid wall sewer pipe (18 inch through 42 inch diameter) meeting the requirements of ASTM F679, wall thickness T-1 (SDR 35), with a minimum pipe stiffness of 46 psi and having

integral bell type flexible elastomeric joints meeting the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. PVC material shall have a minimum cell classification of 12454C or 12364C and a minimum modulus of elasticity of 500,000 psi.

a. Lateral pipe material shall conform to the requirements of paragraph 1 above.

3. Ductile iron meeting the requirements of AWWA Standard C151 (ANSI 21.51), cement mortar lined with internal and external bituminous coating and furnished with either push-on or mechanical rubber gasket joints. Do not furnish cable bonding or other methods of providing electrical conductivity.

a. Ductile iron pipe shall be wrapped with polyethylene wrap meeting the requirements of AWWA Standard C105 (ANSI A21.5) using Class C (black) polyethylene material and shall be installed as specified in Chapter 4.4.4 of the “Standard Specifications”.

B. Well Protection.

1. Sanitary sewer pipe material located within 25 to 50 feet of private wells or within 50 to 200 feet of public wells, as shown on the Plans, shall be pressure pipe as specified below. The pressure pipe shall be PVC pipe unless ductile iron pipe is specified on the Plans or by the Engineer.

a. Polyvinyl chloride (PVC) pressure pipe conforming to AWWA C900, Class 150, DR-18, or AWWA C905, P.R. 235, SDR-18, with integral elastomeric bell and spigot joints.

b. Ductile iron pipe, Class 52, meeting the requirements of AWWA C151 (ANSI 21.51), cement mortar lined with internal and external bituminous coating and furnished with push-on joints with rubber gaskets.

(1) Ductile iron pipe and/or fittings shall be wrapped with polyethylene wrap meeting the requirements of AWWA Standard C105 (ANSI A21.5) using Class C (black) polyethylene material and shall be installed as specified in Chapter 4.4.4 of the “Standard Specifications”. Fold and tape loose wrap material to minimize air entrapment which could cause the material to be punctured when backfilling.

c. Main line wye and tee connections shall be pressure pipe, but laterals and risers may be constructed of gravity sewer pipe materials.

d. Laterals.

- (1) Sanitary sewer lateral pipe material within 8 to 25 feet of private wells shall be plastic sewer pipe conforming to the requirements for PVC sewer pipe of this Section of the Special Provisions.

2. Installation.

a. Private Wells.

- (1) The pressure pipe shall be installed within the limits shown on the Plans where sewers pass within 25 to 50 feet of private wells.

b. Public Wells.

- (1) The pressure pipe shall be installed from manhole to manhole (entire manhole section) on manhole sections passing within 50 to 200 feet of public wells.
- (2) The pressure pipe shall be tested for leakage using a combination leak/pressure test in accordance with Chapter 4.15.0 of the "Standard Specifications". The minimum test pressure shall be 50 psi.

205.1.SANITARY SEWER MATERIAL FOR DIRECTIONAL DRILLING

A. Polyvinyl chloride (PVC) sanitary sewer meeting the requirements of AWWA C900 (4 inch through 12 inch diameter) or AWWA C905 (16 inch diameter) with restraining jointing systems and with built-in sealing gaskets. PVC material shall have a cell classification of 12454-B as defined in ASTM D1784.

1. Pipe shall be CERTA-LOCK C900/RJ or C905/RJ by Certain Teed, Terra Brute by IPEX, or approved equal.

B. Polyvinyl chloride (PVC) pipe meeting the requirements of AWWA C900 (4 inch through 12 inch diameter) or AWWA C905 (14 inch through 48 inch diameter) with thermal butt fused joints between pipe sections. Joint gaskets shall not be required. PVC material shall have a cell classification of 12454-B as defined in ASTM D1784.

1. Pipe shall be Fusible C900, Fusible C905, or Fusible PVC by Underground Solution, Inc., or approved equal.
2. Pipe used for sanitary sewer shall be colored green.

3. Pipe shall conform to the physical characteristics expressed in the following table. Contractor may, upon prior approval of the Engineer, select a lesser DR rating (stronger pipe) appropriate to the job site conditions, the capability of his “pull-in” equipment, and his methods of operation.
- C. High density polyethylene (HDPE) sanitary sewer (4 inch through 54 inch diameter) shall meet the requirements of AWWA C906. Pipe material shall have a cell classification of PE 3408 (345434C) as specified in ASTM D3350.
2. Fusable Pipe Joints.
 - a. Fusable pipe and fittings shall be joined by the butt fusion joining method. The butt joining shall be performed by an experienced and qualified operator using materials and techniques recommended by the pipe manufacturer.
 - b. Lateral connections shall be made with saddles of the appropriate sizes. Adaptors for connection to existing lateral material shall be provided.
 3. Upon completion of pull-ins, Contractor shall wait 24 hours for polyethylene pipe or 4 hours for PVC pipe to allow the pipe to stabilize prior to making connection thereto or backfilling the boring and/or receiving pit.
 4. Pipe fittings shall be manufactured of the same material as specified for pipe.
- E. Tests.
1. Pipe material delivered for use on this project shall conform to the requirements of the appropriate AWWA and ASTM Specifications noted herein. All pipe shall be marked in accordance with the requirements of the cited Specifications and each load delivered to the job site shall be accompanied by the manufacturer’s certification of such compliance. Said certification to be delivered to the Engineer or his representative.

210. SANITARY MANHOLES

- A. Standard Manhole - Type I.
1. Sanitary manholes shall be constructed in accordance with Chapter 3.5.0 and File Nos. 12, 12A, 13, and 15 of the “Standard Specifications” and these Special Provisions.
 - a. Poured Manhole Base.
 - (1) All manhole bases (benches) shall be poured in place in accordance with Subsection 3.5.5(b) of the “Standard

Specifications”. Precast manhole bases or precast integral base units will be allowed in accordance with Subsection 3.5.5(c), however, no precast base units with preformed benches are allowed. All manhole benches shall be poured in place.

2. Manholes shall be precast 48 inch inside diameter with eccentric cones.
 - a. Adjusting Rings.
 - (1) A minimum of 4 inches to a maximum of 19 inches of adjusting rings shall be furnished for each manhole, unless shown otherwise on the Plans. (Note: Type II Manholes - 3 inches minimum of rings is acceptable.)
 - (2) Furnish manholes to minimize the chimney height required, so that chimney seal extensions will not be required. Note that a standard 9 inch seal covers a 6-1/2 inch chimney height.
 - (3) Material - Adjusting rings shall be HDPE.
 - (a) HDPE Adjusting Rings.
 - 1) Adjusting rings shall be injection molded High Density Polyethylene (HDPE) adjustment rings as manufactured by Ladtech, Inc., Lino Lakes, Minnesota, or equal. Install HDPE adjusting rings per the manufacturer recommendations.
 - b. Manhole depths shown on the Plans are approximate only, unless the cover elevation is indicated. Manhole covers shall be placed to match the existing grade unless the finished elevation is shown on the Plans.
 - (1) Place manhole covers 1/4 inch below the pavement grade in streets.
 - c. Plastic manhole steps shall be provided in accordance with Paragraph 3.5.4.4(g) of the “Standard Specifications”.
3. Manhole Frames and Covers.
 - a. Manhole frames and covers shall be Neenah R-1580 with Type “B” self-sealing lids, non-rocking.

- b. Manhole frames, where shown on the Plans as “Bolted Lid”, when required, shall be furnished with Neenah R-1916-F watertight frame with standard Type “T” gasket sealed lid.

B. Frame/Chimney Joints.

1. Type I.

- a. All waterproof manholes shall be constructed with Type I frame/chimney joints. Type I joints shall consist of the following:

- (1) The manhole frame shall be set on a bed of non-shrink grout, 3/4 inch minimum thickness, extending the full width of and continuously around the top of the chimney. The inner and outer faces of the mortar joint shall be trowel finished.
- (2) Adjusting rings shall be set with butyl rubber sealant troweled into a 1/4 inch thick layer over the entire surface area of the top of cone and all adjusting rings, except as specified in Paragraph (1) above. The butyl rubber sealant shall be EZ-Stik or Kent-Seal butyl base sealant in trowelable grade or equal.
- (3) Internal/External Chimney Seal.

Type I joints shall be provided with an internal/external manhole chimney seal as manufactured by Adaptor, Inc, West Allis, Wisconsin or equal. The internal/external manhole seal shall be installed in accordance with the detailed manufacturer’s instructions.

- (a) Furnish and install manhole seals to span (cover) the entire chimney height. Provide extensions as required.
- (b) The seal shall be water tested for leaks after the bottom compression band is installed. After the seal has successfully passed the leakage test, drain the water and install the top band.

Type II - Non-Flexible Watertight Frame/Chimney Joints.

- a. All sanitary manholes located within road shoulders and terraces and at other areas not specified for Type I joints shall be constructed with Type II frame/chimney joints. Type II joints shall consist of the following:

- (1) Adjusting rings and manhole frames shall be set with butyl rubber sealant troweled into a 1/4 inch thick layer over the entire surface areas of the top of cone and all adjusting rings.

The butyl rubber sealant shall be EZ-Stik or Kent-Seal butyl base sealant in trowelable grade.

(2) Internal/External Chimney Seal.

Type I joints shall be provided with an internal/external manhole chimney seal as manufactured by Adaptor, Inc, West Allis, Wisconsin or equal. The internal/external manhole seal shall be installed in accordance with the detailed manufacturer's instructions.

- (a) Furnish and install manhole seals to span (cover) the entire chimney height. Provide extensions as required.
- (b) The seal shall be water tested for leaks after the bottom compression band is installed. After the seal has successfully passed the leakage test, drain the water and install the top band.

2. Cone/Ring Dimensions.

a. Manhole Cone Sections.

- (1) The top dimensions of cone sections shall be 26 inches inside diameter by 38 inches outside diameter.
- (2) The outside diameter of the top of the cone section shall be as large as or larger than the base flange of the manhole casting.

b. Adjusting Rings.

- (1) Adjusting ring dimensions shall match the dimensions of the top of the cone section; 26" x 38".
- (2) Adjusting rings shall have flat or even bearing surfaces providing bearing contact over the entire contact surfaces.
- (3) HDPE adjusting rings shall be as specified in Subsection 210.A.2.a(3) of these Special Provisions, except the dimensions shall be as specified above.

c. Center adjusting rings on manhole cones and center manhole castings on adjusting rings so that their surfaces will be flush whenever possible.

3. Sealing Manhole Chimneys.

- a. The entire outside surface of the manhole chimney, including all adjusting rings and overlapping both the manhole cone or flat-top slab (a minimum of 4 inches) and the manhole frame, shall be covered with a minimum 1/4 inch thick coating of butyl rubber sealant. The butyl rubber sealant shall be EZ-Stik or Kent-Seal butyl base sealant in trowelable grade.
 - (1) Do not cover the outside surface of manhole chimneys with butyl rubber sealant on Type I manholes with internal/external manhole chimney seals.

C. Manhole Riser Joints.

1. Joints for precast manhole riser sections shall be made with rubber “O”-ring gaskets, a continuous ring of butyl rubber sealant (EZ-Stik or Kent-Seal in rope form). The butyl sealant shall be 1 inch diameter equivalent or as recommended by the manhole manufacturer.
2. Joints for precast manhole barrel sections including the joint with the bottom of the cone shall be wrapped with an external joint seal as manufactured by Mar Mac Construction Products Company; Cretex Specialty Products; or CCI Pipeline Systems, LLC. The external manhole joint seal shall be installed in accordance with the manufacturer’s instructions.
 - a. If external joint seals require steel strapping, it shall be a minimum 5/8” - 316 stainless steel with stainless steel “strap lock” fasteners.
 - b. The cost of furnishing and installing manhole joint seals shall be included in the unit price(s) bid for sanitary manholes.

D. Manhole Lifting Holes.

1. All lifting holes in precast manhole sections shall be plugged using rubber plugs supplied by the manhole supplier. Non-shrink grout shall fill the entire void, after the plug has been installed from the outside, and shall be troweled at each face to provide smooth surfaces. Cement mortar shall not be used to plug lifting holes.

E. Manhole Pipe Connections.

1. Connections of pipes to manholes shall be made in accordance with Section 3.5.7 of the “Standard Specifications”. All field tapped holes for connecting sewer pipe to manholes shall be made by coring.
2. All plastic pipe shall be connected to manholes by means of flexible watertight pipe to manhole seals in accordance with Subsection 3.5.7(c).

Manhole seals shall be Kor-N-Seal or Link Seal. All clamps, bolts, etc. of pipe to manhole seals shall be stainless steel. If Link Seal connectors are used, the bolt heads shall be placed on the inside of manholes.

F. Drop Manholes

1. All drop manholes, unless shown otherwise on the Plans, shall be constructed as “outside” drop manholes in accordance with Section 3.5.8(d) and File No. 19 or 20 of the “Standard Specifications” and the requirements of these Special Provisions.
 - a. Heights of manhole drops shown on the Plans are figured from the invert of the outgoing sewer to the invert of the incoming sewer.

G. Waterproof Manholes.

1. Waterproof manholes shall be constructed the same as standard manholes except that they shall be furnished with waterproof frames and lids and Type I frame/chimney joints.
 - a. Waterproof frames and lids shall be Neenah R-1755-C with Type “B” lid (and security saddle plate) or equal.
 - b. The Contractor shall also furnish 1 heavy-duty padlock for each waterproof manhole and 3 matching keys fitting all padlocks. Padlocks shall be “Master” 1-1/2 inch steel padlocks, No. 3-D, with pin tumbler, or equal.

H. Sewer Stubs/Bulkheads.

1. Sewer stubs, where the length is not shown on the Plans, shall be 2 foot maximum length and shall be plugged in accordance with Section 3.2.25(a) of the “Standard Specifications”. The cost of sewer stubs shall be included in the unit price(s) bid for sanitary sewer manholes.
2. Bulkheads for future sewer connections to manholes, where called for on the Plans, shall be made in accordance with File No. 13A of the “Standard Specifications”. Connections for future sewer connections 27 inches in diameter and larger shall be bulkheaded with an 8 inch wall using concrete brick. The cost of bulkheads shall be included in the unit price(s) bid for sanitary sewer manholes.

I. Manhole Marker Posts.

1. The Contractor shall furnish and place posts to mark manholes located in easement areas. Marker posts shall be Rhino FiberCurve™ Marking Post, Green (Sewer) Item number 70454 (<https://www.usabluebook.com/>).

2. The cost of providing marker posts shall be included in the unit price(s) bid for manholes.

J. Manhole Vacuum Testing.

1. Delete Section 3.7.6 of the “Standard Specifications” in its entirety and replace it with the following.
2. The Contractor shall vacuum test all sanitary sewer manholes for leakage, regardless of the sewer diameter, in accordance with the following:
 - a. The chimney and casting shall be in place prior to vacuum testing manholes.
 - b. All testing shall be done in the presence of the project Engineer or his representative.
3. Isolate the manhole to be tested by plugging the inlet and outlet pipes with inflatable stoppers or other suitable test plugs. The plugs shall be securely braced to prevent the plugs from being drawn into the manhole.
4. The test head shall be placed at the top of the manhole in accordance with the manufacturer’s recommendations.
 - a. Prior to starting the vacuum pump, determine the hydrostatic head on the lowest pipe connection to the manhole being tested.
 - b. If the hydrostatic head on the lowest pipe connection to the manhole is 12 feet or less, a vacuum pressure equal to 10 inches Hg (mercury) shall be applied to the manhole utilizing the vacuum pump.
 - c. In the event the hydrostatic head is between 12 feet and 21 feet above the lowest connection to the manhole, the test vacuum pressure shall be reduced one inch Hg for each foot of hydrostatic head in accordance with the following Table I. If the hydrostatic head is greater than 22 feet, no vacuum test shall be performed.

TABLE I ADJUSTMENTS TO VACUUM PRESSURE BASED ON HYDROSTATIC HEAD											
Hydrostatic Head (ft)*	12	13	14	15	16	17	18	19	20	21	22
Vacuum Pressure (in Hg)	10	9	8	7	6	5	4	3	2	1	**
*Hydrostatic head above critical connector.											
**At 22 feet below the groundwater table, the connector is naturally subjected to 9.5 psi.											

- d. When the pressure gage indicates the required testing pressure determined in Table I, close the control valve, shut off the vacuum

pump, and begin counting the seconds for the indicated pressure to drop one inch Hg. If the elapsed time is longer than the minimum time indicated in the following Table II, the manhole passes the test.

TABLE II							
MINIMUM TEST TIMES IN SECONDS							
Depth Feet	Manhole Diameter in Inches						
	48	60	72	84	96	108	120
Time in Seconds							
4	10	13	16	19	23	26	29
6	15	20	25	29	34	38	43
8	20	26	33	38	45	51	57
10	25	33	41	48	56	63	71
12	30	39	49	57	67	76	85
14	35	46	57	67	78	89	100
16	40	52	65	76	89	101	114
18	45	59	73	86	100	114	128
20	50	65	81	95	111	126	142
22	55	72	89	105	122	139	156
24	59	78	97	114	133	152	170
26	64	85	105	124	144	164	185
28	69	91	113	133	155	177	199
30	74	98	121	143	166	189	213
32	79	104	129	152	177	202	227
34	84	111	137	162	188	214	241
36	89	117	145	171	199	227	255
38	94	123	153	181	210	239	270
40	99	129	161	190	221	252	284
42	104	136	169	200	232	264	298
44	109	142	177	209	243	277	312
46	114	149	185	219	254	289	326
48	118	155	193	228	265	302	340
50	123	162	201	238	276	314	355

e. If the test fails, repair or seal the manhole using non-shrink grout or other approved materials. Retest until an acceptable test is obtained.

f. Tests may be conducted before or after backfilling.

5. Payment.

a. The cost of vacuum testing shall be included in the unit price(s) bid for sanitary manholes.

K. Manhole Infiltration Inspection.

1. The Contractor, accompanied by the Engineer or his Representative, shall reinspect all manholes approximately 6 months after completing work on this project to check for manhole infiltration and to observe the general condition of the manhole. All active or flowing leaks and any other necessary repairs shall be corrected prior to final acceptance of the work.

301. FORCE MAIN CONSTRUCTION

A. General Requirements.

1. Delete Section 3.2.6.(n)l of the “Standard Specifications” and replace with:

“Force mains shall be installed in accordance with Chapter 4.1.0, 4.2.0, 4.3.0 (delete Section 4.3.12), 4.4.0 (D.I.), 4.5.0 (PCPP), 4.6.0 (PVC), 4.7.0, 4.9.0 and 4.10.0 of the ‘Standard Specifications’ and as specified herein.”

B. Bedding Material.

1. Wrapped Ductile Iron Pipe.
 - a. Force main bedding and cover material used with wrapped ductile iron pipe shall be bedding sand conforming to Paragraph 8.43.2(c) of the “Standard Specifications”.
2. Polyvinyl Chloride (PVC) Pipe.
 - a. Bedding and cover material shall be crushed stone chips conforming to Paragraph 8.43.2(a) of the “Standard Specifications”. Crushed pea gravel will not be allowed for use as bedding or cover material.
3. Trench Section.
 - a. The trench section shall conform with Section 4.3.3 and File No. 36 of the “Standard Specifications”, as amended below:
 - (1) Bedding and cover material shall be placed in a minimum of three separate lifts to ensure adequate compaction of these materials, with one lift of bedding material ending at or near the springline of the pipe. The Contractor shall take care to completely work bedding material under the haunch of the pipe to provide adequate side support.
 - (2) Place a minimum of 12 inches of cover material over the top of the pipe.

