

Professional

Engineering

Services

Brighton Dale  
Park Force Main

Contract 1-2023

## Technical Specifications

Kenosha County

Kenosha, Wisconsin

Issued for Bid

October 10, 2023



TECHNICAL SPECIFICATIONS  
KENOSHA COUNTY  
KENOSHA, WISCONSIN  
BRIGHTON DALE PARK FORCE MAIN  
CONTRACT 1-2023



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10/6/2023

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### DEMOLITION

#### PART 1–GENERAL

##### 1.01 SUMMARY

- A. Work Included: All demolition, removal, and salvage work as shown on the Drawings.

##### 1.02 SUBMITTALS

- A. CONTRACTOR shall submit permits and notices, if required, authorizing building demolition.

##### 1.03 QUALITY ASSURANCE

- A. CONTRACTOR shall perform demolition, removal, and salvage in conformity with applicable federal, state, and local safety practices and code requirements.
- B. CONTRACTOR shall contact all public utilities and shall shut off, cut, and cap all utility services in accordance with utility requirements, codes, rules and regulations.
- C. Obtain and pay for all necessary permits, licenses and certificates required.

##### 1.04 SEQUENCE

- A. No demolition, removal, or salvage work shall commence until approval to proceed has been granted by OWNER.

#### PART 2–PRODUCTS

##### 2.01 GENERAL

- A. Compacted fill shall meet the requirements of Section 31 23 00–Excavation, Fill, Backfill, and Grading.
- B. Pipe fittings and materials shall meet the requirements of Section 33 00 10–Buried Piping and Appurtenances.

#### PART 3–EXECUTION

##### 3.01 BREAKING DOWN AND REMOVING STRUCTURES

- A. General:
  - 1. All existing structures, with all attached parts and connections, shown on the drawings or specified to be removed or that interfere with the new construction, shall be entirely removed within the limits shown or specified, unless otherwise provided.
  - 2. When a portion of any existing structure is to be retained, CONTRACTOR shall take care during construction operations so as not to impair the value of the retained portion.

- a. Complete all operations necessary for the removal of any existing structure which might endanger the new construction prior to the construction of the new work.
  - b. Do not use any equipment or devices which might damage structures, facilities, or property which are to be preserved and retained.
3. When existing reinforcing is exposed at the surface of removal areas, CONTRACTOR shall burn back the reinforcing bars 2 inches and patch with nonshrink grout, unless noted otherwise.

B. Pavement, Curb, Gutter, Sidewalk, Driveways, Crosswalk, and Similar Structures:

1. Where portions of the existing structure are to be left in the surface of the finished work, CONTRACTOR shall remove the structure to an existing joint, or saw and chip the structure to a true line.
2. Sufficient removal shall be made to provide for proper grades and connections in the new work.

### 3.02 ABANDONING STRUCTURES

A. Tanks, Manholes, Catch Basins, and Inlets:

1. CONTRACTOR shall thoroughly clean structures to be abandoned.
2. CONTRACTOR shall plug existing pipe connections with brick or concrete block masonry or with any grade of concrete having a 28-day compressive strength in excess of 2,000 psi.
3. CONTRACTOR shall remove the walls of the structures to an elevation at least 3 feet below the finished grade line, or to such elevation that may be designated on the drawings or as necessary to clear new construction.

### 3.03 ABANDONING AND REMOVING UTILITIES AND UNDERGROUND PROCESS PIPING

- A. CONTRACTOR shall be responsible for the turning off or unhooking of all utilities and process piping before starting the demolition work. Remove all utility lines, including electrical services and process piping that are shown or specified to be removed. Remove utility lines that are to be abandoned as needed to clear new construction.
- B. The ends of utility lines and process piping shown or specified to be abandoned that are exposed by excavation shall be plugged with concrete to prevent soil infiltration into the pipes.

### 3.04 EQUIPMENT

- A. CONTRACTOR shall remove all equipment specified herein or indicated.
- B. CONTRACTOR shall remove associated exposed conduit, power wiring, controls, switches, instrumentation, control wiring, control boxes, appurtenances, and their supports serving equipment to be removed. Electrical items shall be removed to their junction with motor control center, control panel, or their junction with conduit serving other equipment that is to remain.
- C. CONTRACTOR shall remove all piping and appurtenances and their supports serving equipment indicated to be removed. Piping shall be removed to its junction with the main service header serving other equipment that is to remain or new equipment as indicated. Remaining piping and tubing shall be fitted with an appropriate blind flange or plug and insulated as required.

### 3.05 SALVAGE

- A. OWNER has first right of refusal to all material, piping, and equipment removed.
- B. All equipment, material, and piping, except as specified hereinafter, within the buildings and structures to be demolished and additional items as noted shall be removed by CONTRACTOR. CONTRACTOR shall inspect each structure and determine the type and amount of equipment, materials, and piping to be removed.
- C. All equipment, material, and piping, except as specified hereinafter, within the limits of the demolition and additional items noted to be removed, will become the property of CONTRACTOR if OWNER does not claim under first right of refusal and shall be removed from the project site. Comply with State and local ordinances and regulations for disposing of materials.

### 3.06 BACKFILL

- A. CONTRACTOR shall fill all abandoned structures and excavations resulting from removal of structures and utilities with compacted fill. See Section 31 23 00—Excavation, Fill, Backfill, and Grading for required degree of compaction.
- B. Prior to filling, CONTRACTOR shall break one approximately 9-inch-diameter opening in the floor or wall near the base of each compartment to allow groundwater to freely migrate through the structure.

END OF SECTION

SECTION 31 10 00  
CLEARING AND GRUBBING

PART 1–GENERAL

1.01 SUMMARY

- A. OWNER will complete all work, including:
  - 1. Cutting and disposing of trees, brush, windfalls, logs, and other vegetation.
  - 2. Removing and disposing of roots, stumps, stubs, logs, and other timber.

PART 2–PRODUCTS

NOT APPLICABLE

PART 3–EXECUTION

3.01 PREPARATION

- A. CONTRACTOR shall identify existing plant life to remain and shall tag accordingly.

3.02 PROTECTION

- A. CONTRACTOR shall protect from damage utilities and structures that are to remain.
- B. CONTRACTOR shall protect trees, plant growth, and features designated to remain as final landscaping.
- C. CONTRACTOR shall locate and protect property stakes, legal survey monuments, benchmarks, and survey control and reference points. CONTRACTOR shall pay for replacement of disturbed property stakes and legal survey monuments by a Registered Land Surveyor acceptable to OWNER and for replacement of benchmarks and survey control and reference points provided by ENGINEER.

3.03 TREE PROTECTION

- A. Trees shall be protected when construction activities affect the root zones and limbs.
- B. Minimize storage and use of heavy equipment and materials within the drip line or Critical Root Zone (CRZ), whichever is greater. The CRZ is considered 1 to 1.5 times the diameter (in) at breast height of tree. For example, a 10-inch-diameter tree would require a 10- to 15-foot diameter of protection.
- C. Any exposed fine roots shall be kept damp. Any damaged roots above 1-inch diameter shall be cut clean.

- D. Tree branches damaged as a result of construction activity shall be cut clean. CONTRACTOR shall make a good faith effort to follow and implement the tree protection plan.

#### 3.04 CLEARING AND GRUBBING

- A. OWNER shall perform clearing and grubbing prior to CONTRACTOR starting work.
- B. If CONTRACTOR identifies additional clearing and grubbing needed to perform work, it is CONTRACTOR's responsibility to provide a written request to OWNER to approve and perform additional clearing and grubbing activities at minimum 5 days in advance of the required clearing and grubbing.
- C. If CONTRACTOR receives written approval from OWNER to perform its own clearing and grubbing, this work will be incidental to the work in this CONTRACT. CONTRACTOR must follow the following standards for clearing and grubbing:
  - 1. All roots and stumps shall be removed to a depth of not less than 12 inches below the original ground surface in embankment areas. In cut areas, such material shall be removed to a depth of not less than 12 inches below the subgrade.
  - 2. Disposal by burning or burying clearing and grubbing items within the project limits is not allowed.
  - 3. Under no circumstances shall any trees or limbs be removed by an excavator.

END OF SECTION

## SECTION 31 23 00

### EXCAVATION, FILL, BACKFILL, AND GRADING

#### PART 1—GENERAL

##### 1.01 SUMMARY

- A. Work Included: Excavating, filling, backfilling, and grading for this work includes, but is not necessarily limited to:
  - 1. Excavating for roads, utilities, sidewalks, driveways, parking lots, restoration, and miscellaneous areas.
  - 2. Furnishing and placing all fill and backfill.
  - 3. Provide compaction of all fill and backfill.
  - 4. Rough and finish grading prior to paving, seeding, etc.
- B. Payment: All common excavation shall be considered incidental and included in the total project Bid.

##### 1.02 REFERENCED STANDARDS

- A. Standard specifications, where referenced, shall refer to the State of Wisconsin Department of Transportation, Standard Specifications For Highway and Structure Construction, Current Edition, including all issued supplemental specifications.
- B. ASTM C33—Standard Specification for Concrete Aggregates.
- C. ASTM D698—Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)).

##### 1.03 SUBMITTALS

- A. Submit sources and gradations for materials proposed for use as compacted fill, utility trench backfill, trench bedding and cover material, crushed stone mat, and granular cushion.
- B. Submit samples of materials proposed for use in Paragraph 1.03.A to a soils testing laboratory for analysis of its suitability and for recommendations on moisture content during compaction, compaction methods, or other appropriate information.
- C. Submit sufficient samples of each different type or classification of soil to obtain representative values.

##### 1.04 JOB CONDITIONS

- A. The elevations shown for existing work and ground are reasonably correct, but are not guaranteed to be absolutely accurate. No extras will be allowed because of variations between drawings and actual grades.
- B. Soil borings were made and the soils information is included in an appendix to these Specifications. The information contained is not guaranteed to be indicative of conditions to be encountered during construction. It is CONTRACTOR's responsibility to make its own investigations to determine physical conditions at the site, which may affect the work.

**PART 2-PRODUCTS**

**2.01 COMPACTED FILL**

- A. All fill and backfill material designated to be compacted fill shall be granular with no stones larger than 4 inches and shall be reasonably well-graded throughout the particle size range. A minimum 65% of the material shall pass the 3/4-inch sieve, and the material shall be capable of being compaction tested in accordance with ASTM D698, as determined by the Project Soils Engineer. Of that portion of the material passing the No. 4 sieve, not more than 25% shall pass the No. 200 sieve, and material shall have less than 5% clay content. When placing fill during wet weather or in wet areas, this requirement shall be modified to not more than 5% passing the No. 200 sieve. Adequately dewatered areas are not defined as wet areas.
- B. Native material may be used as compacted fill if it meets the above specification. CONTRACTOR shall submit gradations for the native material meeting the above specification. CONTRACTOR shall provide all needed fill material whether from on-site or off-site at no additional cost to OWNER.

**2.02 TRENCH BEDDING MATERIAL**

- A. Bedding material shall be hard and durable and shall be made by crushing sound limestone or dolomite ledge rock, or crushed gravel aggregate. Bedding material shall conform to the requirements of ASTM C33 and shall conform to gradations shown in the following table. No native soil shall be used for bedding material.