C. Polyethylene Wrap.

1. Polyethylene wrap shall be provided on all ductile iron force main and fittings and on all ductile iron fittings used with polyvinyl chloride pipe.
2. Polyethylene wrap shall meet the requirements of AWWA Standard C-105 (ANSI A21.5) using Class C (black) polyethylene material and shall be installed as specified in Section 4.4.4 of the “Standard Specifications”.
 - a. Fold and tape loose wrap material to minimize air entrapment which could cause the material to be punctured when backfilling.

D. Water Main Crossings.

1. Center one full length of force main on water mains wherever the force main crosses over or under a water main so that both force main joints will be as far from the water main as possible.

E. High Points in Force Main.

1. The Contractor shall install force main at the grades shown on the Plans with no high points constructed in the main except as indicated on the Plans. If a high point which could trap air can not be prevented, then an air release assembly shall be constructed at that point, if so ordered by the Engineer.
2. The cost of furnishing and installing an air release assembly(s) will be paid for by the Owner if it is required through no fault of the Contractor, otherwise this work shall be at the Contractor’s expense.

F. Joint Restraint.

1. Restraining Horizontal Fittings.
 - a. Concrete Blocking (Buttresses).
 - (1) All horizontal bends, tees, caps and plugs shall be buttressed to provide thrust blocking in accordance with Section 4.3.13 and File Nos. 44, 45 and 46 of the “Standard Specifications”.
2. Restraining Vertical Bends and Offsets.
 - a. Changes in the grade of the force main made by vertical bends or offsets shall be restrained by strapping in accordance with File Nos. 47 and 47A of the “Standard Specifications” or as provided for below.

- b. Optional Joint Restraint Systems.
 - (1) MEGALUG Restrained Joints.
 - (a) Restrain joints using MEGALUG restrained joints as manufactured by EBAA Iron Sales, Inc. of Eastland, Texas. Use Series 1100 for mechanical joint ductile iron pipe and Series 1100 HD for push-on joint ductile iron pipe.
 - (2) Retainer Glands.
 - (a) Restrain joints using retainer glands. Retainer gland set screws shall be tightened to 75 foot-pounds torque or as recommended by the manufacturer using a torque wrench. Retainer glands may be used only on 12 inch diameter pipe or smaller.
 - (3) PVC Restrainer Fittings.
 - (a) PVC restrainer fittings, as manufactured by “Uni-Flange Corporation”, EBAA Iron Sales, Inc., Sigma “One Lok”, or Star, may be used to restrain mechanical joint cast iron fittings used with PVC pipe. Restrainer fittings shall be tightened to 70 foot-pounds torque or as recommended by the manufacturer using a torque wrench. Restrainer fittings may only be used on 12 inch diameter pipe or smaller.
 - (4) Joint Restraint Systems.
 - (a) Joint restraint may be provided by the following joint restraint systems.
 - 1) Tyler Mechanical Joint Restraint.
 - a) Joint restraint for mechanical joint pipe and fittings used with either ductile iron or PVC pipe may be provided using the Tyler Mechanical Joint Restraint (MJR) System on 4 inch through 12 inch diameter pipes.
 - 2) Restrained Joint Pipe.
 - a) Joint restraint for push-on joint pipe may be provided by using U.S. Pipe TR FLEX restrained joint pipe, Clow

Super-Lock Joint pipe, Griffin Snap-Lok restrained joint pipe, American Flex-Ring, or Lok-Ring restrained joint pipe.

3. Restrained Joint Pipe Sections.

a. All force main pipe and fittings, within sections shown on the Plans as “Joint Restraint” or “Restrained”, shall be restrained using both joint restraint systems and buttresses as specified in Subsections F.1 (buttresses) and F.2.b (joint restraint) above.

(1) Both joint restraint and buttresses are being provided as a safety factor in locations where the soil supporting the buttress could be removed or weakened by present or future utility excavations.

b. Restrained Joints in Casings.

(1) The joints of restrained joint pipe installed in casings shall be fully extended to take up the joint slack prior to making the end connections.

G. Insulation.

1. Force mains shall be insulated where noted on the Plans and wherever the depth of cover is less than five (5) feet. Insulation shall be in accordance with Chapter 4.17.0 of the “Standard Specifications” and the details in the Appendix.

305. FORCE MAIN MATERIALS

A. Force main pipe material shall be ductile iron (DI), polyvinyl chloride (PVC) or high density polyethylene (HDPE) pipe conforming to the following:

1. Ductile iron pipe meeting the requirements of AWWA Standard C-151 (ANSI A21.51), cement mortar lined with internal and external bituminous coating and furnished with either push-on or mechanical joints with rubber gaskets. Do not furnish cable bonding or other methods of providing electrical conductivity.

Ductile iron pipe shall be furnished for the following minimum thickness classes:

a. Four (4), 6, 8 and 10 inch pipe shall be Class 53.

b. Twelve (12) inch pipe shall be Class 52.

- c. Fourteen (14) and 16 inch pipe shall be Class 51.
 - 2. Polyvinyl chloride (PVC) pipe (4 inch through 12 inch diameter) meeting the requirements of AWWA Standard C-900, Class 150, DR-18, with cast iron O.D. and integral elastomeric bell and spigot joints.
 - 3. Polyvinyl chloride (PVC) sewer pipe (4 inch through 12 inch diameter) meeting the requirements of AWWA C900, DR-18 with restraining grooves and separate PVC couplings with built-in sealing gaskets and matching restraining grooves. Non-metallic restraining splines, when inserted into the matching restraining grooves, shall produce a 360° locking ring. PVC material shall have a cell classification of 12454-B as defined in ASTM D1784.
 - 4. Polyvinyl chloride (PVC) sewer pipe (4 inch through 16 inch diameter) meeting the requirements of ASTM D2241, SDR-//___// with restraining grooves and separate PVC couplings with built-in sealing gaskets and matching restraining grooves. Non-metallic restraining splines, when inserted into the matching restraining grooves, shall produce a 360° locking ring. PVC material shall have a cell classification of 12454-B as defined in ASTM D1784.
 - 5. High density polyethylene (HDPE) sewer pipe (4 inch through 54 inch diameter) meeting dimensional and workmanship requirements of AWWA C906.
 - a. Polyethylene pipe fittings shall be manufactured of the same material as specified for polyethylene pipe.
 - b. Polyethylene Pipe Joints.
 - (1) Polyethylene pipe and fittings shall be joined by the butt fusion joining method. The butt joining shall be performed by an experienced and qualified operator using materials and techniques recommended by the pipe manufacturer.
 - (2) Joints shall be butt fused above ground with the joined pipe section then lowered into the trench.
 - (3) Connect polyethylene pipe to ductile iron pipe and PVC pipe using flange adapters, butt fused to the polyethylene pipe, and mechanical adaptor and restraints on the non-polyethylene end. The joining of polyethylene pipe to non-polyethylene pipe shall be done as recommended by the manufacturer.
- B. Force main fittings shall be ductile iron or cast iron, cement mortar lined with internal and external bituminous coating and meeting the requirements of AWWA

Standard C-110 (ANSI 21.10). Fittings shall be supplied with mechanical joints with rubber gaskets.

1. Ductile iron fittings meeting the requirements of AWWA Standard C-153 for “compact fittings” may be used. Compact fittings shall be U.S. Pipe “Trim Tye” ductile iron mechanical joint fittings or equal.
2. All fittings shall be North American, Sigma or Star made only.
3. Nuts, bolts, and other fastening components shall be 304 stainless steel (or approved equal), and shall be corrosion-resistant and conform to AWWA C-111 specifications.

305.1.FORCE MAIN MATERIAL FOR DIRECTIONAL DRILLING

A. Polyvinyl chloride (PVC) force main meeting the requirements of AWWA C900 (4 inch through 12 inch diameter) or AWWA C905 (16 inch diameter) with restraining jointing systems and with built-in sealing gaskets. PVC material shall have a cell classification of 12454-B as defined in ASTM D1784.

1. Pipe shall be CERTA-LOCK C900/RJ or C905/RJ by Certain Teed, or Terra Brute by IPEX.
2. Pipe shall conform to the physical characteristics expressed in the following table. Contractor may, upon prior approval of the Engineer, select a lesser DR rating (stronger pipe) appropriate to the job site conditions, the capability of his “pull-in” equipment and his methods of operation.

AWWA C900(Jointed) and AWWA C905(Jointed)								
Size	DR	Pipe Wall Thickness	Pipe O.D.	Joint or Coupling O.D.	Tightest Permissible Bend		Maximum Pull-In Force Tightest Bending	Maximum Pull-In Force Straight Pull (No Bending)
					Radius	% Per 10 Ft.		
"	—	"	"	"	'	%	lbs.	lbs.

3. The maximum job site pull-in force shall not exceed the values given in the above table.

B. Polyvinyl chloride (PVC) pipe meeting the requirements of AWWA C900 (4 inch through 12 inch diameter) or AWWA C905 (14 inch through 30 inch diameter) with thermal butt fused joints between pipe sections. Joint gaskets shall not be required. PVC material shall have a cell classification of 12454-B as defined in ASTM D1784.

1. Pipe shall be Fusible C900, Fusible C905, or Fusible PVC by Underground Solution, Inc.
2. For the purpose of this bid item only, the requirements of AWWA C900 and AWWA C905 that pipe be colored blue is hereby waived. All PVC pipe used for force main shall be colored green.
3. Pipe shall conform to the physical characteristics expressed in the following table. Contractor may, upon prior approval of the Engineer, select a lesser DR rating (stronger pipe) appropriate to the job site conditions, the capability of his “pull-in” equipment, and his methods of operation.

AWWA C900, C905 PVC Pipe D.I.P. O.D. (Fusible)						
Size	DR	O.D.	Wall	I.D.	Min. Bend Radius	Max. Pulling Force (Lbs)
"	—	"	"	"	'	=====

4. The maximum job site pull-in force shall not exceed the values given in the above tables.

C. High density polyethylene (HDPE) force main (4 inch through 54 inch diameter) shall meet the requirements of AWWA C906. Pipe material shall have a cell classification of PE 3408 (345434C) as specified in ASTM D3350.

1. Pipe material specified for this project shall conform to the physical characteristics expressed in the following table. Contractor may, upon prior approval of the Engineer, select a lesser DR rating (stronger pipes) appropriate to the job site conditions, the capability of his pull-in equipment and his methods of operation.

AWWA C906; PE PIPE, MATERIAL CLASS PE 3408, D.I.P. O.D.						
Size	DR	O.D.	Wall Thickness	Nominal I.D.	Minimum Bend Radius	Maximum Pull-In Force (Lbs.)
"	—	"	"	"	"	=====

2. The maximum job site pull-in force shall not exceed the values given in the above table.

D. Miscellaneous Items (Applies to PVC and PE Pipe).

1. Fusible Pipe Joints.
 - a. Fusible pipe and fittings shall be joined by the butt fusion joining method. The butt joining shall be performed by an experienced and

qualified operator using materials and techniques recommended by the pipe manufacturer.

2. Upon completion of pull-ins, Contractor shall wait 24 hours for HDPE pipe or 4 hours for PVC pipe to allow the pipe to stabilize prior to making connection thereto or backfilling the boring and/or receiving pit.
3. Pipe fittings shall be manufactured of the same material as specified for pipe.
4. Contractor shall provide appropriate adaptors for connection of HDPE pipe to mechanical joint ductile iron or cast iron pipe or fittings. Submit detailed plans and installation instruction to the Engineer for review and approval.

E. Tests.

1. Pipe material delivered for use on this project shall conform to the requirements of the appropriate AWWA and ASTM Specifications noted herein. All pipe shall be marked in accordance with the requirements of the cited Specifications and each load delivered to the job site shall be accompanied by the manufacturer's certification of such compliance. Said certification to be delivered to the Engineer or his representative.

310. VALVES AND VALVE BOXES

A. Eccentric Plug Valves.

1. Eccentric plug valves shall be furnished for buried or submerged service with mechanical joint ends, cast iron body, corrosion resistant bearings, nickel or stainless steel seat, resilient faced plug for drop-tight shutoff, 2" square operating nut opening to the left (counterclockwise) with a bi-directional worm gear actuator operating against a shut-off pressure of from 0 to 75 psi and rated at a working pressure of 175 psi for 12 inch diameter and smaller and 150 psi for 14 inch diameter and larger.
 - a. Eccentric plug valves shall be DeZurik Series 100 or Val-Matic cam-centric.

B. Valve Boxes.

1. Valve boxes shall be three piece cast iron valve boxes consisting of base, screw type center (5-1/4 inch shaft diameter) and top section with cover marked "SEWER", if available, or blank (unmarked). Extension sections shall be furnished as required. Valve boxes shall be furnished for the depth of trench shown on the Plans with the cover placed at the existing grade or to the elevation shown on the Plans.

- a. Valve boxes shall be North American made only. Acceptable manufacturers include: Tyler 6860 series, Bingham and Taylor 4906 and Bibby - Ste. Croix.

C. Horizontal Swing Check Valves.

- 1. Horizontal swing check valves shall be furnished with mechanical joint ends, cast iron body, fully bronze mounted, outside lever and spring to allow backflushing of pump and discharge line, stainless steel hinge pin, "O"-ring hinge pin seal and rated for 175 psi working pressure.
 - a. Horizontal swing check valves shall be Mueller A-2600-6-02 or Dresser Style 259-02.

320. SEWAGE AIR VALVES AND AIR VALVE MANHOLES

A. Sewage Combination Air Valves.

- 1. Sewage combination air valves, make and model shall be approved by the Engineer prior to installation. The combination air valve shall consist of either: (1) one sewage air release valve and one sewage air and vacuum valve piped together into a compact assembly; or (2) a single body double orifice valve functioning as both an air release valve and air and vacuum valve.
 - a. All combination air valves shall be furnished with protective hoods, except that the Contractor may install nipples and 90° bends in valve outlets in lieu of protective hoods.

B. Backflushing Accessories.

- 1. Backflushing accessories consisting of an inlet shutoff valve (ball or plug valve) or inlet isolation valve(s) on combination air valves, bronze rubber seated blowoff valve(s), bronze rubber seated clear water inlet valve(s) with quick disconnect coupling, quick disconnect coupling to insert in air release valve orifice outlet and 5 feet minimum of rubber hose with quick disconnect couplings on each end shall be furnished by the valve manufacturer and assembled to all sewage air valves.

C. Force Main/Air Valve Connection.

- 1. Sewage air valves shall be connected to the force main in accordance with the details shown in the Plans.
 - a. Air valves shall be connected to the force main in a manner to keep the valve as low as possible in the manhole.

2. Force main tees shall be furnished with mechanical joints or flanged ends except flanged ends shall be furnished for the reducing flange connection and to provide restraint where shown on the Plans.
3. Shop Drawings.
 - a. The Contractor shall submit shop drawings of all air valves showing valve connection piping and manhole clearances to the Engineer for review.

D. Air Valve Manholes.

1. Air valve manholes shall be constructed in accordance with the general requirements of the "Valve Manholes" section of these Special Provisions as amended below and the Typical Details shown in the Plans.
 - a. Manholes shall be precast 48 inch inside diameter, unless shown otherwise, with flat top slabs and offset openings.
2. Sealing Manhole Chimneys.
 - a. The entire outside surface of the manhole chimney, including all adjusting rings and overlapping both the manhole cone or flat-top slab (a minimum of 4 inches) and the manhole frame, shall be covered with a minimum 1/4 inch thick coating of butyl rubber sealant. The butyl rubber sealant shall be EZ-Stik or Kent-Seal butyl base sealant in trowelable grade or equal.
3. Manhole Lifting Holes.
 - a. All lifting holes in precast manhole sections shall be plugged using rubber plugs supplied by the manhole supplier, non-shrink grout or other approved method. Non-shrink grout shall fill the entire void and shall be troweled at each face to provide smooth surfaces. Cement mortar shall not be used to plug lifting holes.
4. Warning Label.
 - a. A weatherproof durable warning label, 4 inch by 6 inch size, printed in red shall be permanently attached to the inside surface of manhole slabs in line with manhole steps.
 - b. The labels shall read:

"Warning: Hazardous gases may be present which could cause severe injury or death. No smoking. Enter only with proper ventilation, life line attached and standby personnel present."
5. Vent Lines.

- a. Construct 4 inch diameter vent lines as shown in the Plans. Vent lines shall be constructed of cast iron soil pipe, “Service Weight” grade, in accordance with Chapter 8.13.0 of the “Standard Specifications”.
 - b. Vent lines shall be laid to drain to the manhole with the bottom of the return bend placed 18 inches above the ground elevation and end of the pipe covered with a brass insect screen.
- 6. Drain Lines.
 - a. Construct 4 inch diameter manhole drain lines as shown on the Plans.
- 7. Marker Posts.
 - a. The Contractor shall furnish and place wood posts to mark and support air valve manhole vent pipes. Marker posts shall be 6 inch nominal diameter treated lumber 7 feet long.
- E. Air Valve Warranty.
 - 1. The sewage air valve manufacturer shall provide a two (2) year warranty from the date that the work is accepted by the Village guaranteeing that all materials and equipment are free from defects in design, materials and workmanship. The manufacturer shall, upon proper notification, repair or replace any equipment proven defective during the warranty period.

325. DRAIN VALVE AND FLOW DIVERSION ASSEMBLIES

- A. Drain Valve Assembly.
 - 1. Drain valve assemblies shall be constructed in accordance with the general requirements of Section 315 of these Special Provisions for valve manholes, as amended below, and the typical details for Drain Valve Manholes in the Appendix.
 - a. Manholes shall be precast 48 inch inside diameter with eccentric cones or flat top slabs having offset openings.
- B. Drain Valve/Flow Diversion Assembly.
 - 1. Drain valve/flow diversion assemblies shall be constructed in accordance with the general requirement of Section 315 of these Special Provisions for valve manholes, as amended below, and the typical details for Drain Valve/Flow Diversion Manholes in the Appendix.

- a. Manholes shall be precast 48 inch inside diameter with eccentric cones or flat top slabs having offset openings.
- b. Side outlet tees shall be furnished with flanged ends to provide restraint.

330. HYDROSTATIC TESTING

- A. Delete Section 3.2.6(n)2. of the “Standard Specifications” and replace with the following:

Force mains shall be hydrostatically tested in accordance with Chapter 4.15.0 of the “Standard Specifications”, as amended below:

1. The pressure test shall be run at a minimum pressure of 75 psi, measured at the point of highest elevation of the section of force main being tested.
2. The leakage test shall be run at a minimum pressure of 50 psi, measured at the point of highest elevation of the section of force main being tested. The final leakage test shall be run for 3 continuous hours.
3. The Contractor shall furnish all labor, equipment and material to complete all testing.
4. The Engineer or his Representative shall be present at all times during testing.
5. The cost of all force main testing shall be included in the unit price(s) bid for force main.

- B. Water Purchased by Contractor.

1. Water for testing will be purchased by the Contractor. The Contractor shall notify the Owner prior to using water and shall coordinate his operations with the Owner in order not to deplete the water supply. Water usage may be restricted to periods of low demand (night time or weekend hours) if water usage is high during normal working hours.
2. Metered Water.
 - a. The Contractor shall meter all water used for flushing purposes. A complete record of all water used for flushing, including amounts and dates, shall be kept by the Contractor and provided to the Owner.
 - b. The Contractor shall use a flushing meter provided by the Owner. The meter shall be returned, in good condition, immediately after

completing flushing operations. The Contractor shall be responsible for any damage to flushing meters.