PERCENTAGE BY WEIGHT PASSING INDICATED SIEVE

Size	2 1/2 IN	2 IN	1 1/2 IN	1 IN	3/4 IN	1/2 IN	3/8 IN	No. 4	No. 8	No. 16	No. 30	No. 100	No. 200
57			100	95-100		25-60		0-10	0-5				
8						100	85-100	10-30	0-10	0-5			
9						100	75-100	0-25	0-5				
10							100	85-100				10-30	

- B. PVC force main shall be bedded and covered in accordance with the Thermoplastic Pipe Bedding Detail on Drawing 01-975-43A or in accordance with the Type 4 laying condition of AWWA C605. HDPE force main shall be bedded and covered in accordance with the Thermoplastic Pipe Bedding Detail on Drawing 01-975-43A or in accordance with ASTM D2774. Bedding material shall conform to Size No. 8 or No. 9. With pipes greater than 15 inches, Size No. 57 may be used. No native materials may be used.

**2.03 TRENCH COVER MATERIAL**

- A. Material which is to be placed from the bedding material to 1 foot above the top of the pipe shall be termed cover material. All trenches shall be backfilled by hand to 1 foot above the top of the pipe with cover material. Cover material shall be deposited in the trench for its full width on each side of the pipe, fittings, and appurtenances simultaneously in 6-inch layers and shall be compacted using hand tamping bars and/or mechanical tampers. Use special care in placing cover material to avoid injury to or movement of the pipe. Cover material shall consist of durable granular particles ranging in size from fine to a maximum size of 3/4 inch. Unwashed bank run sand and crushed bank run gravel will be considered generally

acceptable cover material. Cover material shall generally conform to the following gradation specifications:

#### COVER MATERIAL GRADATION

Sieve Size	Percentage by Weight Passing
1 inch	100
3/4 inches	85 to 100
3/8 inches	50 to 80
No. 4	35 to 65
No. 30	--
No. 40	15 to 30
No. 200	5 to 15

- B. Native trench materials may be used for cover material if they substantially conform to the above gradation specifications and a suitable credit is extended to OWNER.
- C. All bedding materials may be substituted for cover material when requested by CONTRACTOR except where polyethylene encasement is used. In such case, only those bedding materials specifically noted for polyethylene encasement may be used.

#### 2.04 TRENCH BACKFILL MATERIAL

- A. Backfill shall be that material placed between the top of cover material up to subgrade for placement of restoration materials.
- B. All backfill material under and within 5 feet of buildings, structures, piping, roadway and parking areas, curb and gutter, and structure walls shall be granular backfill.
- C. When the type of backfill material is not otherwise specified or shown on the Drawings, CONTRACTOR may backfill with the excavated material, provided that such material consists of loam clay, sand, gravel, or other materials which, in the opinion of Project Soils Engineer, are suitable for backfilling.
- D. All backfill material shall exceed a temperature of 35°F and be free from frost, cinders, ashes, refuse, vegetable or organic matter, boulders, rocks, or stone, frozen lumps, or other material which in the opinion of Project Soils Engineer is unsuitable. From 1 foot above the top of the pipe to the trench subgrade, well-graded material containing stones up to 8 inches in their greatest dimension may be used, unless otherwise specified. Care should be taken in backfilling so as not to damage the installed pipe.
- E. In refilling the trench, if there is not sufficient material excavated therefrom suitable for refilling, CONTRACTOR shall, without extra compensation, furnish the deficiency. Where indicated on the Drawings, fill shall be provided over projecting conduits. Such fill shall be free of large boulders, and the top 6 inches shall be of suitable material to fit the adjoining ground.
- F. When called for on the Drawings, in the Specifications, or requested by ENGINEER, backfill material shall be granular and shall consist of durable particles ranging in size from fine to coarse in a substantially uniform combination. Sufficient fine material shall be present to fill all the voids in the coarse material. No stones over 3 inches or clay lumps shall be present.

Unless otherwise allowed by ENGINEER, granular backfill shall generally conform to the following gradation specification:

#### GRANULAR BACKFILL

Sieve Size	Percentage by Weight Passing
3 inches	100
2 inches	95 to 100
No. 4	35 to 60
No. 200	5 to 10

### PART 3-EXECUTION

#### 3.01 GENERAL

- A. Prior to all excavating, CONTRACTOR shall become thoroughly familiar with the site and site conditions.

#### 3.02 PROTECTION

- A. CONTRACTOR shall provide all necessary sheeting, shoring, or other soil retention systems including all labor, material, equipment, and tools required, or as necessary to maintain the excavation in a condition to provide safe working conditions, to permit the safe and efficient installation of all items of Contract work, and to protect adjacent property. CONTRACTOR shall be held liable for any damage which may result to property from excavation or construction operations. Sheeting, shoring, and other soil retainage systems shall be withdrawn or removed in a manner so as to prevent subsequent settlement of structures, utilities, and other improvements.
- B. Design of sheet piling and other soil retaining systems shall be the sole responsibility of CONTRACTOR. Where such systems are shown on the Drawings, no parameters such as embedment depth, section profile, presence or lack of walers, etc., nor system type or suitability shall be inferred. CONTRACTOR is responsible for designing and providing a fully functional system compatible with construction and site requirements.
- C. Nothing in this specification shall be deemed to allow the use of protective systems less effective than those required by the Occupational Safety and Health Administration (OSHA) and other applicable code requirements.

#### 3.03 FINISH ELEVATIONS AND LINES

- A. CONTRACTOR is responsible for establishing finish elevations and lines.
- B. Where lasers are used, CONTRACTOR shall check the Work against intermediate grade stakes. Prior to initial use of the laser, CONTRACTOR shall set up laser on ground surface and check line and gradient controls. Lasers not functioning properly shall be immediately removed.