C. Test Sections.

1. The Contractor has the option to test the entire new force main as one continuous test section or in segments per his discretion.

340. EQUIPMENT TESTING, START-UP AND INSTRUCTIONS

A. The Contractor shall test all equipment, including air valves and plug valves, after it is installed and prior to lift station start-up to ensure that it is functioning and in proper working order.

B. The Contractor shall have personnel available should they be needed to adjust or repair force main equipment during start-up of the lift station, by others.

C. Instructions by Manufacturer's Representative.

1. After the equipment has been installed, inspected and approved, the manufacturer's representative shall instruct the Owner's operating personnel as to the proper procedures for operating and maintaining the equipment.

350. OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Prior to substantial completion, the Contractor shall provide the Engineer with four (4) operation and maintenance manuals covering each item of equipment, including air valves and plug valves, furnished or installed under the contract.

B. Operation and maintenance manuals shall include the following information:

1. Supplier and manufacturer's name, address, telephone number, and local representative's name, address and telephone number. Sources of service and parts and a list of local repair services, supply houses and potential sources for the types of repairs and equipment parts.
2. Warranties and bonds shall be included in manual.
3. Catalog literature complete with performance data and ratings.
4. Specify equipment function, normal operating and limiting conditions.
5. Assembly, installation, alignment, adjusting and checking instructions.
6. Operating instruction for start-up, shutdown, routine and normal operation.

7. Detailed service information including schedule of recommended maintenance.
 8. Troubleshooting, common operating problems, problems that might occur in unit/process. List and discuss control/prevention.
 9. Detailed safety section covering the operation and maintenance of unit. Contractor shall supply a complete list of equipment service numbers, model numbers, electrical requirements, manufacturer's names, etc.
 10. Complete and accurate set of as-built drawings including dimensions, schematics of hydraulics, wiring, and piping.
 11. Emergency operating instructions indicating range and flexibility during emergencies.
- C. The correct model number shall be designated where the literature covers more than one model.
- D. For items assembled by the Contractor, the Contractor shall write and provide duplicate operation and maintenance instructions.
- E. Data shall be folded to 8-1/2" x 11" size and placed into hard cover binders. Material shall be grouped according to specifications sections and filed behind individual filing tab pages on which the following is to be typed: Item, Manufacturer, Contractor's Order Number, Supplier's Order Number, and manufacturer's Order Number.
- F. Manuals shall be delivered to the Engineer for approval prior to 75% of job completion. Final payment will not be certified until manuals have been received and approved.

401. STORM SEWER CONSTRUCTION

- A. Bedding Sections.
1. Reinforced Concrete Pipe.
 - a. Reinforced concrete pipe shall be installed using Class "B" Bedding unless Class "A" or Class "C" Bedding is specified on the Plans.
 2. Class "B" Bedding.
 - a. Class "B" Bedding shall conform to File No. 4 and Paragraph 3.2.6(b) (concrete pipe) or Paragraph 3.2.6(i) (PVC and HDPE) of the "Standard Specifications".
 - b. Delete the following sentence from Paragraph 3.2.6(b)(2):

“If crushed stone chips or other materials conforming to Section 8.43.2(a) are used as cover material, no compaction is required.”

- c. Amend Section 8.43.2(a) to state that crushed pea gravel is not acceptable as bedding material.
- d. Cover material shall be the same material as used for bedding and shall conform to Section 8.43.2(a).

(1) Limestone Bedding and Cover Material.

- (a) Amend Section 8.43.2(a) to read in part:

“Crushed stone chips, bedding and cover material, shall be made from crushing sound limestone only.”

e. Placement and Compaction.

- (1) Place bedding material to the springline of the pipe and compact prior to placing cover material. Compaction of bedding material at the level of the pipe springline shall include working bedding material under the haunches of the pipe using shovels or other suitable methods. The Contractor shall take care to completely work bedding material under the haunches of the pipe to provide adequate side support.
- (2) Place and compact cover material in one or more lifts after compacting bedding material.
- (3) Refer to Subsection 607.B of these Special Provisions for requirements for recompacting Class “B” bedding disturbed by trench boxes.

3. Class “C” Bedding.

- a. Class “C” Bedding shall conform to File No. 3 and Paragraph 3.2.6(a) of the “Standard Specifications”.
- b. Amend File No. 3 and Paragraph 3.2.6(a) to require cover material to 12 inches over the top of the pipe.
- c. Bedding Material.

- (1) Bedding material shall conform to Subsection 8.43.2 of the “Standard Specifications”, as modified below.

- (a) Limestone Bedding and Cover Material.

- 1) Amend Section 8.43.2(a) to read in part:

“Crushed stone chips, bedding and cover material, shall be made from crushing sound limestone only.”

B. Pipe Fittings.

1. The cost of furnishing and installing fittings such as tees, plugs, bends and reducers shall be included in the unit price(s) bid for storm sewer pipe.

C. Field Tile Connections.

1. All field tile encountered during construction shall be connected to the new storm sewer. The cost of tile connections shall be included in the unit price(s) bid for storm sewer.
 - a. Tile lines crossed by the trench shall be replaced with polyvinyl chloride (PVC) sewer pipe meeting the requirements of ASTM D3034, SDR-35, with rubber gasket joints. The PVC pipe shall extend for a minimum distance of 2 feet outside of the edge of the undisturbed trench wall. The tile to PVC pipe connection shall be made with compatible fittings, adapters or encased in concrete. The size of the new pipe shall be equal to or greater than the field tile it is connected to.
 - b. Connection to the storm sewer shall be made by coring a hole into the pipe or structure and installing a boot or KOR-N-TEE.
 - c. All damaged field tile shall be repaired and connected to the storm sewer the same day as the damage occurs so that the flow of water will not be unreasonably restricted.

D. Pipe Joint Restraint (Outfalls).

1. Secure the last two pipe sections, including end sections, at all storm sewer outfalls (discharge points) using joint ties in accordance with the Standard Detail Drawings shown in the Appendix.

E. Sump Pump Lateral Connections.

1. All sump pump lateral discharge lines shall be connected to the new storm sewer in accordance with these specifications and the typical details shown on the Plans. The size and location of existing sump pump laterals are shown on the Plans. Laterals located in the field during construction, but not shown on the Plans, shall also be connected to the new storm sewer. The cost of connecting laterals to the storm sewer will be paid for at the price bid in the Bid Form or Schedule of Supplemental Unit Prices.

2. Sump pump lateral material shall be polyvinyl chloride (PVC) pipe conforming to the following:
 - a. PVC pressure pipe meeting the requirements of ASTM D2241, SDR-26, 160 psi, with solvent cement joints and Schedule 40 fittings.

F. Sump Pump Laterals (New).

1. The Contractor shall construct sump pump laterals at the locations shown on the Plans. Sump pump laterals shall be 42 inches deep wherever possible.
 - a. Sump pump laterals shall be constructed adjacent to and left of the water service wherever possible.
 - b. Sump pump laterals shall be 6 inch PVC meeting the requirements of ASTM D3034, SDR-35, with integral bell type flexible elastomeric joints meeting ASTM D3212.
 - c. Sump pump laterals shall extend to the right-of-way line and shall be constructed without vertical breaks or bends.
 - d. Sump pump laterals shall be connected to the storm sewer by a precast tee, cored rubber boot, or KOR-N-TEE connection. All cored connections shall be completed and inspected prior to installing the pipe in the trench.
 - e. See Section 635 of these Special Provisions for tracer wire requirements.
 - f. Mark the end of laterals with a wooden stake.
 - g. Roof and/or yard drains shall not be connected to new sump pump line.

G. Sump Pump Tile Lines.

1. The Contractor shall construct sump pump tile lines in locations shown on the Plans.
 - a. Sump pump tile lines shall be 6 inches (minimum) and shall be constructed with PVC pipe meeting the requirements of ASTM D3034, SDR-35 with flexible elastomeric joints meeting ASTM D3212.
 - b. Tile cleanouts shall be provided at the locations shown on the Plans and in accordance with the details shown on the Plans.

H. Televising Storm Sewers.

1. The Contractor is responsible for cleaning and televising all public storm sewers, at no cost to the Owner.
3. The debris removed from the sewers will be left on the project site and will be the responsibility of the Contractor to dispose of.
4. All defects (i.e., bad joints, cracked pipe, infiltration, standing water, etc.) shall be corrected and any dirt, gravel, or foreign material removed from the sewer prior to acceptance by the Owner.
5. All lines that were either repaired or cleaned prior to acceptance by the Owner must be re-televised.

I. Tracer Wire.

1. See Section 635 of these Special Provisions for tracer wire requirements.

402. STORM SEWER INLETS/OUTLETS

A. Inlet/Outlet Grates.

1. Install steel grating on the ends of storm sewers where shown on the Plans in accordance with the details shown on the Plans and/or in the Appendix and per the requirements of Chapter 8.16.0 of the “Standard Specifications”.
2. Revise Section 8.16.1 as follows:
 - a. Delete the requirement for fastening grating to the pipe with nuts and replace with the following:

“Grating shall be prefabricated as described in Section 8.16.2.”
 - b. Delete the requirement for painting and replace with the following:

“After fabrication, the entire grating shall be hot-dipped with a galvanized coating.”
3. Inlet grates (trash racks) shall be placed over the pipe end section and outlet grates shall be placed approximately 3 inches from the end of the pipe unless specified otherwise on the Plans.

405. STORM SEWER MATERIALS

- A. Storm sewer pipe material shall be reinforced concrete sewer pipe conforming to the following:

1. Reinforced concrete sewer pipe (RCP) shall meet the requirements of ASTM C76 with mortar or rubber gasket joints conforming to ASTM C443.
 - a. RCP shall be furnished for the classes of pipe shown on the Plans.
2. Reinforced concrete “D-Load” sewer pipe (D-Load) shall meet the requirements of ASTM C655 with rubber gasket joints conforming to ASTM C443. The D-Load is that load producing a 0.01 inch crack when tested in a three-edge bearing test. D-Load pipe shall have a minimum wall thickness equal to the thickness required for the “C” wall design of ASTM C76.
 - a. D-Load pipe shall be furnished for the classes of pipe shown on the Plans.
3. Reinforced concrete horizontal elliptical sewer pipe RCHEP shall meet the requirements of ASTM C507 with mortar or rubber gasket joints conforming to ASTM C443.
 - a. RCHEP shall be furnished for the classes of pipe shown on the Plans.

410. STORM SEWER MANHOLES

A. Standard Manhole.

1. Storm sewer manholes shall be constructed in accordance with Chapter 3.5.0 and File Nos. 12, 13, and 15 of the “Standard Specifications” and these Special Provisions.
 - a. Poured Manhole Base.
 - (1) All manhole bases (benches) shall be poured in place in accordance with Subsection 3.5.5(b) of the “Standard Specifications”. Precast manhole bases or precast integral base units will be allowed, however, no precast base units with preformed benches are allowed.
 - b. Manholes less than 4 feet deep do not require steps.
 - c. Plastic manhole steps shall be provided in accordance with Paragraph 3.5.4(g) of the “Standard Specifications”.
2. Manholes shall be precast 48, 60, or 72 inch inside diameter, as noted on the Plans, with eccentric cones. Unless indicated otherwise on the Plans, standard manholes shall be 48 inch inside diameter.

- a. Flat top slabs with offset openings may be used for shallow manholes where there is not sufficient depth to install cones or on deeper manholes with the approval of the Engineer.
- b. Adjusting Rings.
 - (1) A minimum of 12 inches to a maximum of 27 inches of adjusting rings shall be furnished for each manhole, unless shown otherwise on the Plans.
 - (2) Material - Adjusting rings shall be HDPE.
 - (a) HDPE Adjusting Rings.
 - 1) Adjusting rings shall be injection molded High Density Polyethylene (HDPE) adjustment rings as manufactured by Ladtech, Inc., Lino Lakes, Minnesota, or equal. Install HDPE adjusting rings per the manufacturer recommendations.
- c. Manhole depths shown on the Plans are approximate only, unless the cover elevation is indicated. Manhole covers shall be placed to match the existing grade or at the elevation shown on the Plans.
 - (1) Place manhole covers 1/4 inch below the pavement grade in streets.

3. Manhole Frames and Covers.

- a. Manhole frames and covers shall be Neenah R-1580 with Type “B” lids, non-rocking.
- b. Beehive grate manhole covers shall be Neenah R-2560-EI.
- c. Manhole frames shall be centered on the top of the cone section.

B. Tee-Line Manholes.

- 1. Tee-line manholes shall be constructed in accordance with File No. 16 of the “Standard Specifications” and the pertinent provisions of Subsection 410.A above.

C. Junction Box Manholes.

- 1. Junction box manholes shall be constructed in accordance with the details included in the Appendix and the pertinent provisions of Subsection 410.A above.

D. Inlet Manholes.

1. Inlet manholes shall be constructed in accordance with the provisions of Subsection 410.A above except as provided for below.
 - a. Use flat top slabs with sizes to match specified frame and grate.
 - b. Place a //Neenah R-3067 (barrier curb)// //Neenah R-3501-R (roll curb) or R-3501-P// curb inlet frame and grate on manholes.
2. Do not construct sumps in inlet manholes.

E. Manhole Joints.

1. Joints for precast manhole riser sections shall be made with non-shrink grout, rubber “O”-ring gaskets, a continuous ring of butyl rubber sealant (EZ-Stik or Kent Seal in rope form). The butyl sealant shall be 1 inch diameter equivalent or as recommended by the manhole manufacturer.
2. Adjusting rings and manhole frames shall be set with butyl rubber sealant troweled into a 1/4 inch thick layer over the entire surface areas of the top of cone and all adjusting rings. The butyl rubber sealant shall be EZ-Stik or Kent Seal butyl base sealant in trowelable grade.

F. Frame/Chimney Joints.

1. The entire outside surface of the manhole chimney, including all adjusting rings and overlapping both the manhole cone or flat-top slab (a minimum of 2 inches) and the manhole frame, shall be sealed with a minimum of 1/4 inch thick coating of butyl rubber sealant.

G. Cone/Ring Dimensions.

1. Manhole Cone Sections.
 - a. The top dimensions of cone sections shall be either 24 inches inside diameter by 36 inches outside diameter or 26 inches inside diameter by 38 inches outside diameter.
 - b. The outside diameter of the top of the cone section shall be as large as or larger than the base flange of the manhole casting.
2. Adjusting Rings.
 - a. Adjusting ring dimensions shall match the dimensions of the top of the cone section; either 24" x 36" or 26" x 38".
 - b. Adjusting rings shall have flat or even bearing surfaces providing bearing contact over the entire contact surfaces.

- c. HDPE adjusting rings shall be as specified in Subsection 410.A.2.b(2) of these Special Provisions, except the dimensions shall be as specified above.
 - 3. Center adjusting rings on manhole cones and center manhole castings on adjusting rings so that their surfaces will be flush whenever possible.
- H. Sewer Stubs.
 - 1. Sewer stubs shall be one full length of pipe or 4 foot minimum length and shall be bulkheaded in accordance with Section 3.2.25(a) of the “Standard Specifications”. The cost of sewer stubs shall be included in the unit price(s) bid for storm sewer manholes.
- I. Manhole/Pipe Connections.
 - 1. Connections of pipes to manholes shall be made in accordance with Section 3.5.7 of the “Standard Specifications”, as modified below. All field tapped holes for connecting sewer pipe to manholes shall be made by coring.
 - a. Rigid Pipe. Reinforced concrete pipe shall be connected by means of brick and mortar per Subsection 3.5.7(a)1.b.

416. CATCH BASIN REMOVAL

- A. The bid item for removing catch basins shall include removing and disposing of catch basins as shown on the Plans, backfilling excavations with granular material, and plugging lines with concrete as specified in Section 3.2.24 of the “Standard Specifications”, included in the cost of other bid items.
- B. Salvageable inlet castings, as determined by the Owner, shall remain the property of the Owner. Deliver salvaged castings to a location specified by the Owner.

420. DITCH FILLING AND GRADING

- A. The Contractor shall fill in ditches where indicated on the Plans, grade the ditches to drain to storm sewer inlets in accordance with the grades shown and form new ditch sections per typical details and cross-sections.
- B. Prior to grading and filling in ditches, the Contractor shall strip and stockpile all topsoil for future use in restoring disturbed construction areas. All fill areas shall be covered with a minimum of 4 inches of topsoil. If sufficient quantities of salvaged topsoil are not available for covering fill areas, the Contractor shall furnish additional topsoil at no cost to the Owner.
- C. Ditch drainage, in accordance with Section 1.7.10 of the “Standard Specifications”, must be provided at all times.

- D. Borrow excavation shall comply with Section 208 of the “State Specifications”. Fill areas shall be constructed in accordance with Section 207 of the “State Specifications”. Fill shall be placed in 8 inch maximum layers and compacted using specialized compaction equipment including pneumatic-tire rollers or vibratory rollers. The initial layer of fill placed over storm sewers shall be 24 inches in thickness. The Contractor shall take precautions to protect storm sewers from damage during compaction operations.

430. RIPRAP

- A. Riprap shall comply with Section 606 of the “State Specifications”, as modified below.
- B. Materials.
 - 1. Riprap shall comply with Subsection 606.2 of the “State Specifications” except that concrete slabs may not be substituted for stone. Riprap dimensions shall be as specified in Subsection 606.2(2) and will be to the approximate sizes and thicknesses listed below.

<u>Type</u>	<u>Stone Sizes (Inches)</u>	<u>Thickness (Inches)</u>
Light Riprap	4 to 16	12
Medium Riprap	5 to 20	18
Heavy Riprap	6.5 to 25	24
Extra Heavy Riprap	8 to 30	30

- C. Placing Riprap.
 - 1. Light Riprap.
 - a. Place by hand with larger stones in lower courses. Lay stones perpendicular to the slope with close, broken joints, firmly bed in the slope, and thoroughly compact. Chink spaces between stones to make the finished surface even and tight.
 - 2. Medium, Heavy, and Extra-Heavy Riprap.
 - a. May be placed by mechanical means, not dumping, that produces work within reasonable tolerances of the typical section(s). Fill voids with smaller pieces.
- D. Geotextile Fabric.
 - 1. Riprap shall be placed on a layer of geotextile fabric as indicated on the Plans.

2. Place the fabric in accordance with Subsections 645.3.6 and 645.3.7 of the “State Specifications”.
3. Material.
 - a. Light Riprap.
 - (1) The fabric shall be geotextile fabric, Type R (Riprap) meeting the minimum values specified in Subsection 645.2.6 of the “State Specifications”.
 - b. Medium, Heavy, and Extra Heavy Riprap.
 - (1) The fabric shall be geotextile fabric, Type HR (Heavy Riprap) meeting the minimum values specified in Subsection 645.2.7 of the “State Specifications”.
4. Payment.
 - a. The cost of furnishing and installing fabric shall be included in the unit price(s) bid for riprap.

440. PRECAST BOX CULVERT

- A. The Contractor shall furnish and install a precast reinforced concrete box culvert and endwalls in accordance with the Plans and these Special Provisions.
- B. Precast box culverts shall conform to Chapter 8.8.0 of the “Standard Specifications”.
- C. Installation of the precast box culvert and endwalls shall conform to Section 3.2.7 of the “Standard Specifications”, manufacturer’s recommendations, and these Special Provisions.
 1. Excavation shall comply with Section 206 of the “State Specifications”.
 - a. The trench shall be wide enough to permit the construction of the abutments and thorough compaction of the backfill material.
 - b. The excavation shall be deep enough to permit the installation of the precast box culvert such that the invert is a minimum of 6 inches below the streambed or as shown on the Plans.
 2. Bedding for precast box culverts shall consist of 6 inches of crushed stone chips conforming to 8.43.2 of the “Standard Specifications”.

3. Backfill shall be in accordance with Section 206.2 of the “State Specifications”.
 - a. No backfill shall be placed against any structural elements until they have been approved by the Engineer.
 - b. Structural backfill shall be compacted to a minimum of 95% Modified Proctor Density.
 - c. Mechanical tampers or approved compacting equipment shall be used to compact all backfill and embankment immediately adjacent to each side of the culvert and over the top of the culvert until it is covered to a minimum depth of one foot. The backfill within four feet of each side of the culvert shall be placed in lifts of 12 inches or less. Heavy compaction equipment shall not be operated in this area of over the culvert until it is covered to a depth of one foot.
 - d. Lightweight dozers and graders may be operated over culverts having one foot of compacted cover, but heavy earth moving equipment shall require two feet of cover, unless the design cover is less than two feet. In no case shall equipment operating in excess of the design load be permitted over the culvert unless approved by the manufacturer.
 - e. As a precaution against introducing unbalanced stresses in the culvert, when placing backfill, at no time shall the difference between heights of fill on opposite sides of the culvert exceed 24 inches.
 - f. Backfill in front of endwalls shall be carried to ground lines as shown in the Plans.
 - g. The interior of the culvert shall be filled with No. 2 stone conforming to Section 8.43.6 of the “Standard Specifications”. The depth of stone within the culvert shall be a minimum of 6 inches or as shown on the Plans and shall match the existing streambed.
4. Precast flared endwalls shall be furnished and installed at the inlet and outlet of the box culvert.
5. Where storm sewers are to connect into the precast culvert, such connections shall be cored and placed at least 18 inches away from the nearest box joint when measured from the outside edge of the core hole to the joint. Connections shall be made of brick and mortar and conform to Subsection 3.5.7(a)1.b of the “Standard Specifications”.
6. Where shown on the Plans, the Contractor shall install joint ties conforming to “Eye Bolt and Tie Rod Assembly (Alternate No. 2)” of SDD 8 F 4-5 as

shown in the Appendix. Two joint ties shall be installed on each side of the precast box culvert section.

500. WATERMAIN SYSTEM

A. The work to be performed under this Section includes the furnishing of all materials, parts, labor, tools, equipment, and supervision necessary for the installation and testing of the water distribution system and appurtenances.

1. PVC Water Main
2. 6-Inch Ductile Iron Hydrant Lead
3. Hydrant Assembly
4. Gate Valve & Butterfly Valve
5. Check Valve
6. Horizontal Directionally Drilled Water Main
7. Water Service
8. Water Curb Stop and Box
9. Water Corporation Stop

Contractor shall notify residents, businesses, The Village, and Fire Department of all water shut-downs 3 days prior to water being shut off.

505. WATERMAIN MATERIALS

A. General

4. All materials supplied by the contractor shall be new and made in the United States, meeting the specifications contained herein unless otherwise approved by the Engineer.
5. The Contractor shall provide to the Engineer Submittals for all pipe, valves, hydrants, and other appurtenances prior to start of construction.
6. Nuts, bolts, and other fastening components shall be 304 stainless steel (or approved equal), and shall be corrosion-resistant and conform to AWWA C-111 specifications.

B. Pipe

1. All pipe shall be either ductile iron, PVC or HDPE meeting the following requirements.
2. All ductile iron pipe shall meet the specifications of ANSI/AWWA C151/A21.51-91, class 53 and shall be cement mortar lined in accordance with ANSI/AWWA C104/A21.4.
3. The pipe shall have FASTITE or TYTON push-on joints.
4. All PVC pipe shall meet the specifications for AWWA C-900 for all sizes up to and including 12", and AWWA C-905 for all other sizes. The pipe shall have integral elastomeric bell and spigot joints and the outside diameter shall equal that of ductile iron pipe.
5. All PVC pipe shall have a dimension ratio equal to 18 and a pressure class equal to 235.
6. HDPE pipe shall be used where directional drilling is called on plans, pipe must be black with blue accents.

C. FITTINGS

1. All fittings shall be Cast Iron ANSI/AWWA C110/ A21.10-93, class 250, cement mortar lined and shall have mechanical joints per ANSI/AWWA C111/ A21.11-90 with plain rubber gaskets, mechanical joint restraint, and cable bonded.
2. Ductile Iron compact fittings, in accordance with the requirements of ANSI/AWWA C153/A21.53, may be used as an alternate to Cast Iron fittings.
3. Mechanical joint restraints shall be EBAA Mega Lug, Tyler Union Tuf Grip or approved equal.
4. Anchor tees shall be used for hydrant settings and any service valves 6" and larger.
5. Tapping Sleeves shall be Powerseal Model 3480MJ.

D. GATE VALVES

1. All valves 10" and smaller shall be the American Flow Control series 2500 resilient wedge gate valve or approved equal.
2. Gate valves shall meet or exceed ANSI/AWWA Specification C509 latest revision.
3. The resilient wedge valve shall have a non-rising stem with 2" square operating nut, "O" ring packing, mechanical joints with plain rubber or armor tipped gaskets and open left.
4. The wedge shall be constructed of ductile iron, fully encapsulated in synthetic rubber except for guide and wedge nut areas; the rubber shall be molded in place and bonded to the ductile iron portion, and shall not be mechanically attached with screws, rivets, or similar fasteners.
5. Wedge shall seat against seating surfaces so the seating is equally effective regardless of direction of pressure unbalanced across the wedge.
6. Stem shall be sealed by at least two O-rings; all stem seals shall be replaceable with valve open and while subjected to full rated pressure.
7. The waterway shall be smooth and shall have no depressions or cavities in seat area where foreign material can lodge and prevent closure or sealing.
8. The valve body and bonnet shall be epoxy coated, inside and out.

E. BUTTERFLY VALVES

1. All valves 12" and larger shall be DeZURIK AWWA Butterfly Valve (BAW), Henry Pratt Groundhog[®] or approved equal.
2. All valves shall meet or exceed AWWA standard C504, latest edition, Class 150B.
3. The rubber seat shall be molded into the valve body, and the disc shall have a stainless steel seating edge.
4. The valve operator shall be designed to accept input torque of at least 450 ft-lbs.
5. Valves shall be open "left", mechanical joint and have a 2" square operating nut.

F. VALVE BOXES

1. Valve boxes shall be three-piece, screw type, with the cover marked "Water" as manufactured by the Tyler Corporation. All valve box supplies shall be of sufficient length to place the cover at finish grade.
2. All valve boxes shall be installed upon the valve with the use of a valve adapter as manufactured by Adapter Incorporated. The adapter shall be installed in

accordance with all manufacturer specifications.

3. New valve boxes shall be of proper size; for example, a 2" service shall receive a 2" stop box, and so forth. Undersized stop boxes shall be replaced at the Contractor's expense.
4. The Contractor shall furnish and place posts to mark valve boxes located in easement areas. Marker posts shall be Rhino FiberCurve™ Marking Post, Blue (Water) Item number 70453 (<https://www.usabluebook.com/>).

G. HYDRANTS

1. Hydrants shall be Waterous Pacer with Storz hose couplings.
2. Hydrants shall conform to AWWA Specification C-502, compression type, with 6" mechanical joint connection, plain rubber gasket with cable bonding, 1-1/2" pentagon operating nut open left, two 2 1/2" hose nozzles and one 4-1/2" pumper connection with Storz fire hose coupling screw threads, nut type nozzle caps with gaskets and chains, and 5 1/4" diameter main valve opening.
3. Hydrants shall be designed for 250 psi working pressure and tested to 500 psi hydrostatic pressure.
4. Hydrant must be "Traffic Model" with safety flanges and couplings.
5. Hydrants shall have a sealed lubrication reservoir and weather shield, a copper alloy main valve seat ring that screws into a copper alloy drain ring.
6. Lower and upper valves plate shall be copper alloy.
7. Bottom rod shall be 304 or 316 stainless steel or approved equal.
8. Bottom shoe bolts shall be 304 or 316 stainless steel.
9. All hydrants shall have a minimum bury depth of 6' 6".
10. Varying bury depths or hydrant extensions may be allowed with the approval of the Engineer.
11. Hydrants shall be factory painted with a Blue head and a Green barrel. Hydrants painted the wrong color will be rejected.
12. All Hydrant leads shall be constructed with ductile iron pipe.
13. The Contractor shall furnish and place posts to mark hydrants. Marker posts shall be Hydrant Marker 5' Fiberglass (with spring) Item number 22516 including Universal Hydrant Flag Kit, Red, 4-1/2"OD for 1/4 to 1/2" Pole Item number 65949 (<https://www.usabluebook.com/>).

H. WATER SERVICES

1. All underground water service pipe shall be copper water tube, Type K, soft temper, conforming to ASTM-B88 and ASTM-B251. The pipe shall be marked with the manufacturer's name or trademark and a mark indicative of the type of pipe. The outside diameter of the pipe and minimum weight per foot of the pipe shall not be less than that listed in ASTM B251, Table 11.
2. Water service pipe inside of a building shall conform to ASTM-B88, Type L. Connections shall be solder or flared style fittings for above grade pipe.
3. All water service connections shall be constructed with the following:
 - a) Corporation stops shall be Mueller H-15008, A. Y. McDonald 74701BQ or approved equal.
 - b) Curb stops shall be A. Y. McDonald 76104-22 or approved equal. This is a Minneapolis pattern ball valve with compression fittings.
 - c) Curb stop boxes for 1" and 1 ¼" curb stops shall be a telescoping type and have a 1 ¼" inside diameter upper section, a 1 ½" threaded Minneapolis style bottom section, and a two-piece lid. (A. Y. McDonald 5614, Mueller H10300, Ford EM2 70-56 or approved equal.)
 - d) Curb stop boxes for 1 ½" and 2" curb stops shall be a telescoping type and have a 1 ½" inside diameter upper section, a 2" threaded Minneapolis style bottom section, and a two-piece lid. (A.Y McDonald 5615 or approved equal.
4. Water services less than 2" in diameter shall be direct tapped on new ductile iron water mains. 2" water services on new ductile iron water mains shall be tapped using a Blair-Smith model 397 Tapping Saddle.
5. For water services installed on PVC pipe or existing cast iron water mains, all corporations, regardless of size, require the use of a tapping saddle.
6. Saddles shall be all stainless steel construction with nitrile pad gasket. (A.Y. McDonald 8403 TECK saddle, Smith-Blair model 372 saddle or approved equal)
7. 3" and 4" water services shall be connected to the new water main using a 6" anchor tee, 6" gate valve and respective reducers.
8. All large services 6" and larger shall be connected to the new water main using respective sized anchor tees and valves.
9. Interior ball valves shall be made of lead-free forged brass, full port and of matching inside diameter of copper pipe.
10. Water meters, when required by the Engineer, shall be supplied and installed by the Utility.
11. See Section, Water Main Construction 510.F for corrosion protection.

I. BACKFILL FITTINGS

1. For ductile iron pipe, the bedding and cover material shall meet the gradation requirements for bedding sand as specified in Table 35 of Section 8.43.2(c) of the Standard Specifications.
2. For PVC pipe, the bedding and cover material shall meet the gradation requirements for crushed stone chips as specifies in Table 32 of Section 8.43.2(a) of the Standard Specifications.
3. All services regardless of size shall be bedded and backfilled with sand as specified.
4. The balance of the trench, unless otherwise noted on the Plans, shall be backfilled with granular backfill conforming to the gradation requirement of Table 37 of Section 8.43.4 of the Standard Specifications, or other material may be used if it conforms to the State Specifications, Section 209, Grade 2. All material not meeting these gradation requirements will be rejected.
5. For projects on a State Highway, slurry backfill is required.
6. For asphalt streets, the top 12" of trench shall be a material suitable for a road base, such as road gravel; see table 39 of the Standard Specifications.
7. For projects on a State Highway, granular backfill MAY be used provided it meets the following requirements:
 - a) Granular backfill shall conform to the State Specifications, Section 209, Grade 2.
 - b) Granular backfill must be placed and tested as required in the following section, Trench Backfill Special, as provided by the Wisconsin Department of Transportation.

510. WATERMAIN CONSTRUCTION

A. GENERAL

1. The Contractor shall notify the Water Utility seven (7) days in advance of the start of construction.
2. The Contractor shall notify the Engineer's representative in the event work will not commence due to inclement weather or other conflicts. If the Contractor fails to properly notify the Engineer's representative of work stoppages, the Contractor shall be responsible for inspection costs to the Utility that day.

B. EXCAVATION & BACKFILL

1. The contractor shall excavate all material to the depths necessary to construct the

water main as shown on the plans. Excavation shall include the removal of soil, rock, abandon pipelines, old foundations, stumps, roots, and similar materials encountered. Excavation of whatever material shall be included in the contract unit prices for water main installation and will not be paid for separately.

2. The excavated area shall be kept free of water at all times.
3. The contractor shall excavate to the depths required to construct the water main and appurtenances as described on the plans. For water main construction, trench excavation shall be to a depth sufficient to provide a minimum of 6' of cover over the top of the pipe and a 4" bedding material cushion below the pipe. Over excavation will be at the contractor's expense.
4. In areas where the proposed construction may interfere with existing utilities, additional excavation may be required to determine the exact location of said existing utilities. This work will be incidental to the contractor and no additional compensation will be due to the contractor for this work.
5. No excavated material shall be placed in the street right of way.
6. The Contractor shall be responsible for immediate removal and proper disposal of all materials resulting from excavation, demolition, abandonment, and removal, unless otherwise indicated.
7. Backfilling shall follow immediately behind trench excavation and pipe laying operations. In no case shall more than 100 feet of trench excavation be open at any one point and time. Any excavation left open and unattended shall be protected with lighted Type II barricades and "Snow Fence" constructed around the perimeter of the excavation.
8. Backfill shall be initially placed 2 feet over the pipe and mechanically compacted, taking care not to over-stress the pipe. After the initial placement, the backfill shall be placed in 12" lifts and mechanically compacted to reach the required density.
9. All services regardless of size shall be covered with a minimum 36" of sand.
10. Granular backfill material shall be compacted to a minimum of 95% Modified Proctor Density.

C. WATERMAIN

1. Watermain construction shall conform to Chapter 4 of the Standard Specifications.
2. Pipe joints shall be assembled in accordance with the manufacturer's recommendations in that after thorough cleaning of the bell gasket recesses, the face of the bell recess and inner shoulder shall be lubricated prior to inserting the rubber gasket. After seating the gasket in the bell recess, the exposed gasket surface and the plain end of the companion pipe shall be lubricated prior to assembly.

3. Where Ductile Iron pipe material is used, all Water Main materials, including all pipe, fittings, valves, etc., shall be equipped to provide electrical continuity with shop welded copper straps or Thermite welded cables; see plans for details. Pipe with pre-drilled holes for bond straps with pound in rivets is not acceptable.
4. All new water mains shall pass hydrostatic and bacteriological testing.
5. Where the new mains terminate at a valve or dead end, a full length of mechanical joint pipe shall be laid to facilitate the installation of a mechanical joint plug, test hydrant (or blow-off) and blocking as required and as shown on the plans.
6. For PVC pipe, deflection will not be allowed at bell and spigot joints, nor shall the pipe be bent between joints. Grade breaks shall only be made at mechanical joints, and only within manufacturer's specifications.

D. THRUST AND JOINT RESTRAINT

1. For both PVC and ductile iron pipe, fittings shall be restrained via thrust blocking, mechanical joint restraints, or a combination thereof.
2. Specially Designed Push-On Restrained Joints by AMERICAN, McWane, or U.S. Pipe may be used for ductile iron pipe.
3. Joint restraint is required for all joints within the lengths specified in the table below:

JOINT RESTRAINT DISTANCE (FT) PER FITTING

FITTING TYPE	4"	6"	8"	12"	16"	20"
Horizontal Bend - 45°	10	10	12	16	20	26
Horizontal Bend - 11.25°	5	5	5	5	8	8
Horizontal Bend - 22.5°	8	8	8	10	10	15
Horizontal Bend - 90°	16	20	25	32	40	52
<i>*Restrained both sides of reducer</i>						
Reducer - Dia x 4"	-	25	50	60	80	130
Reducer - Dia x 6"	-	-	25	60	100	125
Reducer - Dia x 8"	-	-	-	50	80	120
Reducer - Dia x 12"	-	-	-	-	50	100
Reducer - Dia x 16"	-	-	-	-	-	50
Dead End	40	40	60	90	120	150
Tee or Cross - Run	10	10	10	20	30	40
Tee - 4" Branch	8	6	6	6	6	6
Tee - 6" Branch	-	8	6	6	6	6
Tee - 8" Branch	-	-	10	6	6	6
Tee - 12" Branch	-	-	-	12	6	6
Tee - 16" Branch	-	-	-	-	30	10
Tee - 20" Branch	-	-	-	-	-	50
Vertical Bend - 45° - Upper	12	20	26	40	50	60
Vertical Bend - 45° - Lower	5	5	6	10	12	14
Vertical Bend - 22.5° - Upper	8	10	14	18	24	28
Vertical Bend - 22.5° - Lower	4	5	5	8	8	8
Vertical Bend - 11.25° - Upper	6	6	8	10	12	14
Vertical Bend - 11.25° - Lower	4	4	4	4	4	6

*Un-restrained Sleeve fittings not allowed within the above distances

E. TRACER WIRE

1. See tracer wire specifications following these special conditions.
2. All tracer wire and tracer wire components shall be manufactured in the USA.

F. CORROSION PROTECTION

1. PVC water main does not require polyethylene wrap.
2. Polyethylene wrap shall be provided for all Ductile Iron Water Main and fittings and shall meet all of the requirements of Chapter 4.4.4 of the Standard Specifications.
3. When a water service is tapped two or three layers of polyethylene compatible adhesive tape shall be wrapped completely around the pipe to cover the area where the tapping machine and chain is mounted. Mount the tapping machine on the pipe area covered by the polyethylene tape. The tap shall be made and the corporation stop installed directly through the tape and polyethylene.

4. After making the direct service connection inspect the entire circumferential area for damage and make any necessary repairs.
5. After inspection, wrap the corporation and copper as follows:
 - a. Clean and dry the corporation and copper service section to be wrapped.
 - b. Wrap the corporation and the following 3 feet (minimum) of new and or existing copper service with Scotch Super 33+ Vinyl Electrical Tape.
 - c. For services 1.5" and smaller, use 1" wide tape. Use 1.5" wide tape for copper services larger than 1.5" in diameter.
 - d. Wrap the tape in a spiral manner, with at least a 10% overlap.