- C. If existing property stakes, not within the limits of the trench or street slope limits, are removed or damaged by CONTRACTOR, CONTRACTOR shall bear the cost of replacement. Replacement shall be made by a legal survey performed by a licensed Land Surveyor hired by OWNER. Cost for survey shall be deducted from the Contract Price.

### 3.04 COMMON EXCAVATION

- A. After the site has been cleared and stripped, the site shall be cut and filled to the indicated subgrade as shown or specified.
- B. All excavated material that does not meet the specification for compacted fill or embankment fill or meets the specification but is not required for backfill or fill shall be classified as excess material and shall be removed from the site and disposed of at CONTRACTOR's expense.
- C. All material other than suitable bearing soil or bedrock, as determined by the Project Soils Engineer, shall be removed from under paved surfaces.
- D. Excavation for all footings, foundation walls, pits, etc., shall be large enough to provide adequate clearance for the proper execution for the work within them.
- E. Excavations scheduled to extend below groundwater shall not be started until the area has been dewatered. See Section 31 23 19–Dewatering.
- F. All street excavation shall be performed as called for in Section 205 of the Standard Specifications and as herein modified.
- G. The following items of Work shall be included in common excavation:
  - 1. The excavation to subgrade elevations as detailed in the Drawings including road bed areas, terraces, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.
  - 2. Removal (and stockpiling, if the use of salvaged topsoil is required) of topsoil from all cut areas and fill areas within a 1:1 slope of finished street, sidewalks, bike paths, driveways, and other miscellaneous surface improvements.
  - 3. The preparation, grading, compaction, and proof-rolling of subgrade areas for roadbed, sidewalks, bike paths, driveways, and other miscellaneous surface improvements to the elevations detailed on the Drawings.
  - 4. Excavation and grading required to realign and/or create ditch lines and drainage ways to route drainage to or from storm facilities as shown on the Drawings, or as necessary to maintain positive drainage.
  - 5. Removal of temporary backfill placed in new utility trenches above the subgrade.
  - 6. The removal and disposal of all undesirable and surplus materials.
  - 7. Pipe placement and/or replacement.
- H. Common excavation may be completed as part of utility construction.
- I. All subgrade areas in streets and parking lots, including utility trench restoration areas, shall be proof-rolled with a heavily loaded triaxle dump truck or other similar equipment requested by ENGINEER prior to the placement of any fill materials or base course. ENGINEER must be present during proof-rolling to review the Work necessary for the stabilization of any unstable areas identified.

- J. Saw cuts shall be made in existing pavement, driveways, curb and gutter, and sidewalks to allow restoration to neat straight lines. Saw cuts damaged during construction shall be recut prior to beginning restoration.

### 3.05 UTILITY TRENCH EXCAVATIONS

- A. Caution In Excavation: CONTRACTOR shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures may be determined and shall be held responsible for the repair of such structures when broken or otherwise damaged because of carelessness on its part.
- B. Subsurface Exploration: When determined that it is necessary to explore and excavate to determine the location of existing underground facilities, CONTRACTOR shall make explorations and excavations for such purposes. If CONTRACTOR is asked to perform additional Work in making the explorations and excavations, extra compensation will be allowed as specified In the General Conditions.
- C. The trench shall be dug so that the utilities can be laid to the alignment and depth specified. Unless otherwise allowed by ENGINEER, trenches shall not be excavated more than 100 feet in advance of pipe laying. Earth excavation shall include all excavation. Included in earth excavation shall be removal of street paving of all types, existing structures, existing improvements and trees smaller than 4 inches in diameter measured 4 feet above the ground, all as necessary to complete the pipe installation.
- D. The trench shall be finished to the depth necessary to provide a uniform and continuous bearing and support for the pipe on the bedding material provided at every point between bell holes. Any part of the bottom of trench excavated below the specified grade shall be corrected with bedding material, thoroughly compacted in place. The bedding shall be shaped and finished with hand tools to fit the bottom quadrant to the pipe.
- E. If unstable soil conditions are encountered at subgrade, CONTRACTOR shall replace the unstable soil with special bedding. CONTRACTOR shall be allowed extra compensation for the special bedding, unless the unstable soil conditions are caused by CONTRACTOR's failure to adequately dewater the trench, in which case CONTRACTOR shall bear the entire cost.
- F. All excavated material shall be piled in a manner that will not endanger the Work. Stockpiles not for immediate backfilling shall have silt fences placed around their perimeter for erosion control. The Work shall be conducted in such a manner that pedestrian and motor traffic is not unnecessarily disrupted. Fire hydrants, valve boxes and manholes shall be left unobstructed. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed.
- G. Excavated material designated by ENGINEER as being undesirable for backfilling and all surplus excavated material shall be immediately removed as excavation progresses. All such material shall be disposed of in an environmentally safe manner in accordance with local, state, and federal regulations. No such materials shall be disposed of in wetlands, floodplains, or other environmentally sensitive areas. Disposal sites are also subject to approval of OWNER. All undesirable and surplus material disposed of must be leveled off and graded to rough elevations as determined by OWNER. Appropriate erosion control measures shall be provided and maintained at disposal sites until disposal is complete and the disposal site is permanently stabilized.

- H. CONTRACTOR shall remove bituminous pavement and road surface as a part of the trench excavation. The width of pavement removed shall be the minimum possible, and acceptable, for convenient and safe installation of utilities and appurtenances.
- I. All bituminous pavement shall be cut on neat, straight lines and shall not be damaged beyond the limits of the trench.
- J. Where it is necessary to trench through concrete pavement, a strip shall be sawed and removed in such a manner as not to disturb the remainder of the pavement. Paving and undermining of existing concrete pavement shall be prevented by CONTRACTOR. If CONTRACTOR unnecessarily removes or damages pavement or surfaces beyond limits acceptable to ENGINEER, such pavement and surfaces shall be replaced or repaired at the expense of CONTRACTOR.
- K. All trees, shrubs, and improved areas outside the excavation shall be protected from damage.
- L. Pipe shall be placed only on dry foundations.
- M. Excavation shall include all necessary incidental work such as tunneling, sheet piling, shoring, underpinning, pumping, bailing, transportation, and all fill and backfilling.
- N. CONTRACTOR shall excavate whatever materials, are encountered as required to place at the elevations shown, all pipe, manholes, and other work as required to complete the project as shown.
- O. The excavation at the crossing of all underground utility services in place shall be as narrow as practicable. All underground services shall be protected from damage and maintained in service at their original location and grade during the process of the work. Any damage to underground services shall be replaced or repaired at no cost to OWNER or to the owner of the service. The present underground services shown on the Drawings are located in accordance with available data. Encountering these services at a different location or encountering services not shown shall not release CONTRACTOR from the above-stated conditions.
- P. Any water, drainage, gas, sewer, or electric lines encountered in the excavation that are not to be disturbed shall be properly underpinned and supported. Any service connections encountered that are to be removed shall be cut off at limits of the excavation and capped in accordance within the requirements of or permits governing such removals. Any permits required for this work will be obtained by OWNER upon request of CONTRACTOR.
- Q. CONTRACTOR shall be responsible for determining and providing the minimum width necessary to provide a safe trench in accordance with current OSHA standards and all other applicable standards. The top width of trench excavation shall be kept as narrow as is reasonably possible and acceptable to minimize pavement damage. Pay items related to maximum trench widths shall not limit CONTRACTOR's responsibility to provide safe trench conditions.
- R. Width of Trench—Rigid Pipe: The width of trench below the outside top of the pipe shall be as shown in the following table for the sizes listed. A minimum clearance of 8 inches between the outside of the pipe barrel and the trench wall at the pipe spring line shall be maintained to allow for bedding and haunching. If sheeting is used and is going to remain in place, the trench width shall be measured as the clear distance between inside faces of the sheeting.

Otherwise, the trench width shall be based on the width between stable trench walls after sheeting is removed.

MAXIMUM WIDTH OF TRENCH BELOW TOP OF PIPE

Nominal Pipe Diameter (Inches)	Trench Width (Inches)
4	30
6	30
8	36
10	36
12	36
15	36
18 and larger	Pipe O.D. Plus 16 (Minimum 36)

- S. Where the width of trench below the outside top of the pipe barrel cannot be otherwise maintained within the limits shown above, CONTRACTOR, at its own expense, shall furnish an adequate pipe installation for the actual trench width which will meet design conditions. This may be accomplished by furnishing higher class bedding, a stronger pipe, concrete cradle, cap or envelope or by driving sheeting prior to excavation to subgrade. Removal of sheeting below the top of the pipe, if allowed by ENGINEER, shall be gradual during backfilling.
- T. If the maximum trench width is exceeded for any reason other than by request of ENGINEER, the concrete cradle, cap, sheeting, bedding or the stronger pipe shall be placed by CONTRACTOR at its own expense. Where the maximum trench width is exceeded at the written request of ENGINEER, the concrete cradle, cap, sheeting, bedding or stronger pipe will be paid for on the basis of the price bid.
- U. Width of Trench—Thermoplastic and Ductile Iron Pipe: The trench width for flexible pipe shall be minimum three times the pipe outside diameter or the maximum trench width specified for rigid pipe, whichever is greater. A minimum clearance of 8 inches between the outside of the pipe barrel and the trench wall at the pipe spring line shall be maintained to allow for bedding and haunching.
- V. Special bedding shall consist of stone material and filter fabric as described herein. Where the bottom of the trench at subgrade is found to be unstable or of unsuitable material, which should be removed, CONTRACTOR shall excavate and remove such unstable or unsuitable material to the trench width and to a depth of 2 feet. The excavated area shall be lined with filter fabric, Mirafi 140 N, US Fabrics US 120NW, Propex Geotex 401, or equal, and backfilled with bedding material in maximum 12-inch layers. At subgrade the filter fabric shall be wrapped over the special bedding with an 18-inch overlap. Bedding material shall then be placed over the special bedding to support the piping. See Dewatering and Excavation to Subgrade sections for additional conditions.
- W. If soil conditions require it, concrete cradle or encasement shall be placed around the pipe as shown on Drawing 01-975-43A. Excavation shall be carried below the grade line to a depth requested by ENGINEER and concrete cradle or encasement placed. Before the concrete is placed, the pipe shall be laid to line and grade, blocked and braced, and the joint made. The cradle shall then be placed, taking care not to disturb the pipe. Concrete shall

have a minimum 28-day compressive strength of 4,000 psi. Concrete cradle shall not be used for thermoplastic piping. See Trench Width section for additional conditions.

- X. Open-cut trenches shall be sheeted and braced as required by any governing federal regulations including OSHA, state laws, and municipal ordinances; and as may be necessary to protect life, property, improvements or the Work. Underground or aboveground improvements to be left in place shall be protected and, if damaged, shall be repaired or replaced at the expense of CONTRACTOR.
- Y. Sheeting and bracing which is to be left in place must be removed for a distance of 4 feet below the present or proposed final grade of the street, road, or land, whichever is lower. Trench bracing, except that which shall be left in place, may be removed after backfilling has been completed or has been brought up to such an elevation as to permit its safe removal.
- Z. Portable Trench Box: Whenever a portable trench box or shield is used, special precautions shall be taken so as not to pull already jointed pipe apart or leave voids around the pipe wall. Whenever possible, the bottom edge of the box shall be kept at a level approximately even with the top of pipe. Cover material shall be placed to at least the top of pipe before moving the box ahead.
- AA. All trenches shall be backfilled using specified material so that excessive lengths of trench are not left open. In general, the backfilling operation shall proceed so that no more than 100 feet of trench is open behind the pipe laying operation.
- BB. Backfill shall be left below the original surface to allow for placement of restoration materials including pavement, base course, concrete, topsoil, sod, plus any pavement replacement specified in accordance with the Asphaltic Paving section herein. When settlement occurs, CONTRACTOR shall restore the surface improvements at its expense to maintain the finished surface.