G. HYDRANTS

1. Where applicable, hydrants shall be placed on lot lines.
2. Hydrants, barrel including barrel extensions, shall be painted with Rust Oleum Industrial Enamel V7400 "Safety Red" with the head and operating nut painted with Rust-Oleum Industrial Enamel V7400 "Safety Blue".
3. All Hydrants shall be installed prior to bacteriological and hydrostatic testing of the water main.
4. Hydrants shall be set with a minimum horizontal clearance of 24" measured from the face of curb to the nozzle cap.
5. Hydrants shall be installed such that the "Groundline Groove" is equal to the existing ground elevation.
6. Where hydrants will stand in concrete, brick or asphalt, the first 6" below grade shall be wrapped with felt or polyethylene foam (1/4" max) to prevent contact between the hydrant barrel and the pavement.
7. Barrel Extensions.
 - a) Hydrants shall be furnished for the depth of bury shown on the Plans. Hydrants requiring greater than 7-1/2 feet of bury shall be furnished as standard 7-1/2 foot hydrants with extensions as required. Hydrant extensions shall be compatible with hydrant barrel and stem sections and shall be installed at the top of the barrel section. The distance from the ground line to the centerline of the lowest nozzle shall be from 18 to 23 inches.
 - 1) Secure extension flanges using stainless steel nuts and bolts.

H. VALVES

1. Where valve boxes are placed in concrete, valve box extensions shall be used to achieve proper grade, adjusting rings will not be allowed.

I. WATER SERVICE

1. All new services and all associated fittings shall be installed as noted on the Plans.
2. Where new services replace existing services, the existing service shall be disconnected at a location just past the existing curb box.
3. Where new services replace existing services and are being tapped off an existing main (the main is not being replaced), the existing service corporation shall be turned off at the main and abandoned in accordance with section 5.6.3 of the Standard Specifications.
4. Where new services replace existing services and are being tapped off an existing main (the main is not being replaced), a tapping saddle shall be used as described in the Materials section of these Special Conditions.
5. Reconnections of 1/2", 5/8", 3/4", 1", 1 1/2", and 2" copper services shall be made with the same size corporation (3/4" minimum) as the existing service, copper pipe, and union, if possible.
6. It is the Contractor's responsibility to adjust stop boxes to finished grade.
7. If a stop box is located in concrete, a slip-top is required.
8. All new service installations shall be 1" minimum in diameter unless otherwise noted.
9. For new ductile iron water main, service less than 2" in diameter shall be direct tapped (no saddles). 2" water services shall be tapped using a Blair-Smith model 397 Tapping Saddle.
10. All service tubing, from the curb stop to the main, shall run perpendicular to the main itself. At no time shall the curb stop and the main stop be offset or aligned at an angle any other than 90 degrees.
11. Where new services are installed via trench-less methods, the Contractor shall maintain at least six feet of cover over the service. If a sewer or other underground obstruction prevents the cover from being 6 feet, the service must be installed underneath the conflicting utility. The Contractor shall use locating equipment to spot-check and verify cover along the new service.
12. Where services connect to water mains that are shallower than six feet, the service

shall maintain six feet of cover for as long as is practically possible before it ties into the shallower water main.

13. Stop boxes that are not adjusted properly, or that are damaged through poor adjustment methods, will not be accepted.
14. Stop boxes requiring more than a few inches of adjustment shall be cut to the proper height to assure they can be properly adjusted in the future.

J. TESTING

1. General

- a) The Contractor shall furnish all labor, equipment and material to complete all flushing and testing.
- b) Water for flushing and testing shall be furnished by the Yorkville Water Utility via existing mains and or hydrants. Water usage, however, may be restricted to nighttime or weekend hours during periods of high demand.
- c) All flushing of new mains will be done under the direct supervision of the Engineer and will be coordinated to serve the best interests of the Water Utility and its customers.
- d) The Utility's permit with the WDNR requires all discharge water to be dechlorinated below 0.01ppm regardless of the point of discharge.
- e) It shall be the contractor's responsibility to supply and install everything necessary to comply with the WDNR discharge permit for reaching 0.01ppm residual chlorine in discharged water.
- f) Dechlorination setups shall be installed AFTER any testing spigots.

2. HYDROSTATIC TESTING

- a) All new construction shall be subjected to hydrostatic pressure testing. Testing shall be performed as soon as possible after construction on a section.
- b) The Contractor shall provide all equipment, materials, and labor necessary to perform the tests. This includes pumps, gauges, corporations, and backfill, water, miscellaneous piping and fittings, and means of measuring the volume of water.
- c) Contractor shall use a pressure gauge with a maximum reading of 200 PSI, with gauge intervals of 2 PSI and have a face diameter of at least 3".
- d) The Hydrostatic pressure testing shall conform to Chapter 4.15.0 except that the duration of the test shall not be less than 4 consecutive passing hours. The allowable leakage rate shall not exceed a rate of 10 gallons per 24 hours per mile of pipe per inch diameter at the test pressure of 100 psi or as computed in the formula in Section 6.B.6.
- e) If the actual leakage rate exceeds the allowable leakage rate, the contractor at his own expense shall locate and repair the leak(s). The test process shall be repeated

until satisfactory results are obtained.

- f) Hydrostatic pressure tests shall not commence after 12:00 p.m., unless authorized by the Engineer.
- g) The maximum allowable length of pipe to be pressure tested at any one time is 2000 feet.
- h) Maximum Allowable Leakage Rate Formula:

$$\text{GPH} = \frac{\text{ND} \cdot \text{P}^{1/2}}{7400}$$

3. BACTERIOLOGICAL TESTING

- a) All new construction shall be subjected to bacteriological testing. Testing shall be performed as soon as possible after construction on a section.
- b) Disinfecting of Water Mains shall be done in accordance with Chapter 4.16.0.
- c) Should the test prove unsatisfactory the Water Main shall be sterilized and samples taken until acceptable results are obtained before the main is placed in service.
- d) The Contractor shall pay for the cost of all work for test piping and fittings, sterilization, and flushing.

600. GENERAL CONSTRUCTION PROCEDURES

605. ROCK EXCAVATION

- A. Rock excavation shall be in accordance with Section 2.2.9. of the “Standard Specifications”. The payment width for rock excavation in open-cut shall be the actual width of excavated trench, but not to 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 may be measured by stripping earth overburden prior to blasting or removal or by other methods mutually acceptable to both the Engineer and Contractor. One such method may be to measure the depth of rock exposed on trench walls after blasting and excavation have been completed.

606. PREVENTION OF PIPE FLOTATION

- A. The Contractor shall at all times prevent the possibility of pipe flotation, i.e.: the lifting of pipes by buoyancy as water rises in the trench by proper bracing or by

loading to overcome buoyancy. All pipe damaged by flotation shall be removed and relaid at the Contractor's expense.

607. PORTABLE TRENCH BOX

- A. The use of portable trench boxes and sliding trench shields shall conform to Section 2.3.6. of the "Standard Specifications", as modified below:
1. Trench boxes or shields used within trenches in which the pipe is installed with Class "B" or Equivalent Bedding, including flexible sewer pipes and PVC water main, shall ride on a shelf excavated in the trench to ensure that the proper bedding section is achieved and maintained.
 - a. 4" Through 16" I.D. Pipe. The shelf shall be located no lower than the top of the pipe, except that it shall not be placed more than 24 inches above the trench bottom.
 - b. 18" Through 30" I.D. Pipe. The shelf shall be located no lower than the springline of the pipe, except that it shall not be placed more than 24 inches above the trench bottom.
 - c. 36" Through 60" I.D. Pipe. The shelf shall be located no lower than 24 inches above the trench bottom.
- B. Recompaction of Class B or Equivalent Bedding.
1. If a trench box or shield is supported or rides within bedding or cover material located below the top of a pipe in trenches in which the pipe is installed with Class "B" or Equivalent Bedding, including flexible sewer pipes and PVC water main, the Contractor shall recompact bedding and cover material to the top of the pipe after removing the box or shield as follows:
 - a. First, thoroughly compact bedding and cover material per the provisions of Paragraphs 201.A.1.a.(3) (sanitary sewer), 301.B.3.a.(1) (force main), 401.A.2.b (storm sewer), and 501.A.3.a.(1) (water main) of these Special Provisions before moving the trench shield; then
 - b. lift the trench shield so that it rides on top of the cover material;
 - c. recompact the bedding and cover material so that there are no voids between the pipe and trench walls; and
 - d. pull the trench shield ahead.
 2. Alternate method(s) of recompacting bedding and cover material disturbed by the trench box or shield may be used if approved by the Engineer.

608. MANUFACTURER'S REPRESENTATIVE

- A. The pipe manufacturer shall have a representative available to the Contractor and Engineer for the purpose of advising them in the proper method of laying pipe and making watertight joints. It is the intent of this requirement that the representative spend only such time on the job as will accomplish the desired result of satisfactory installation practice. The presence of such representative, however, or the partial payment made for pipe as delivered, shall not relieve the Contractor of his responsibility under these Special Provisions. All pipe laying and making of all joints shall be done strictly in accordance with the manufacturer's directions, however, the Contractor shall be responsible for the watertightness specified.

609. HANDLING PIPE AND ACCESSORIES

- A. Proper equipment, tools and facilities shall be provided and used by the Contractor for the safe and convenient prosecution of the work. Pipe, fittings, valves and other accessories shall at all times be handled with care to avoid damage. In loading and unloading they shall be lifted by hoist or derrick or rolled on skidways in such manner as to avoid shock. Pipe unloaded by skidding shall be protected from bumping contact with other pipe or the ground. Under no circumstances shall pipe be dropped.
- B. The Contractor shall carefully examine all pipes and other materials immediately before placing in the trench, and if any such pipes or materials are found to be defective they shall be rejected and removed from the work site.

610. BORING AND JACKING

- A. General.
 - 1. Boring and jacking shall be in accordance with Chapters 4.13.0 and 6.2.0 and File No. 49 of the "Standard Specifications", as amended herein.
 - a. The diameter of borings shall be no greater than the outside diameter of the bell of the carrier pipe or casing plus two inches. Voids occurring between the pipe or casing and the undisturbed natural soil shall be backfilled with a pea gravel/water slurry or other approved non-cementitious material.
 - 2. Where indicated on the Plans, Contractor shall construct //interceptor sewer// by boring and jacking methods.
 - 3. Jacking pits shall be located at Contractors discretion taking into account permit requirements, safety and protection of public and private property unless pit locations are indicated on the Plans.

B. Subsurface Conditions.

1. It is the Contractor's responsibility to familiarize himself with subsurface conditions at the site of boring or jacking work and the Contractor shall be responsible for complete and accurate installation regardless of the subsurface conditions encountered.

C. Alignment.

1. The Contractor shall be responsible for maintaining proper line and grade of the boring or casing pipe and shall check the alignment during boring or jacking operations at intervals he feels are necessary to maintain the proper alignment. The pipe or casing shall be installed at a positive or negative grade as indicated on the Plans with no intermediate high or low points. Misalignment of the bore or casing pipe shall be corrected at the Contractor's expense.
 - a. Pipe or casing shall be installed by jacking at the grade shown on the Plans. Final alignment of the pipe or casing shall be within three (3) inches of line and grade.
 - (1) The grade of the pipe, including both end elevations, will be checked by the Engineer upon completion of jacking operations and prior to backfilling of jacking pits. The Contractor shall expose both ends of the pipe and shall provide any assistance required by the Engineer when checking grade. The Contractor shall provide the Engineer with at least 24 hours advance notice when requesting alignment checks.
 - b. Sanitary sewer laterals installed by boring or directional drilling shall be placed at a grade of 1/4 inch per foot (2.08%) unless shown otherwise on the Plans. Vertical alignment of the completed bore shall be within 4 inches of grade and shall provide a continuous positive lateral grade.

D. Casing Pipe.

1. Casing pipe shall be ASTM A-53, Grade B, welded steel pipe with a minimum yield strength of 35,000 psi and thickness(es) of not less than:

Carrier Pipe Largest O.D.	Standard Size Casing Pipe	Casing	
		Minimum Wall Railroad	Minimum Wall Highway
10-3/4"	16"	.250"	.250"
16"	20"	.312"	.250"
20"	24"	.375"	.313"
24"	30"	.438"	.344"
30"	36"	.563"	.375"

36"	42"	.625"	.438"
42"	48"	.625"	.500"

2. Reinforced Concrete Pipe.

- a. ASTM C-76. All reinforced concrete casing pipe (RCP), unless shown otherwise on the Plans or otherwise specified below, shall meet the requirements of ASTM C-76 with rubber gasket joints conforming to ASTM C-443 and shall be manufactured using "C" wall design.
 - (1) All ASTM C-76 reinforced concrete casing pipe shall be class as shown on the Plans.
 - (2) Reinforced concrete pipe used for jacking or tunneling shall have a minimum of two (2) circular rings of reinforcement extending into both tongue and groove (bell and spigot) of pipe. The concrete shall have a minimum compressive strength of 5000 psi. This compressive strength shall be reached prior to delivery of the pipe to the site.

E. Inserting Carrier Pipe.

- 1. Carrier pipes installed within casing pipes shall rest on skids or centering devices securely fastened to the pipe to prevent slipping or 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.
 - a. The thickness of skids shall be varied through the casing, if required, to provide a positive grade on the carrier pipe.
 - b. If carrier pipes twist or turn during insertion operations, the pipe shall be withdrawn and reinserted until the carrier pipe rests level on the skids as inserted.
- 2. Skids or centering devices shall be designed to support the full weight of the carrier pipe full of water without imparting excessive point loading to the carrier pipe wall as determined by the pipe manufacturer. Skids or centering devices shall be placed, as a minimum, three per pipe length, one at each end approximately one foot from the joint and at the mid-point of the pipe length. Additional casing spacers may be required to support the weight of the loaded pipe as stated above. Two additional spacers shall be placed approximately one foot apart and one foot inside each end of the casing pipe.

- a. Skids shall be a minimum of three feet long 4" x 4" nominal maple hearts or approved equal with banding grooves that will prevent the bands and pipe bells from coming in contact with the casing.
 - b. Centering devices shall be RACI, Cascade, or Advance casing spacers or equal. Submit shop drawings, design data and loading calculations to Engineer for approval.
3. Contractor shall provide three copies of shop drawings and calculations indicating the design loading, circumferential spacing and longitudinal spacing. The calculations shall include a safety factor of not less than two.
4. 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. Rigid end seals that may result in a shear plane are not allowed. Flexible end seals shall be wrap around type manufactured to fit the casing and carrier pipe O.D.s with an adequate overlap for sealing with mastic cement. The seal shall be minimum 1/8 inch thick neoprene rubber fastened to the casing and carrier pipes with stainless steel bands with stainless steel screw assemblies.
5. Amend Paragraph 6.2.3(b) of the "Standard Specifications" to read in part: "The annular space between the casing and carrier pipes shall not be filled."
6. The cost of inserting carrier pipe including skids and/or centering devices within casing pipe shall be paid for at the unit price bid per foot for utilities.

611. DIRECTIONAL DRILLING

A. Work Included.

1. Furnish all labor, materials and equipment required to install //water main, force main and sanitary sewer// using directional drilling method of installation, all in accordance with the requirements of the Contract Documents. Work shall include but not be limited to proper installation, testing, restoration of underground utilities, environmental protection and restoration.
2. The directional drill shall be accomplished by drilling a pilot hole to design standards, and then enlarging the pilot hole no larger than that allowed in Subparagraph I.8 below to accommodate the pullback of the pipe through the enlarged hole.
3. Soil borings as required for directional drilling shall be provided by the Contractor.

B. Reference Special Provisions.

1. See Special Provision Section 205.1 for sanitary sewer pipe material to be installed by directional drilling.
2. See Special Provisions Section 305.1 for force main pipe material to be installed by directional drilling.
3. See Special Provision Section 505.3 for water main pipe material to be installed by directional drilling.

C. Quality Assurance.

1. All directional drilling operations shall be done by a qualified directional drilling Contractor with at least three (3) years experience involving work of a similar nature to the work required of this project.
2. Notify Engineer a minimum of 48 hours in advance of the date of work start.
3. All work shall be performed in the presence of the Engineer or his representative.

D. Directional Drilling Equipment Requirements.

1. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the installation, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be reused (if required), a magnetic guidance system or walk over system to accurately guide boring operations, a vacuum truck or trucks of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safe condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.
2. Drilling Rig: The directional drilling machine shall consist of a hydraulically powered system to rotate and push hollow drilling pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pullback pressure during pullback operations. Provide Engineer with a copy of the current, not more than six (6) months old, certification of the gage accuracy. There shall be a system to detect electrical current from the drill string and an audible alarm which automatically sounds when an electrical current is detected.

3. Drill Head: The drill head shall be steerable by changing it's rotation and shall provide necessary cutting surfaces and drilling fluid jets.
4. Mud Motors (if required): Mud motors shall be of adequate power to turn the required drilling tools.
5. Drill Pipe: Shall be constructed of high quality 4130 seamless tubing, Grade D or better, with threaded box and pins. Tool joints should be hardened.

E. Guidance System.

1. A guidance system probe or proven gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance shall be capable of tracking at all depths up to 50 feet and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall sense and display to 0.10% of inclination with an accuracy of $\pm 10\%$ of the indicated inclination. Horizontal location shall be maintained within 0.5 feet of alignment.
2. Components: The Contractor shall supply all components and materials to install, operate, and maintain the guidance system.

F. Drilling Fluid (Mud) System.

1. Mixing System: A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing.
2. Drilling Fluids: Drilling fluid shall be composed of clean water and bentonite clay. Water shall be provided by the Contractor. Water of a low pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or other approved modifier. No additional material may be used in drilling fluid without prior notification to Engineer. The bentonite mixture used shall have appropriate viscosities to support the drill hole during drilling and pullback.
3. Delivery System: The mud pumping system shall have an adequate capacity to deliver the drilling fluid to the drill head at a pressure suitable for the work. The delivery system shall have filters to prevent solids from being pumped into drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during operations shall be contained and conveyed to the drilling fluid recycling system or shall be removed. A berm, minimum of 12 inches high,

shall be maintained around drill rigs drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills into the surrounding environment. Pumps and/or vacuum truck(s) of sufficient size shall be in place to convey drilling fluid from containment areas to storage and recycling facilities or disposal.

G. Other Equipment.

1. Pipe Rollers: Pipe rollers shall be used for pipe assembly during final product pullback. (Fused joint pipe only.)

H. General Requirements.

1. The Engineer shall be notified 48 hours in advance of starting work. The directional bore shall not begin until the Engineer is present at the job site. The Engineer's approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as required under the Contract. It shall be the responsibility of Engineer to provide inspection personnel at such time as appropriate without causing undue hardship by reason of delay to the Contractor.

I. Directional Drilling Operation.

1. The Contractor shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the borehole shall be consistently maintained throughout the directional drilling operation. The method used to complete the directional drill shall conform to the requirements of all applicable permits. Copies of all permits obtained by the Owner are included in the Appendix of this Project Manual.
2. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on the Plans. If Contractor is using a magnetic guidance system, drill path shall be surveyed by Contractor for any surface geo-magnetic variations or anomalies.
3. Contractor shall place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by Contract Documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations.
4. Readings shall be recorded after advancement of each successive drill pipe, and the readings plotted on a scaled drawing of 1" = 20' horizontal and 1" = 2' vertical. Access to all recorded readings and plan and profile

information shall be available to the Engineer, or his representative, at all times.

5. A complete list of all drilling fluid additives and mixtures to be used in the directional drilling operation shall be submitted to the Engineer, along with their respective Material Safety Data Sheets. All drilling fluids and loose cuttings shall be contained in pits or holding tanks for recycling or disposal. No fluids shall be allowed to enter any unapproved areas or natural waterways. Upon completion of the directional drill project, the drilling mud and cuttings shall be disposed of by the Contractor at an approved dump site.
6. The pilot hole shall be drilled on bore path with no deviations greater than //10%// of Plan grade (6" maximum deviation) and //0.5// feet in horizontal alignment. In the event that pilot does deviate from the bore path more than stated above, Contractor will notify Engineer and Engineer may require Contractor to pullback and re-drill from a location along bore path before the deviation.
7. Upon completion of pilot hole phase of the operation, a complete set of "as-built" records shall be submitted in duplicate to the Engineer. These records shall include copies of the plan and profile drawing, as well as directional survey reports as recorded during the drilling operation.
8. Upon approval of the pilot hole location the hole opening or enlarging phase of the installation shall begin. The borehole diameter shall be increased to accommodate the pullback operation of the required size of water or sewer pipe. The type of hole opener or back reamer to be utilized in this phase shall be determined by the types of subsurface soil conditions that have been encountered during the pilot hole drilling operation. The reamer type shall be at the Contractor's discretion with the final hole opening not greater than the following:
 - a. C900 and C905 PVC pipe with bell joints or couplings:
 - (1) O.D. of the coupling or bell plus 4 inches.
 - b. C900 and C905 PVC pipe and C906 HDPE pipe with fused joints:
 - (1) 4" to 16" Nominal Diameter - O.D. plus 4 inches.
 - (2) 18" to 30" Nominal Diameter - O.D. plus 6 inches.
 - (3) 36" to 48" Nominal Diameter - O.D. plus 8 inches.
 - c. Ductile iron pipe with flexible restrained joints.
 - (1) 1.5 times the O.D. of the pipe.

9. The open borehole may be stabilized by means of bentonite drilling slurry pumped through the inside diameter of the drill rod and through openings in the reamer. The drilling slurry must be in a homogenous/flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. The volume of bentonite mud required for each pullback shall be determined by the Contractor. The bentonite slurry shall be contained at the exit or entry side of the directional bore in pits or holding tanks. The slurry may be recycled for reuse in the hole opening operation, or shall be hauled by the Contractor to an approved dumpsite for proper disposal.
10. The //sewer / force main / water// pipe shall be joined together according to manufacturer's specifications. The //gaskets and the //ends of pipe shall be inspected and cleaned prior to each joint assembly. The ends of pipe shall be free of any chips, scratches, or scrapes before pipe is assembled. A pulling eye shall be attached to the pulling head on the lead stick of pipe, which in turn shall be attached to a swivel on the end of the drill pipe. This shall allow for a straight, smooth pull of the //sewer / force main / water// pipe as it enters and passes through the borehole toward the drill rig. The pipe shall be adequately supported, to eliminate bending stresses as the pipe is pulled into the exit hole. The pullback phase of the directional drilling operation shall be carried out in a continuous manner until the pipe reaches the original entry side of the bore.

J. Record Keeping and As-Builts.

1. Contractor shall maintain a daily project log of drilling operations and a guidance system log with a copy given to the Engineer at completion of project.
2. The guidance system data shall be recorded //every 25 feet //during the actual drilling operation. The Contractor shall furnish "as-built" plan and profile drawings based on these recordings showing the actual location horizontally and vertically of the installation, and all utility facilities found during the installation. The guidance system data shall be certified accurate within the tolerance allowed in these Special Provisions by the Contractor.

K. "Frac-Out" Containment Procedures.

1. Should a "frac-out" occur, where by drilling fluids find and flow to a seam exposure, the drilling process shall immediately stop.
2. The area in question shall be contained using sand bags and resulting fluid shall be removed with vacuum excavation equipment supplemented with hand tools as necessary. Vacuum trailers or trucks shall be on site at all times during the drilling and pipe installation process. Resulting fluids shall be removed to a suitable disposal location.

3. The bore shall then be assessed and evaluated to formulate a satisfactory adjustment in additives at the point of obstruction before the bore can be continued.
 - a. Should a “frac-out” occur, the bore hole shall be stabilized by use of “N-Seal” by Baroid or approved equal. The product shall have a proven history of successfully sealing “frac-outs” and shall be non-toxic and environmentally inert.
4. If efforts to seal the “frac-out” are unsuccessful, the bore shall be abandoned.

L. Environmentally Sensitive Areas.

1. In environmentally sensitive areas the “frac-out” containment procedures listed in K above shall be modified to include the following:
 - a. DNR staff shall be contacted 24 hours prior to initiating the bore.

District Water Management Specialist:

Name: _____

Phone: _____

Phone: _____

- b. The Contractor shall dedicate on-site staff to follow the route of the bore for quick identification of a frac-out. This person shall have direct communication with the bore operator to cause immediate shutdown of equipment if drilling mud is observed.
- c. DNR staff, see list above, shall be contacted immediately if a “frac-out” occurs.
- d. The Contractor shall have the following equipment on site:
 - (1) Silt fence.
 - (2) Prefilled sand bags.
 - (3) Tools including shovels, buckets, and trowels.
 - (4) Portable pumps and hoses.
 - (5) Applicable MSDS for any additives used in the process.
 - (6) Vacuum trailers or truck.
- e. All equipment shall be on-site and in adequate supply prior to starting drilling operations.

- f. The Contractor shall supply sufficient staff to contain drilling mud immediately upon identification.
- g. Once a frac-out has been identified, all of the following courses of action shall be examined:
 - (1) Reducing drilling mud pressure.
 - (2) Temporarily stopping advancement of the drill (rotation may continue).
 - (3) Modification of composition of the drilling mud.
 - (4) Sizing the bore hole annulus to re-open the circulation pathway.
- h. In the event that the bore hole must be abandoned, the hole shall be filled with thickened drilling mud as the drill assembly is extracted. A concrete plug shall be used to cap the drilling mud.

620. SANITARY SEWER LATERAL RELAY

A. Definition of Conflict.

- 1. The Contractor shall take all precautions necessary to protect sanitary sewer laterals not conflicting with the new storm sewer from being damaged. Conflict between sanitary sewer laterals and storm sewer is defined as those laterals with less than four (4) inches of separation from the storm sewer. The Contractor shall relay laterals conflicting with the storm sewer to provide four (4) inches minimum of clearance unless directed otherwise by the Engineer.
- 2. The Contractor shall take all precautions necessary to protect sanitary sewer laterals not conflicting with the new water main from being damaged. Conflict between sanitary sewer laterals and water mains is defined as those laterals with less than six (6) inches of separation from the water main. The Contractor shall relay laterals conflicting with the water main to provide six (6) inches minimum of separation where laterals pass under water mains and eighteen (18) inches minimum of separation where laterals pass over water mains.

B. Construction Procedure.

- 1. Conflicting sanitary laterals shall be relaid from the main sewer line to a point two feet past the new water main or storm sewer. Lateral pipe material shall match the size of the existing lateral.

2. The connection to the main sewer shall be made with a new wye or tee, unless the existing connection is satisfactory, with the lateral opening placed at the springline of the main sewer and the lateral laid at a minimum 1.04% grade or as required to provide the necessary clearance.
 3. Changes in vertical alignment may be made using bends.
- C. Lateral Pipe Material.
1. Sanitary sewer lateral pipe material shall be polyvinyl chloride (PVC) pipe conforming to the following:
 - a. Polyvinyl chloride (PVC) sewer pipe meeting the requirements of ASTM D-3034, SDR-35, with integral bell type flexible elastomeric joints meeting the requirements of ASTM D-3212.
 - b. Connect new pipes to existing pipes having different types of material with approved watertight adaptors.

625. WATER SERVICE RELAY

- A. Water service relays and offsets shall be coordinated with the Village of Yorkville Water Utility.

630. WATER MAIN OFFSETS

- A. Water service relays and offsets shall be coordinated with the Village of Yorkville Water Utility.

635. TRACER WIRE

- A. Tracer wire shall be installed with all underground utilities and storm sewers including laterals installed under this Contract, which are not identified by surface facilities such as manholes. Installation shall conform to Chapter 2.11.0, File No. 24A and File No. 24B of the “Standard Specifications” or as modified by the following Special Provisions.
- B. Material.
 1. Tracer wire for use in open cut construction shall be 12 gauge multiple stranded copper wire insulated for underground installation. Tracer wire for use with horizontal directional drilling shall be 8 gauge multiple stranded copper wire insulated as specified above.

2. Tracer wire insulation shall conform to the uniform color code adopted by the American National Standard Institute. Tracer wire for:
 - a. Sanitary sewer and laterals shall be green.
 - b. Water mains and services shall be blue.
 - c. Force mains shall be green with yellow stripe.
 - d. Storm sewers and laterals shall be brown.

Note: If wire with identifying stripes as in c above is not readily available, the Contractor may identify coils at ends of laterals and “pig tails” in pullboxes with electrical “phase” marking tape of the same color as that called for stripes.

3. Splices.

- a. Tracer wire shall be continuous between exposed connection points unless splicing is approved by the Engineer.
- b. Wire splices shall be in accordance with standard electrical practices. Acceptable wire splices are brass split bolts, Dryconn Waterproof Connectors or Snap-loc Model LV 9500 and Copperhead SnakeBite™ Locking Connectors. Wire nuts are not acceptable.
 - (1) Branch connections utilizing split bolts. Splice branch tracer wire to the main tracer wire using the following procedure:
 - (a) Bare tracer wire on main line (do not cut).
 - (b) Connect branch wire to main line with brass split-bolt.
 - (c) Seal the connection with rubber electrical tape and overwrap with 2 layers of polyethylene adhesive tape 1-1/2" wide and 8 mils thick.
 - (2) Branch connections utilizing other approved connectors, follow manufacturers' recommendations.

- C. Installation.

1. In open cut construction, place the tracer wire at the springline of the main or lateral and tape to the pipe at 5 foot intervals.

2. For horizontal directional drilling type construction, tape the tracer wire to the pipe at 5 foot intervals leaving sufficient slack to accommodate the stretching of the pipe during pull-back.

D. Electrical Connections.

1. The wire shall be positively electrically connected to valve boxes and hydrants with the wire extended to the top of valve boxes and hydrants for future connection.
2. Tracer wires shall identify sanitary sewer and storm sewer laterals and water services.
 - a. Sanitary sewer laterals shall have tracer wire run from main to lateral marker board at right-of-way, up the lateral marker board, then back down and terminating at the right-of-way line with a 5 foot coil of wire and all the while maintaining a continuous loop.
 - b. Storm sewer laterals shall have tracer wire run from main to lateral marker board at right-of-way, up the lateral marker board, then back down and terminating at the right-of-way line with a 5 foot coil of wire and all the while maintaining a continuous loop.
 - c. Water services shall have tracer wire run from main to curb box at right-of-way, up the curb box, then back down and terminating at the right-of-way line with a 5 foot coil of wire and all the while maintaining a continuous loop.
2. Tracer wires identifying force mains shall be accessed in an upper section of a valve box with cover marked sewer at approximately 500 foot intervals, at all angle points, and at other convenient locations as shown on the Plans.

E. Grounding.

4. Tracer wire must be properly grounded at all dead-ends/stubs.
5. Grounding of tracer wire shall be achieved by using a 1.5-lb, drive-in, magnesium Ground Rod with a minimum 20-feet, #12 red HDPE insulated copper-clad steel wire connected to the rod specifically manufactured for this purpose.

F. Testing.

1. The Contractor shall test all tracer wire for electrical continuity prior to acceptance of the main or service lateral to which it is accessory.

650. EROSION CONTROL

A. General.

1. The Contractor shall take all measures necessary to minimize erosion, water pollution and siltation caused by construction of this project. Erosion control measures shall be in accordance with Chapter 2.8.0 of the “Standard Specifications”, Subsection 107.20 and Section 628 of the “State Specifications”, the details shown on the Plans and in the Appendix.

The Contractor shall use the standards prepared by the Wisconsin Department of Natural Resources as a reference and guide for erosion control practices. The standards are maintained and located on the Wisconsin Department of Natural Resources website at:

www.dnr.wi.gov/runoff/stormwater/techstds.htm

The Contractor shall comply with the provisions of local erosion control plans and/or ordinances.

2. Erosion Control Plan.
 - a. Prior to beginning work, the Contractor may be required to submit an erosion and sediment control plan, detailing specific measures that will be employed in the various stages of construction for approval by the Engineer and/or Village.
3. Implementation.
 - a. The Contractor shall not begin work until after initial erosion and sediment control devices are in place and approved by the Engineer.
4. Costs.
 - a. All costs associated with erosion control measures and devices, unless bid separately in the Bid Form or listed in the Schedule of Supplemental Unit Prices, shall be included in the unit prices bid for other items.

B. Erosion Control Measures.

1. Erosion control measures shall include, but not be limited to the following:
 - a. Divert upstream runoff from flowing through the construction site.
 - b. Protect downstream or adjacent waterways and wetlands with silt fence.

- c. Delay stripping topsoil until required for construction.
 - d. Place erosion control bales or stone check dams in ditches and other drainageways to collect sediment and to slow the velocity of runoff.
 - e. Construct sedimentation basins.
 - f. Protect storm sewer inlets and the upstream end of culverts with erosion control bales or stone check dams.
 - g. Prompt removal of excavated material.
 - h. Proper storage of backfill and bedding materials including placing silt fence or erosion control bales on the downslope sides of spoil piles.
 - i. Construction of gravel access roads to construction sites to prevent sediment from being tracked onto roadways.
 - j. Prompt (same-day) cleanup of material tracked onto adjacent streets.
 - k. Timely restoration of damaged surface areas.
 - l. Temporary seeding.
 - m. Install silt fence on both sides of the construction corridor through wetland areas as well as at all edges of wetland areas.
2. Temporary Erosion Control Measures.
- a. The Contractor shall construct temporary erosion control measures, where erosion is likely to be a problem, prior to beginning work on those section(s) of the project. Temporary erosion control measures shall be maintained until after permanent erosion control, such as seeding or sodding, has been established.
 - b. In the event that permanent erosion control measures are not fully implemented in the current construction season, the Contractor shall be responsible for maintaining all necessary temporary erosion control measures until after permanent measures have been completed in the following year.

C. Construction Pit Dewatering.

- 1. The Contractor may be required to treat effluent from construction pit dewatering prior to the direct discharge to surface waters or wetlands.
- 2. Dewatering treatment practices shall be implemented in accordance with DNR Dewatering Technical Standard 1061.

3. Refer to Subsection 102.A of these Special Provisions for instructions for obtaining discharge permits.
- D. Dust Control.
1. The Contractor shall minimize the dispersion of dust caused by construction operations in accordance with DNR Dust Control Technical Standard 1068.
- E. Construction Within Drainageways.
1. Construction work within ditches or drainage swales shall not be allowed to disrupt the existing drainage pattern for a distance greater than 500 feet at one time unless otherwise approved by the Engineer. The Contractor shall be responsible for providing temporary drainage around the work area when existing drainage patterns are interfered with.
 - a. Protect the upstream end of culverts with erosion bales or sand bags.
 2. Ditches shall be reshaped to their existing cross-section immediately after construction work on that section of the project has been substantially completed. The Contractor shall take all measures necessary to prevent erosion of drainageways.
 3. Temporary and permanent erosion control measures, including erosion bales, stone check dams, silt fence, riprap and lawn restoration including erosion mat, shall be performed in a timely manner and in accordance with the requirements of these Special Provisions.
- F. Installation, Inspection, Maintenance and Restoration of Erosion Control Devices.
1. General.
 - a. This subsection applies to all erosion control devices used on this project.
 2. Installation.
 - a. Install or place erosion control devices either (as appropriate):
 - (1) Prior to beginning construction activities;
 - (2) Immediately after grading of ditches or slopes is completed;
 - (3) Immediately after completing lawn restoration; and/or
 - (4) When so ordered by the Engineer.

3. Inspection.
 - a. Inspect erosion control devices:
 - (1) Within 24 hours after each 0.5 inch or greater rainfall;
 - (2) At least daily during prolonged rainfall; and
 - (3) At least once every seven days.
4. Maintenance.
 - a. Maintain erosion control devices for the duration of the project and until after slopes and ditches have been stabilized and turf developed to the extent that future erosion is unlikely, at which time the Contractor shall remove the temporary erosion control device(s).
 - b. Remove sediment deposits when the build-up exceeds approximately one-half the volume capacity of the erosion control device.
5. Restoration.
 - a. Restore areas immediately after removing erosion control devices by reshaping or regrading and placing topsoil, fertilizer, seed and mulch. Place erosion mat, if required to control erosion.

G. Erosion Bales.

1. The Contractor shall place erosion bales of straw, hay or other suitable baled material to form checks or dikes as required to control erosion, including at locations shown on the Plans. Placement and maintenance of erosion bales shall be in accordance with Subsections 628.3.3 and 628.3.14 (temporary ditch checks) of the “State Specifications” and the Standard Detail Drawings shown in the Appendix of this Project Manual.
2. Temporary Ditch Checks.
 - a. Place a double row of erosion bales as shown in the Standard Detail Drawings in the Appendix.

H. Silt Fence.

1. The Contractor shall place silt fence as required to control erosion, including at the locations shown on the Plans. Silt fence shall be placed and maintained in accordance with Subsection 628.3.4 of the “State Specifications” and the Standard Detail Drawings shown in the Appendix of this Project Manual.

- a. Furnish fabric with a top support cord.
- b. Install tie backs in areas of heavy flow or where directed by the Engineer.

2. Ditches/Drainageways.

- a. Do not use silt fence in ditches or drainageways.

I. Wetland Protection.

1. The Contractor shall install a sediment filtration device within wetlands, where shown on the Plans. The device is used in place of silt fence, allowing greater water passage than silt fence while trapping soil particles.

2. Material.

- a. The sediment filtration device (biodegradable) shall be “Sediment STOP” manufactured by North American Green of Evansville, Indiana, or equal.

3. Installation.

- a. Install the device per manufacturer’s recommendations.

J. Erosion Mat.

1. General.

- a. The Contractor shall place erosion mat over all restored ditches (bottoms and side slopes), slopes greater than 10%, areas shown on the Plans or specified below. The Contractor may also place erosion mat to improve grass seed germination and growth.

2. Material.

- a. Erosion mat materials shall be as specified herein and/or in the Wisconsin Department of Transportation’s Product Acceptability Lists (PAL) included in the Appendix.

(1) Low Flow (Ditches - Typical).

- (a) Erosion mat shall be WisDOT Class I, Type B, double netted mat.

(2) High Flow (Specified on Plans).

- (a) Erosion mat shall be WisDOT Class II, Type B, long lasting organic mat.

(3) Urban - Short Term (Residential Lawns).

(a) Erosion mat shall be WisDOT Class I, Urban, Type A, short term except the mat shall be double netted. Use biodegradable anchoring devices only per PAL.

(4) Turf Reinforcement Mat (TRM) - (Emergency Spillways).

(a) TRM shall be WisDOT Class III, Type B, double netted mat.

3. Installation.

a. Install erosion mat in accordance with Subsection 628.3.2 of the "State Specifications", the details in the Appendix of this Project Manual and the manufacturer's recommendations. The Contractor shall provide the Engineer with one (1) full set of manufacturer's literature and installation instructions for each product prior to installing erosion mat.

K. Stone Check Dam.

1. The Contractor shall construct stone check dams in ditches or drainageways at the locations shown on the Plans. Construct stone check dams in accordance with the details in the Appendix.