### 3.06 PREPARATION OF SUBGRADE

- A. After the site has been cleared, stripped, and excavated to subgrade, thoroughly compact subgrade to the requirements specified for compacted fill below. Scarify and moisture condition the subgrade as recommended by the Project Soils Engineer.
- B. Remove all ruts, hummocks, and other uneven surfaces by surface grading prior to placement of fill.
- C. All slab-on-grade and road subgrades shall be proofrolled with a heavy rubber-tired construction vehicle (such as a fully loaded tandem-axle dump truck) in the presence of the Project Soils Engineer.
- D. ENGINEER may request the excavation of unsuitable materials in areas of unstable subgrade. The excavation of such materials, except in areas where CONTRACTOR has completed utility construction or placed street fill, shall be measured by ENGINEER for payment.
- E. The excavation and replacement of unstable utility trench backfill and/or street fill placed by CONTRACTOR shall be at CONTRACTOR's expense.

### 3.07 COMPACTED FILL AND BACKFILL

- A. All fill and backfill, except as otherwise specified, shall be compacted fill placed to within 4 inches of the bottom of the topsoil or to the bottom of the structure or other improvement.
- B. No fill shall be placed under water or over unsuitable subgrade conditions.
- C. All fill and backfill, except embankment fill and clay fill, shall be compacted as follows:
  - 1. Class 1 Compaction: This class of compaction shall apply to all fill areas under buildings, structures, piping, bituminous roadway and parking areas, curb and gutter, and backfill within 10 feet of structure walls. All compacted material shall be placed in uniform layers not exceeding 6 inches in loose thickness prior to compaction. Each layer shall be uniformly compacted to a dry density at least 95% of the maximum dry density as determined by a laboratory compaction test at the optimum moisture content (ASTM Test Designation D698). Compaction shall be obtained by compaction equipment appropriate for the conditions.
  - 2. Class 2 Compaction: This class of compaction shall be used in excavated areas beyond 10 feet of structures without any piping or adjacent foundations. Material for backfill shall be granular material as specified above. The material shall be deposited, spread, and leveled in layers generally not exceeding 12 inches in thickness before compaction. Each layer of the fill shall be compacted to at least 90% of the maximum dry density (testing same as Class 1). Compaction shall be obtained by compaction equipment appropriate for the conditions.
- D. No frozen material shall be placed nor shall any material be placed on frozen ground.
- E. Four inches of clay fill shall be placed and compacted to at least a firm consistency in areas to be seeded or sodded prior to placement of topsoil.

### 3.08 PIPE BEDDING AND COVER

- A. Immediately prior to placing the pipe, the trench bottom shall be shaped by hand to fit the entire bottom quadrant of the pipe. If pipe is of the bell and spigot type; bell holes shall be provided to prevent the bell from supporting the backfill load. Bell holes shall be large enough to permit proper making of the joint, but not larger than necessary to make the joint. All adjustments to line and grade must be done by scraping away or filling in bedding material under the body of the pipe. Any fill used must be bedding material. If necessary to obtain uniform contact of the pipe with the subgrade, a template shall be used to shape the bedding material. All pipe shall be placed on bedding material at least 4 inches thick. See Drawing 01-975-43A. Bedding material shall then be placed and tamped into place up alongside the pipe in maximum 6-inch layers shovel slicing the bedding material under the haunches to provide firm contact with the pipe. CONTRACTOR shall perform all necessary excavation and shall furnish all necessary material to provide this bedding.
- B. Trenches shall be kept water-free and dry during bedding, laying, and jointing. CONTRACTOR shall provide, operate, and maintain all pumps or other equipment necessary to drain and keep all excavation pits and trenches and the entire subgrade area free from water under any and all circumstances that may arise.

### 3.09 TRENCH BACKFILL CONSOLIDATION

- A. All trenches shall be consolidated as specified in this section for the entire depth and width of the trench.
- B. Consolidation shall be achieved by use of smooth surface vibratory compactors or backhoe operated hydraulic compactors for granular materials and rotating sheepsfoot type mechanisms for loam/clay soils. The lift height shall not exceed 8 inches for walk behind, hand operated, vibratory compactors and sheepsfoot. Lift height shall not exceed 24 inches for self-propelled vibratory drum or backhoe operated hydraulic compactors. Smaller lift heights shall be provided as necessary to achieve the degree of compaction specified.
- C. Unless specified otherwise, backfill material beneath paved areas or future paved areas and within 5 feet of paved areas or future paved areas shall be consolidated as follows: Within 3 feet of the surface 95% of maximum dry density, below 3 feet from the surface to 1 foot above the pipe 90% of maximum dry density, as determined by the standard Proctor Test (ASTM D698).
- D. Unless otherwise specified, backfill material placed in all other areas shall be compacted to the point where no additional consolidation can be observed from the compaction and backfill equipment being used.
- E. Backfill material not meeting the compaction specification shall be recompacted by CONTRACTOR at no cost to OWNER. Cost for additional testing on recompacted material shall be at CONTRACTOR's expense.