L. Inlet Protection.

1. The Contractor shall install inlet protection on all existing and new catch basins and storm sewer inlets, both within the construction limits and downstream of the project as noted on the Plans, in accordance with Subsection 628.3.13 of the "State Specifications" and the Standard Detail Drawings in the Appendix.

M. Stone Tracking Pad.

1. The Contractor shall install stone tracking pads to reduce the amount of sediment tracked onto roads at the locations shown on the Plans, and at other access points.

2. Construction.

a. Construct pads using a minimum of 12 inches of 3" to 6" clean aggregate with minimum dimensions of 12 foot in width (matching the width of the egress point) by 50 feet in length. Construct pads on a WisDOT Type R geotextile fabric in wet ground conditions. Extend and/or widen pads if required to prevent tracking.

- b. Repair and clean pads as required.
 - c. Remove tracking pads after construction has been completed and restore the area.
 - 3. Tire Washing.
 - a. If all sediment is not removed by the tracking pad, then tires shall be pressure washed prior to exiting the site.
 - b. Contractor shall be required to power wash equipment to remove all plant material and soil from the equipment to be used in and adjacent to prairie and wetland areas and where rivers or streams are to be crossed.
- N. Soil Stabilizer.
 - 1. General.
 - a. The Contractor shall apply soil stabilizer over all disturbed areas where final lawn restoration has not been completed (i.e., topsoil, seed, mulch, and matting) and erosion is occurring.
 - 2. Material.
 - a. The soil stabilizer shall be on WisDOT's Product Acceptability Lists (PAL) and shall be a Type B anionic polyacrylamide.
 - 3. Application.
 - a. Apply soil stabilizer in accordance with Subsection 628.3.12 of the "State Specifications" and the Department of Natural Resources (DNR) Conservation Practices Standards 1050.
 - b. Test soil types to insure proper material selection.
 - c. Apply per manufacturer's recommendations. Provide the Engineer with a copy of the manufacturer's product literature and suggested application method(s).
 - d. Do not apply to channel bottoms.
- O. Temporary Sedimentation Basins.
 - 1. The Contractor, when required, shall construct temporary sedimentation basin(s) at location(s) shown on the Plans. The basins shall be filled in and banks removed after slopes and ditches have been stabilized and turf developed to the extent that future erosion is unlikely. The basin area shall

be reshaped and restored by seeding in accordance with Subsection 820.A of these Special Provisions.

2. Polymers (Settling Suspended Sediment).

a. The Contractor shall install product(s) containing polymers to promote settling out of suspended sediments in sediment basins if required to improve the sediment removal efficiency of the basin.

b. Material.

(1) The polymer shall comply with DNR Conservation Standard 1051, be on WisDOT's Product Acceptability Lists (PAL) and shall be in the anionic form only.

(2) Use "Floc Logs" as manufactured by Applied Polymer Systems, Inc., of Woodstock, Georgia, or equal.

c. Installation.

(1) Place the product in ditches or swales upstream of all sediment traps and detention/retention basins used for sediment control. Install the product in the lower one-third of the swale, about 100 feet upstream of the basin to provide mixing and reaction time, to intercept and treat as much runoff as possible.

(a) Application locations may be shown on the Plans.

(2) Install the polymer product in accordance with the Department of Natural Resources (DNR) Conservation Practices Standards 1051.

(3) Test soil types to insure proper material selection.

(4) Install per manufacturer's recommendations. Provide the Engineer with a copy of the manufacturer's literature and suggested application method(s).

P. Temporary Seeding.

1. The Contractor shall restore all grass and terrace areas within sections shown on the Plans as "Temporary Seeding" with a temporary seeding composed of 100% oats (annual rye grass - optional) at a seeding rate of 2 pounds per 1,000 square feet. Temporary seeding shall include placing topsoil in accordance with Subsection 820.A of these Special Provisions. The temporary seeding shall be placed within ____ days after work on the project has been substantially completed. Permanent lawn replacement

shall be placed as early as possible in the spring of the following year, but no later than May 15, ____.

655. EROSION CONTROL PLAN

A. Erosion Control Measures.

All erosion control measures shall be in accordance with Section 650 of these Special Provisions and the provisions of the Wisconsin Department of Natural Resources website for the erosion control technical standards at www.dnr.wi.gov/runoff/stormwater/techstds.htm

B. Construction Activity.

1. Description.

Major construction activities on this project include:

- a. clearing and grubbing
- b. site grading
- c. detention pond(s)
- d. ditching
- e. road construction
- f. sanitary sewer
- g. water main
- h. storm sewer

2. Construction Sequence.

Construction activities will generally consist of the following work sequence:

- a. install temporary erosion control
- b. clearing and grubbing
- c. construct detention ponds for temporary use as sediment traps
- d. construct ditches to divert or direct runoff
- e. site grading and rough cut roads

Opt.—Strip topsoil from road right-of-ways prior to utility construction.

- f. install sanitary sewer, water main, and storm sewer
- g. finish grade roadways and complete site grading
- h. place salvaged topsoil, fertilize, seed, and mulch, and install permanent erosion control measures

C. Erosion Control Sequence.

No construction may proceed until after the appropriate erosion control devices have been installed and approved by the Engineer. Erosion control measures or devices shall be installed in the following sequence.

1. Preconstruction Erosion Control Measures.
 - a. Install silt fence around the project perimeter.
 - b. Construct sediment traps.
 - c. Construct detention ponds if used for sediment control.
 - d. Protect existing culverts and storm inlets with erosion bales or silt fence.
 - e. Construct stone construction site access roads.
2. Erosion Control Measures Installed During Construction.
 - a. Place erosion bales in rough graded drainageways and roadside ditches.
 - b. Protect stockpiles with silt fence.
 - c. Immediate restoration of critical areas such as stream banks.
 - d. Maintenance of erosion control devices.
3. Permanent Erosion Control Measures
 - a. Seed and mulch immediately after placing topsoil.
 - b. Place sod in highly erodible areas.
 - c. Install erosion control fabric.
 - d. Place erosion bales on steep slopes in ditches.
4. Post Construction Activities.
 - a. Remove all temporary erosion control devices after permanent erosion control has been established and the site is stabilized.
 - b. Restore areas from which erosion control devices have been removed by seeding, mulching, and erosion mat or sodding as directed by the Engineer.

700. BACKFILLING UTILITY TRENCHES

A. Excavated Material Backfill.

1. Excavated material, in accordance with Section 8.43.5 of the “Standard Specifications”, may be used to backfill trenches as shown on the Plans, except as provided for in Paragraph 2 below.
 - a. If excavated material is unsuitable for backfilling, trenches shall be backfilled with granular material when so ordered by the Engineer. The cost of disposing of unsuitable (surplus) materials and furnishing and placing granular backfill will be paid for at the price bid in the Schedule of Supplemental Unit Prices. The volume of material will be based upon field measurements of the trench.
2. Granular or Slurry Backfill Required in Place of Excavated Material Backfill.
 - a. The following categories of trenches, in sections specified on the Plans as excavated material backfill, shall be backfilled with granular material, unless slurry backfill is specified in Subsection 700.__ (slurry backfill) of these Special Provisions. The cost of furnishing and placing granular backfill and/or slurry backfill and disposing of excavated material shall be included in the unit price(s) bid for utilities.

(1) Existing Pavements and Shoulders.

- (a) Trenches extending to within or under existing paved roads and gravel shoulders, in sections allowing excavated material backfill, shall be backfilled with granular material, unless slurry backfill is specified in Subsection 700.__ (Slurry Backfill) of these Special Provisions; except as modified below.

1) Shoulder Width Less Than 3 Feet.

- a) Trenches extending to within three (3) feet of the pavement shall be backfilled with granular material regardless of the shoulder width. (Three [3] foot minimum shoulder granular backfill.)

2) Shoulder Width Greater Than 5 Feet.

- a) Trenches located more than five (5) feet beyond the edge of the pavement

may be backfilled with excavated material regardless of the shoulder width. (Five [5] foot maximum shoulder granular backfill.)

- (2) Structures Located Within Roadways or Other Improved Surfaces.
 - (a) Trenches within fifteen (15) feet of manholes (measured from the center of manholes), located within existing or proposed roadways or other paved or graveled surfaces, shall be backfilled with granular material.
 - (b) Trenches within ten (10) feet of catch basins and valve boxes, located within existing or proposed roadways or other paved or graveled surfaces, shall be backfilled with granular material.
- (3) Driveways, Parking Areas, and Cross Streets.
 - (a) Trenches through paved or graveled surfaces, such as driveways, parking areas, or cross streets, but not including parallel gravel shoulders, in sections allowing excavated material backfill, shall be backfilled with granular material within one half-to-one slopes extending downward and outward from the edges of such improved surfaces.
- (4) Sewer Laterals and Water Services.
 - (a) Sewer lateral and/or water service trenches through roads, shoulders, parking areas and driveways in sections allowing excavated material backfill shall be backfilled with granular material within one half-to-one slopes extending downward and outward from the edges of gravel and paved areas or from the back of curb and gutter, unless slurry backfill is specified in Subsection 700.__(slurry backfill) of these Special Provisions.

B. Granular Backfill.

1. Granular backfill, in accordance with Table 37 of Section 8.43.4 of the “Standard Specifications”, shall be used to backfill trenches as shown on the Plans, except as provided for below. The cost of furnishing and placing granular backfill and disposing of excavated material shall be included in the unit price(s) bid for utilities.

a. If excavated material is suitable for use as granular backfill, trenches shall be backfilled with suitable excavated granular material when so ordered by the Engineer. A credit for using excavated material backfill in place of granular material will be figured based upon the price bid in the Schedule of Supplemental Unit Prices. The volume of material will be based upon field measurements of the trench.

2. Slurry Backfill Required In Place of Granular Backfill.

a. Refer to Subsection 700.____ of these Special Provisions for categories of trenches requiring slurry backfill, although specified on the Plans as granular backfill. The cost of furnishing and placing slurry backfill shall be included in the unit price(s) bid for utilities.

b. State Highways.

(1) Granular backfill placed within state highway right-of-ways shall conform to Section 209 of the "State Specifications".

3. Sewer Laterals and Water Services.

a. Sewer lateral and/or water service trenches through lawn or terrace areas in sections requiring granular backfill may be backfilled with excavated material outside of one half-to-one slopes extending downward and outward from the edges of pavement and gravel areas or from the back of curb and gutter.

C. Slurry Backfill.

1. "Slurry" aggregate material shall be used to backfill trenches as shown on the Plans.

a. The slurry backfill material must be prepared in the quantities noted below. The material shall be placed in a clean cement mixer truck and thoroughly mixed.

1,350 lbs. Sand

775 lbs. #1 Stone (1 inch)

1,150 lbs. #2 Stone (2 inch)

25 gals. (+0 to -0.5 gal.) Water per cubic yard

b. No additional water will be allowed. The above weights are damp weights.

c. Just prior to placing the slurry, the mixer shall be run at mixing speed for one full minute to insure an even mixture.

d. Compaction of slurry backfill is not required.

2. State Highways.
 - a. Trenches located under the traveled roadway of State Highways shall be backfilled with “slurry” material between points located 5 feet beyond the edge of shoulders or the back of curb and gutter.

D. Consolidation.

1. Amend Section 2.6.14 of the “Standard Specifications” to read in part:

“All granular and excavated material backfill shall be consolidated through mechanical compaction by means of a backhoe boom-mounted compactor. Either a vibratory compactor or compaction wheel is acceptable if it can meet the densities specified below. The backhoe used for compaction shall be equal in reach to the backhoe used for excavating the trench; i.e., capable of reaching the bottom of the trench with no additional shelf excavation. Backfill shall be compacted in eighteen (18) inch maximum lifts, before compaction, unless noted otherwise below, except that the first lift shall be two (2) feet in depth. The Contractor shall take all precautions necessary to protect utilities from being damaged during backfilling and compaction operations.”

- a. Granular backfill shall be compacted to a minimum of 95% Standard Proctor Density.
 - b. Excavated material backfill shall be compacted to a density equal to 100% of the density of the undisturbed material in adjacent trench walls.
 - c. Topsoil shall not be compacted.
 - d. State Highways.
 - (1) Backfill placed within state highway right-of-ways shall be compacted in 12” maximum lifts, except that the first lift shall be two (2) feet in depth.
2. If there is a question as to whether or not the specified density has been achieved, a soil testing firm selected by the Engineer will be brought in to determine the backfill density. The cost of this testing will be paid for by the Owner if the test results are satisfactory, however, if the backfill is found to be inadequately compacted, the Contractor shall pay all testing costs.
 3. If the Contractor desires to use alternate compaction equipment or backfill depths greater than those specified, documentation must be submitted to the Engineer substantiating the adequacy of the proposed compaction method. Alternate compaction methods shall not be used unless approved by the Engineer. The Engineer may require density testing by an approved soil testing firm to field verify backfill densities. All compaction testing costs

for field verifying alternate compaction methods shall be paid for by the Contractor.

E. Special Compaction Procedure (Density Testing).

“Backfill placed within paved roadways on County Highway right-of-ways shall be backfilled and compacted in accordance with the requirements for ‘Special Compaction Procedure Within County Trunk Highway Right-of-Ways’. A copy of the ‘Special Compaction Procedure’ is included in the Appendix.”

F. Surplus Excavated Material.

1. Surplus excavated material shall be disposed of by the Contractor at his own option and cost in accordance with Section 2.2.11 of the “Standard Specifications” and these Special Provisions.
2. The Contractor shall be responsible for obtaining the use of all “off site” disposal sites and all necessary permits, unless the site is designated by the Owner. Disposal sites designated by the Owner shall be kept neat, leveled, and graded to drain. Material lost from trucks in transit shall be cleaned up immediately. Material not properly cleaned up will be removed by the Owner and the cost thereof charged to the Contractor.
 - a. Refer to Subsection 102.A of these Special Provisions for disposal site permit requirements.
3. Surplus excavated materials shall not be deposited within floodplains, marshes or other wetland areas.
4. All costs for disposal of surplus materials shall be included in the unit prices bid for other items.

800. SURFACE REPLACEMENT AND SITE RESTORATION

A. General Replacement.

1. The provisions of Sections 2.6.11 and 2.7.2 of the “Standard Specifications” are modified as follows:
 - a. The Contractor shall replace or restore, unless specified otherwise, any sidewalk, driveway, curb, gutter, shoulder, pavement, culvert, lawn, ditch, fence, sign, mailbox, address marker or other property damaged by him at his own cost. Minimum requirements for restoration and replacement shall be in accordance with the applicable sections of these Special Provisions.

(1) The Contractor is specifically directed to replace or reinstall all mailboxes, address markers and street signs removed or damaged by his operations.

b. Damaged concrete pavements and driveways, sidewalks and curb and gutter shall be removed and replaced to existing joints.

c. Restoration of pavements damaged by normal truck hauling operations; i.e., hauling within approved weight and speed limits and exercising reasonable care while starting, stopping or turning vehicles, will not be the responsibility of the Contractor. This provision does not apply to pavement damaged by truck wheels during loading or unloading operations.

2. Mailbox Relocation.

a. The Contractor shall relocate all mailboxes, including those not damaged or disturbed by his operations, to meet U.S. Postal Service Requirements, a copy of which is included in the Appendix. The cost of this work shall be included in the unit prices bid for other items.

3. Temporary Street Signs.

a. The Contractor shall erect and maintain temporary street signs until the Owner installs permanent street signs.

4. Correction of Minor Replacement Problems.

a. Any minor construction related replacement or restoration problems, brought to the Contractor's attention, shall be corrected within 24 hours or this work may be done by the Owner's personnel with the cost deducted from monies owed the Contractor.

b. Minor problems might include: driveway access restrictions caused by rutting, settling or other maintenance problems, damaged or removed mailboxes, blockage of surface drainage and erosion problems.

B. Culverts.

1. Amend Section 2.1.2 of the "Standard Specifications" to include the following:

"The Contractor shall remove and protect culverts conflicting with the utility work and shall replace the culverts to their original line and grade upon completion of utility installation in the immediate area."

C. Property Corner Monuments.

1. Contractor's attention is directed to Section 2.1.4 of the "Standard Specifications" requiring the Contractor to protect property corner monuments, excluding those monuments within or adjacent to trench excavations or road grading limits, from being damaged. The Contractor shall notify the Engineer at least 48 hours prior to removing or disturbing any property corner monuments within his construction limits, to allow the Engineer to tie in the location of these monuments prior to their removal.

a. The Engineer will replace all damaged property corner monuments previously tied in as stated above.

b. All damaged property corner monuments shall be replaced by a Registered Land Surveyor at the Contractor's expense if the monument is:

(1) Located within the construction limits, but not tied in by the Engineer due to the Contractor's failure to notify the Engineer as stated above; or

(2) Damaged due to careless operations outside of the excavation limits.

2. Public Land Survey System (PLSS) and All Other Survey Monuments.

a. The Contractor shall notify the County Surveyor at least 48 hours prior to removing or disturbing any PLSS monuments within his construction limits and shall coordinate with the County Surveyor regarding the tying in, removal, and salvaging of these monuments.

b. For all other survey related monuments, other than property corner monuments, the Contractor shall contact the appropriate agency responsible for the installation and perpetuation of these monuments at least 48 hours prior to removing or disturbing any monument within his construction limits and shall coordinate with the appropriate agency regarding the tying in, removal, and salvaging of these monuments.

c. The Contractor shall confirm that all such monuments have been tied in prior to removal. Monuments not tied in prior to removal shall be replaced by a Land Surveyor Registered in the State of Wisconsin at the Contractor's expense.

D. Pavement Protection.

1. The Contractor shall take all precautions necessary to protect road pavements, including shoulders, from being damaged. Sheathing and bracing or the use of a portable trench box, if required, shall be in accordance with Chapter 2.3.0 of the "Standard Specifications".

2. Backfill or excavated material spilled or tracked onto pavements or shoulders shall be removed at the completion of each working day or as directed by the Engineer. Any such materials interfering with traffic shall immediately be swept off with power brooming equipment.
- E. Pavement Replacement.
1. See Sections 810 and 815 of these Special Provisions.
- F. Pavement Marking Replacement.
1. Pavement markings shall be replaced in-kind in accordance with Section 646 of the “State Specifications”.
- G. Lawn Replacement.
1. See Section 820 of these Special Provisions.
- H. Field Restoration.
1. All trenches crossing fields (croplands) shall be restored as follows:
 - a. Strip all topsoil from over trenches, stockpile within easement areas and replace over trenches after backfill materials have been compacted.
- I. Clearing and Grubbing.
1. Amend Sections 2.1.3 and 2.2.15 of the “Standard Specifications” to read in part:

“The Contractor shall cut down and remove all trees, stumps, bushes, shrubs and brush interfering with construction of utilities as shown on the Plans and as approved by the Engineer. No trees, unless marked on the Plans with an “X” for removal, may be removed without the Engineer’s approval. The Engineer will field verify and mark all trees to be removed from within easement areas. The cost of tree clearing and grubbing shall be included in the unit price(s) bid for utilities.”

 - a. Refer to Subsection 102.B.3. of these Special Provisions for tree removal restrictions within easement areas.
 2. Tree Trimming and Protection.
 - a. The Contractor shall carefully trim tree limbs or branches interfering with work operations, from trees to be saved, as approved by the Engineer. Such trimming shall be performed in accordance with

generally accepted horticultural practices. The cost of tree trimming shall be included in the unit price(s) bid for utilities.