### 3.10 GRADING

- A. CONTRACTOR shall perform all rough and finish grading required to attain the elevations shown on the Drawings.
- B. Grading Tolerances:
  - 1. Rough Grade: Buildings, parking areas, and sidewalks— $\pm 0.1$  feet.
  - 2. Finish Grade: Granular cushion or crushed stone mat under concrete slabs— $\pm 0.03$  feet.
  - 3. Lawn areas away from buildings, parking areas, and sidewalks— $\pm 0.25$  feet.

### 3.11 MAINTENANCE OF SURFACE

- A. CONTRACTOR shall maintain all backfilling, resurfacing, repaving, and other surface improvements constructed under this Contract. CONTRACTOR shall, upon proper notice from OWNER, make all repairs in surfaces of trenches and excavations. All expenses incurred by OWNER and/or CONTRACTOR in making repairs and all expenses in maintaining trench and excavation surfaces shall be at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. OWNER reserves the right to make all emergency repairs necessary to make safe all streets and walks at the expense of CONTRACTOR regardless of the material used in backfilling trench excavations. A maintenance guarantee fund, if specified, will be withheld from the final amount due CONTRACTOR for a period of 6 months, after acceptance of the Work, to provide such maintenance.

- B. CONTRACTOR shall be responsible for controlling dust dispersion during utility and street construction. Remedial actions required as a result of inadequate dust control shall be CONTRACTOR's responsibility. To control dust, CONTRACTOR shall apply calcium chloride or ammonium lignin sulfonate in 12 to 14% solution or other dust control palliative acceptable to OWNER. Prior to application of dust palliative, the street shall be graded smooth.

### 3.12 COMPACTION TESTING

- A. Compaction tests shall be done by the Project Soils Engineer. Location and frequency of the tests shall be as recommended by the Project Soils Engineer and paid for by OWNER.

END OF SECTION

## SECTION 31 23 19

### DEWATERING

#### PART 1–GENERAL

##### 1.01 SUMMARY

- A. Work Included:
  - 1. Removal of groundwater to allow belowgrade construction.
  - 2. Site grading to prevent surface water from entering the excavation.
- B. Payment:
  - 1. The expense for making all extra excavations necessary to prevent water from interfering with the proper construction of the work and for forming all dams or diversions, digging of sumps or pump wells, bailing, and installation and pumping of wells shall be borne by CONTRACTOR.
  - 2. The cost for removal of groundwater and surface water shall be included in the prices bid for the work. No separate payment will be made for dewatering whether accomplished by use of sumps and pumps, well point systems, deep wells, or any other method.
  - 3. Any permits necessary for the dewatering operations shall be obtained and paid for by CONTRACTOR.

##### 1.02 REFERENCES

- A. Wisconsin Administrative Code Chapter NR 141.

##### 1.03 SYSTEM REQUIREMENTS

- A. CONTRACTOR shall, at its own expense, keep the excavation clear of water while structures, mains, and appurtenances are being built, utilities are being installed, and fill and backfill are being compacted. Under no conditions shall the work be laid in or under water. No water shall flow over the work until the joints are complete or the concrete has set.
- B. Wherever necessary, CONTRACTOR shall excavate in advance of the completed work, lead the water into sumps or pump wells, and provide erosion control measures to prevent water or sediment damage.
- C. CONTRACTOR's dewatering system shall perform so that the soils within the trench will not be destabilized by hydrostatic uplift pressures from adjacent groundwater. If conditions warrant, CONTRACTOR shall furnish and install well point systems or deep wells.
- D. Dewatering shall be sufficient to lower the piezometric level to at least 2 feet below the bottom of the excavation. Additional lowering shall be provided as necessary to create a stable subgrade.

- E. In areas where rock is encountered, the water level shall be kept at or below top of rock, but at least 6 inches below bottom of concrete. Additional rock shall be removed as needed to provide clearances.
- F. The control of groundwater shall be such that softening or heaving of the bottom of excavations or formation of “quick” conditions or “boils” shall be prevented.
- G. Dewatering systems shall be designed and operated so as to prevent the migration or removal of soils.

#### 1.04 QUALITY ASSURANCE

- A. All dewatering shall be done in accordance with applicable federal, state, and local code requirements.
- B. In particular, groundwater observation wells shall be provided and subsequently abandoned in accordance with NR 141. CONTRACTOR shall complete all observation well construction and abandonment forms as required by NR 141 and shall submit the forms to OWNER within 15 days of construction or abandonment activities.

### PART 2–PRODUCTS

NOT APPLICABLE

### PART 3–EXECUTION

#### 3.01 DEWATERING

- A. Dewatering shall be started, and the water level shall be lowered as specified herein prior to beginning excavation and shall be continued until structure, main, or appurtenance has been completed and fill has been placed and compacted to final grade.
- B. CONTRACTOR shall provide all necessary materials and equipment to keep the excavation free from water during construction. CONTRACTOR shall at all times have on hand sufficient pumping equipment and machinery in good working condition for all ordinary emergencies, including power outages, and shall have available at all times competent workers for the operation of the pumping equipment. The dewatering systems shall not be shut down between shifts, on holidays or weekends, or during the work stoppages.
- C. CONTRACTOR shall meet all requirements of applicable WDNR permits for construction pit or trench dewatering.
- D. The release of groundwater to its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted fill or backfill, and prevent floatation or movement of all structures and pipelines.

#### 3.02 PROTECTION

- A. CONTRACTOR shall take all necessary precautions during the dewatering operation to protect adjacent structures against subsidence, flooding, or other damage. The dewatering

system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would damage or endanger adjacent structures or property. Any such facilities and structures damaged shall be repaired or replaced to the satisfaction of their owner.