- b. The Contractor's attention is directed to Section 2.1.3 of the "Standard Specifications" requiring the Contractor to neatly cut perpendicular to the direction of growth all tree roots one inch or greater in diameter.
 - c. Trees and shrubs to be preserved shall be protected from scarring or other injury. The Contractor shall compensate the Owner for damage to protected trees caused by the Contractor's operations.
3. The Contractor's attention is directed to Section 2.1.3 of the "Standard Specifications" requiring the Contractor to neatly cut perpendicular to the direction of growth all tree roots one inch or greater in diameter.
 4. See Appendix for additional tree maintenance prior to any roadway or utility work.
 5. Any tree removals, trimming, or damage to trees without City approval will be handled and paid for according to the Tree Preservation document in the Appendix.

J. Field Tile.

1. Field tile lines crossed and damaged by trenches shall be replaced with polyvinyl chloride (PVC) sewer pipe meeting the requirements of ASTM D-3034, SDR-35, with rubber gasket joints. The PVC pipe shall extend for a minimum distance of 2 feet outside of the edge of the trench wall. The tile to PVC pipe connection shall be made with compatible fittings, adapters or encased in concrete. The size of the new pipe shall be equal to or greater than the tile line being replaced. The cost of repairing field tile shall be included in the unit price(s) bid for utilities.
 - a. Damaged field tile shall be repaired the same day as the damage occurs so that the flow of water will not be unreasonably restricted.
 - b. Damaged tile shall be connected to new storm sewers wherever possible. The cost of tile connections shall be incidental to the cost of new storm sewers.

K. Waterway Restoration.

1. Lawn areas adjacent to waterways (creeks or drainage ditches), including stream banks, shall be restored immediately upon completion of trench backfilling and compaction operations.
2. Lawn restoration shall include topsoil, fertilizer, seed, mulch and erosion control fabric as specified in these Special Provisions.

3. Restoration of banks shall include placing an erosion control fabric over all seeded areas. The fabric shall be Erosion Control Fabric as manufactured by Geotextile Systems, Inc., Pewaukee, Wisconsin, or equal. The fabric shall be installed in accordance with the manufacturer's specifications. The cost of erosion control fabric shall be included in the unit price(s) bid for utilities.
4. Care shall be taken during construction to minimize erosion into waterways. Temporary erosion control measures including bales or silt fences shall be used to prevent sediment-laden runoff from entering waterways.

L. Trench Surface Maintenance.

1. The Contractor's attention is directed to Section 2.6.16 of the "Standard Specifications", requiring the Contractor to maintain trench surfaces for the duration of the Contract and for one (1) year after acceptance.
2. The Contractor shall maintain trench surfaces within Village of Caledonia highway right-of-ways for the duration of the Contract and for a period of fifteen (15) months after the date of the Caledonia highway permit or as specified in Paragraph 1 above, whichever is more restrictive.

M. Replacement/Restoration Costs.

1. All replacement and restoration costs, unless bid separately in the Bid Form, shall be included in unit prices bid for other items.

810. PAVEMENT REPLACEMENT

A. Saw-Cutting Pavements.

1. All concrete and asphalt pavements, shoulders and driveways shall be saw-cut to a minimum depth of three (3) inches prior to being shattered and removed. Where concrete pavements are covered with an asphalt overlay, both the asphalt and concrete shall be saw-cut. Pavements shall be saw-cut in neat straight lines perpendicular or parallel to the road centerline to produce a clean joint for pavement restoration. If the saw-cut edge is damaged during construction, the Contractor shall saw-cut the pavement again immediately prior to paving. The cost of saw-cutting shall be included in the unit prices bid for other items.
 - a. All concrete and asphalt pavements within state highway right-of-ways shall be saw-cut full depth prior to being shattered and removed.
 - b. The edges of trenches crossing road pavements and driveways shall be saw-cut in neat straight lines, with no zigzags, perpendicular to

the street or driveway centerline. The saw-cut shall be made through the widest point of damaged pavement.

2. Concrete Pavement.

a. If the saw-cut edge of a trench through a concrete pavement outside of state highway right-of-ways is closer than 4 feet to an existing joint or pavement edge, the pavement shall be removed and replaced to such joint or pavement edge.

b. State Highways.

(1) A minimum width of 10 feet of concrete pavement shall be removed and replaced on state highways.

(2) If the saw-cut edge of a trench through a concrete pavement within a state highway right-of-way is closer than 10 feet to an existing joint or pavement edge, the pavement shall be removed and replaced to such joint or pavement edge.

B. Temporary Surfacing.

1. All trenches in asphaltic shoulders, driveways and pavements shall be temporarily surfaced with base aggregate dense 1-1/4-inch equal in thickness to the total thickness of gravel base course and asphaltic pavement.

2. All trenches in concrete driveways and pavements shall be temporarily surfaced with base aggregate dense 1-1/4-inch equal in thickness to the total thickness of gravel base course and concrete pavement.

3. The temporary gravel surface shall be in place at the end of the working day and shall be maintained until the asphaltic surface or concrete pavement is placed.

4. Cold Patch.

a. The Contractor shall temporarily restore all damaged asphaltic pavements and driveways with a minimum of 2 inches of approved well compacted asphaltic cold patch or temporary asphaltic hot mix as soon as practicable following backfilling of trenches.

b. The Contractor shall be responsible for maintaining temporary pavement replacement.

c. The temporary patch shall be replaced with the permanent pavement at the completion of all trenching work and/or when weather conditions permit.

- d. All costs for temporary pavement replacement shall be included in the unit prices bid for other items of work.
- C. Damaged shoulder, pavement, driveway, and parking areas shall be replaced “in kind”; except that where the existing pavement thickness is less than the following minimum pavement thickness(es), the minimum pavement section (specified below) shall be placed:
- 1. Gravel Roads and Road Shoulders.
 - a. A minimum of 10 inches of dense graded base shall be placed over gravel roads.
 - 2. Asphaltic Pavements.
 - a. Existing asphaltic pavements shall be replaced with a minimum of 10 inches of dense graded base and 4 inches of asphaltic concrete pavement.
 - (1) The pavement shall consist of a minimum 1-1/2 inch thick upper layer and a minimum 2-1/2 inch thick lower layer.
 - b. The cost of excavation to obtain subgrade will be included in the unit price bid for common excavation within the limits of full pavement reconstruction limits.
 - c. Pavement in full reconstruction limits shall be replaced from flange to flange with a typical 2% crown. If the flange elevations prohibit this, a minimum 1.5% crown and maximum 3% crown or as approved will be allowed.
 - d. The cost for asphalt within the trench restoration limits including driveways as specified below will be paid for at the unit price bid for asphalt.
 - 3. New Subdivision Roads.
 - a. New subdivision roads may be graded to subgrade, by others, prior to utility construction.
 - b. The Utility Contractor shall restore the subgrade to its existing condition upon completion of utility construction.
 - 4. Concrete Pavements.
 - a. Existing concrete pavements shall be replaced with a minimum of 7 inches of non-reinforced concrete pavement and 6 inches of base aggregate dense 1-1/4-inches.

5. Concrete Base and Asphaltic Overlay.
 - a. Restoration of pavements consisting of a concrete base and asphaltic surface or overlay may be “in-kind” or with full depth asphaltic concrete pavement.
 - (1) Pavement replacement “in kind” shall be installed with a 3-day high-early-strength concrete and asphaltic overlay.
 - (2) Full depth asphaltic concrete pavement shall be installed with 4 equal lifts with a maximum of 2 lifts installed per day.
6. Driveways and Parking Areas.
 - a. Gravel Surface.
 - (1) Existing gravel driveways and parking areas shall be replaced with a minimum of 8 inches of dense graded base.
 - (2) Base course material shall match the existing material; example, place limestone material over existing limestone drives.
 - b. Asphaltic Pavement.
 - (1) Existing asphaltic driveways and parking areas shall be replaced with the following minimum thicknesses:
 - (a) Residential - 6" base and 3" pavement (1-1/2" upper layer and 1-1/2" lower layer using 9.5 mm aggregate gradation).
 - (b) Commercial - 8" base and 4" pavement (1-3/4" upper layer and 2-1/4" lower layer using 12.5 mm aggregate gradation).
 - (c) Industrial - 12" base and 4" pavement (1-3/4" upper layer and 2-1/4" lower layer using 12.5 mm aggregate gradation).
 - c. Concrete Pavement.
 - (1) Existing concrete drives shall be replaced with a minimum of 6 inches (7 inches minimum over business or industrial drives) of concrete pavement and 6 inches of base aggregate dense 1-1/4 inch. Concrete drives shall be reinforced if the existing drive has reinforcing.

D. Base Aggregate Dense.

1. Base aggregate dense shall comply with Section 305 of the “State Specifications”, as modified below.
 - a. The top layer of base (4 inches minimum thickness) shall be base aggregate dense 1-1/4-inch and the lower layer(s) shall be either base aggregate dense 3-inch (6 inches minimum thickness) or base aggregate dense 1-1/4-inch (4 inches minimum thickness). Note: If the total base thickness is less than 10 inches, then only base aggregate dense 1-1/4-inch may be used.
 - (1) The base shall be constructed in two or more layers in accordance with Section 305.3 of the “State Specifications”.
 - b. Base material placed over driveways shall be base aggregate dense 1-1/4-inch.
 - c. The top 3 inches of base material placed over road shoulder areas shall be base aggregate dense 3/4-inch and the remainder shall be either base aggregate dense 3/4-inch or base aggregate dense 1-1/4-inch.
2. Base material, including shoulders and drives, shall be compacted using rolling or vibratory type equipment unless otherwise approved by the Engineer.
3. Dense graded base shall be crushed limestone.

E. Asphaltic Concrete Pavement.

1. Asphaltic concrete pavement shall comply with Section 815 these “Special Provisions”.

F. Concrete Pavement.

1. Concrete pavement shall comply with Section 415 of the “State Specifications”, as modified below:
 - a. All concrete shall be Grade C, air-entrained, 7-bag mix with a 28-day compressive strength of 4000 psi, as specified in Subsection 501.3.2 of the “State Specifications”, and shall be ready-mixed.
 - b. All concrete shall receive a brush finish.
 - c. Concrete shall be cured by the Impervious Coating Method in accordance with Subsection 415.3.12.2 of the “State Specifications”.

d. The pavement shall be opened to traffic in accordance with Subsection 415.3.17 of the “State Specifications”.

2. Pavement Ties.

a. All joints between existing and new pavements shall be constructed using tie bars conforming to Subsection 505.2.6 of the “State Specifications” and the Standard Detail Drawings shown in the Appendix of this Project Manual.

(1) Anchor transverse joints with 1-1/4" x 18" dowel bars at 15" maximum spacing as shown on the detail.

(2) Anchor longitudinal joints with No. 4 x 24" ties bars at 30" C-C spacing.

3. Test Specimens.

a. The Contractor shall take two (2) representative concrete samples for 7 day and 28 day compression testing from each days concrete mix.

b. The Contractor shall field cure, care for, and ship the test cylinders to the testing laboratory. Test results shall be forwarded to the Engineer. All testing costs shall be paid for by the Contractor.

G. Pavement Restoration Timetable.

1. Asphaltic pavement shall be placed in accordance with the requirements of Subsection 450.3 and concrete pavement shall be placed in accordance with the requirements of Subsection 415.3.16 of the “State Specifications”.

2. Weather permitting, pavement replacement shall be completed within 30 calendar days after completing utility construction.

3. Pavement replacement work in areas constructed during winter months shall be completed by the following June 1st. All pavement replacement in areas constructed after June 1st shall be completed in accordance with Paragraphs 1 and 2, above.

815. ASPHALTIC CONCRETE PAVEMENT

A. Asphaltic concrete pavement shall comply with Sections 450, 455, and 460 of the “State Specifications” as modified below. The HMA pavement mix shall be comprised of virgin and/or recycled aggregate and asphaltic materials unless otherwise specified.

1. Aggregate.
 - a. Aggregate in the pavement mix shall conform to Subsection 460.2.2 of the “State Specifications”, including the gradation requirements of Subsection 460.2.2.3, and the gradations listed below.

	<u>Nominal Size</u>	<u>Minimum Layer Thickness</u>
Lower Layer	3/4" (19.0 mm)	2.25"
Upper Layer	1/2" (12.5 mm)	1.75"
Asphaltic Surface	3/8" (9.5 mm)	1.50"

2. Asphalt Cement.
 - a. Asphalt cement shall conform to Subsection 455.2.4 of the “State Specifications”. Asphalt cement content shall be in accordance with approved mixes.

3. Pavement Mix.
 - a. Prior to beginning construction, the Contractor shall provide the Engineer with copies of current state approvals for the pit, mixing plant and design mixes for materials proposed to be used on this project.
 - b. HMA mixture shall be produced and incorporated in the work on the basis of a job-mix formula. The Contractor shall be responsible for the asphaltic job-mix design report, conforming to Subsection 460.2.7, and shall submit a signed copy of the report to the Engineer for review at least two weeks prior to plant start up for paving production.
 - c. Pavement Mix.
 - (1) Pavement mixture shall be in accordance with Subsection 460.2 of the “State Specifications” and shall performance grade 58-28 with the designation to be determined from design.
 - d. Delete Subsection 450.3.2.9.2 from the “State Specifications”. Ride Quality does not apply to this project.
 - e. Recycled Asphaltic Concrete Pavement.
 - (1) The Contractor may use recycled asphaltic concrete pavement for all layers.

- a. The recycled pavement shall consist of a mix of salvaged asphaltic pavement materials, presently stockpiled for use by the Contractor, and the required amounts of aggregate and asphalt cement. The recycled pavement shall be in accordance with a State approved mix calculated for the stockpiled material and comply with Section 460 of the “State Specifications”. The Contractor shall submit a copy of the job-mix formula to the Engineer.
 4. Maximum variations:
 - a. 1/8 inch across a 5 foot straight edge.
 - b. Thickness: Within 1/4 inch of design.
 - c. Finish elevation: Within 1/4 inch of design.
- B. Pavement Compaction.
1. For compaction of the surface follow Section 465 of the “State Specifications.”
 2. Delete Subsection 460.5.2.3 from the “State Specifications”. Pavement density incentives do not apply to this project.
- C. Pavement Thickness.
1. The pavement thickness shall match the existing thickness unless the minimum thickness(es) specified in Subsection 810.C of these Special Provisions apply.
 2. Pavement shall be placed in two or more lifts conforming to Subsection 460.3.2 of the “State Specifications”. The maximum compacted thickness of individual layers shall not exceed four inches for lower layers and three inches for upper layers.
- D. Tack Coat.
1. A tack coat shall be applied to each lower layer prior to placing the succeeding layer. Apply the tack coat the same day that the next layer is placed.
 - a. Tack coat material shall be an asphalt emulsion, conforming to Section 455.2.5 of the “State Specifications”, diluted with an equal amount of water and applied at a rate of 0.05 to 0.15 gallons per square yard or as directed by the Engineer.
 2. The cost of applying tack coat shall be included in the unit price(s) bid for other items.

E. Temperature of Asphalt Placed.

1. All asphalt (both upper and lower layers) shall be delivered to the project site at a temperature not lower than 250°F.

F. Cold Weather Work.

1. Asphaltic pavement shall not be placed when the air temperature in the shade is less than 35°F unless approved by the Engineer.
2. Remove Subsections 450.3.2.1(3), 450.3.2.1(4), and 450.3.2.1(5) of the “State Specifications” and replace with the following:

“If the Engineer allows placing asphaltic mixtures below the specified minimum temperature, either at the Contractor’s request or to complete the work to the stage the contract requires, the work will be performed at the Contractor’s risk. Final inspection of the HMA paving or asphaltic surfacing work will be deferred until May of the following year. Before final acceptance, restore all pavement damage or defects the Engineer attributes to temperature or other weather conditions. Repair or replace areas of pavement as identified by the Engineer.”

G. Construction Methods.

1. The paver shall have sufficient power and traction to operate on grades. Screenshot extensions with static extensions shall not exceed 12 inches.
2. Vibratory rollers shall conform to Subsection 450.3.1.5 of the “State Specifications”.
3. Prior to placing asphaltic base or surface courses, all required corrections of filling potholes, sags, and depressions shall be made.
4. All rolling shall be performed during daylight hours.
5. In the event of sudden or impending rain, material in transit will be permitted to be laid at the Contractor’s risk providing the pavement is free of standing water and the proper temperature of the asphalt is maintained. Approval to unload the trucks in transit shall in no way relax the requirements of quality, density, or smoothness of the asphalt being placed.

900. TRAFFIC MAINTENANCE

A. Through Traffic Access.

1. The Contractor shall maintain a minimum of one lane of traffic all street(s) at all times. Roads shall be maintained in a safe condition throughout the duration of the project. The Contractor shall take all precautions necessary

to safely warn the public of the probable increased danger to travel due to construction of the Work.

- a. All streets shall be open to two-way traffic after working hours and all day on weekends and holidays.
- b. The Contractor shall at all times conduct his work in a manner to minimize obstruction to local traffic.
- c. Open-cut road crossings one-half street width at a time to maintain through traffic access.
- d. The Contractor shall notify police and fire departments if one lane of traffic is to be obstructed at all during construction, make provisions for garbage collection and mail delivery.

2. Traffic Control Plan.

- a. Traffic control shall be done in accordance with the latest version of the FHWA “Manual on Uniform Traffic Control Devices”, Part 6; along with the Wisconsin Supplement; and shall be in accordance with the Traffic Control Plan shown on the Plans or included in the Appendix.

C. Driveway Access.

1. If driveway access is to be blocked, then it shall be the Contractor’s responsibility to notify all affected property owners prior to closing that section of the street to traffic.
2. The Contractor shall construct temporary ramps at all driveways to provide access during road construction.
3. The Contractor shall provide full-time access to residences of handicapped persons, nursing and retirement homes, hospitals, and other facilities, unless other satisfactory arrangements are approved.
4. Access to Businesses and Industries.
 - a. The Contractor shall provide full-time access to businesses and industries unless other satisfactory arrangements are approved. Access may be provided by constructing temporary drives and/or by placing steel plates over new concrete gutters.

D. Mail Delivery.

1. The Contractor is responsible for insuring that mail can be delivered to properties affected by his work operations in a reasonable and timely manner.

2. If the Contractor's operations unduly restrict or prohibit mail delivery, he shall take measures to provide alternate method(s) for mail pick-up. Alternate methods may include:
 - a. Temporarily relocating mailboxes removed by his operations.
 - b. Providing alternate/multiple delivery and collection boxes at a central location. See the delivery and collection box detail in the Appendix.
3. Alternate mail delivery methods shall be coordinated with both the post office and all affected properties.

E. Snow Removal.

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

F. Signing, Barricades and Flagmen.

1. Whenever the Contractor's activities obstruct through traffic, there shall be sufficient flagmen on duty to guide the traffic, and the Contractor shall furnish and install all temporary signing and barricades required to safely direct the traveling public around the obstructed area.
2. Suitable barriers shall be erected and maintained at each end of an obstructed section of roadway and at all affected roadway intersections.
3. Traffic control shall be done in accordance with the latest version of Part 6, Temporary Traffic Control of the FHWA "Manual on Uniform Traffic Control Devices" and the Wisconsin Supplement; the Traffic Control Plan (if shown on the Plans or in the Appendix); and Section 643 of the "State Specifications".

G. Railroad Flagging.

1. The railroad company will provide their own flagmen for the railroad crossing.
2. Flagging Costs.
 - a. The Contractor shall reimburse the railroad company for all costs associated with flagging done by the railroad company