END OF SECTION

## SECTION 31 25 00

### SLOPE PROTECTION AND EROSION CONTROL

#### PART 1–GENERAL

##### 1.01 SUMMARY

- A. Work Included: Erosion control devices.

##### 1.02 PAYMENT

- A. All costs associated with slope protection and erosion control shall be included in CONTRACTOR's Bid. This work shall include, but is not limited to, erecting fence, excavation, placing posts, backfilling, attaching woven wire and geotextile fabric; placing ditch checks; installing sediment traps; removing the fence at completion of project; cleaning and repairing; removing or spreading accumulated sediment to form a surface suitable for seeding; replacing silt fence and damages caused by overloading of sediment material or ponding of water adjacent to silt fence; and furnishing labor, tools, equipment, and incidentals necessary to complete the work in accordance with the Contract.

##### 1.03 REFERENCES

- A. Wisconsin Department of Natural Resources Conservation Practice Standards-Construction Site Erosion and Sediment Control (Conservation Practice Standards).
- B. Erosion Control Product Applicability List (PAL) for Multi-Modal Applications (PAL) Wisconsin Department of Transportation.
- C. Kenosha County Construction Erosion Control (<https://www.kenoshacounty.org/DocumentCenter/View/120/Construction-Erosion-Control?bidId=>).

##### 1.04 REGULATORY REQUIREMENTS

- A. Land disturbance greater than one acre and OWNER obtains "Notice of Intent" (NOI). OWNER has prepared a Storm Water Management and Erosion Control Plan in conjunction with the development of the Contract Documents and has submitted a NOI for Storm Water Discharges Associated with Land Disturbing Activities. The NOI is included as an attachment to the Contract Documents. CONTRACTOR as designated operator of activities at the construction site shall be responsible for compliance with all permit conditions. This includes but is not limited to the following:
  1. Implement erosion and sediment control practices necessary to meet federal, state, and local performance standards.
  2. Receive required approvals from OWNER and regulatory agencies for any modifications to the erosion control plan necessitated by site conditions or CONTRACTOR's operations.
  3. Provide a "qualified" inspector to inspect erosion control and sediment controls. Inspector shall have prior experience with and knowledge of installation and maintenance of erosion and sediment controls. Inspector shall be identified to OWNER.
  4. Perform all inspection, maintenance, and record keeping activities required by the permit. This shall include inspecting erosion and sediment control facilities weekly and

within 24 hours after a precipitation event of 0.5 inch or greater. CONTRACTOR shall maintain weekly written reports of all inspections.

5. CONTRACTOR shall respond within 24 hours to all corrective measures noted on the inspection report to address pollution issues.
6. CONTRACTOR shall submit to OWNER a written notice stating the times, dates and actions taken to rectify the defective pollution and erosion controls.
7. Pay any fines or other fees resulting from failure of CONTRACTOR to comply with the permit requirements.
8. Submit a "Notice of Termination" (NOT) to DNR at end of the Project.

- B. CONTRACTOR and its subcontractors shall execute and sign the following certification:

"I certify under penalty of law that I understand the terms and conditions of the General Pollutant Discharge Elimination System Permit that authorizes the storm water discharges associated with industrial activities from the construction site and as may be detailed in the Contract Documents. I agree to indemnify and hold OWNER harmless from any claims, demands, suits, causes of action, settlements, fines, or judgments and the costs of litigation, including, but not limited to, reasonable attorneys fees and costs of investigation and arising from a condition, obligation or requirement assumed or to be performed by CONTRACTOR for storm water pollution and erosion control."

- C. CONTRACTOR shall pay any fines or other fees resulting from failure of CONTRACTOR to comply with the permit requirements.

#### 1.05 QUALITY CONTROL

- A. Construct and maintain erosion sediment control measures in accordance with the Conservation Practice Standards.
- B. Check facilities weekly and after any rainfall event, and make needed repairs within 24 hours.

### PART 2--PRODUCTS

#### 2.01 EROSION CONTROL PRODUCTS

- A. Erosion control products shall be as listed in the *Erosion Control Product Acceptability List (PAL)* of the Wisconsin Department of Transportation. Contractors may obtain copies of the PAL and PAL qualification procedures from the WisDOT Bureau of Highway Construction.

#### 2.02 EROSION MATS

- A. Erosion mat products shall be selected from the PAL in conformance with criteria specified in Conservation Practice Standard 1052 (Nonchannel Erosion Mat) and 1053 (Channel Erosion Mat).
- B. Unless designated on the Drawings or specified, CONTRACTOR may furnish any prequalified erosion mat product of the class and type listed in the PAL.

- C. A 300 mm by 300 mm sample of a product proposed for erosion mat may be required to verify that it is prequalified. When a sample is required, it shall be accompanied by the manufacturer's literature for the proposed product.

#### 2.03 SILT FENCE

- A. Silt fence shall conform to Conservation Practice Standard 1056–Silt Fence and as shown on Drawing 01-975-111A. Silt fence shall conform to Table 2 of Conservation Practice Standard 1056.
- B. Furnish wrapping on each roll of fabric to protect the fabric from ultraviolet radiation and from abrasion during shipping and handling. Keep geotextile dry until installed.

#### 2.04 SOIL STABILIZER

- A. Soil stabilizer shall be Type A or Type B. Type A is either a cementitious soil binder added to wood cellulose fiber mulch or a bonded fiber matrix. Type B is a water soluble anionic polyacrylamide meeting requirements specified in Conservation Practice Standard 1050–Land Application of Anionic Polyacrylamide. CONTRACTOR shall provide soil stabilizer products from the PAL.

#### 2.05 INLET PROTECTION

- A. Inlet protection shall conform to Conservation Practice Standard 1060–Storm Drain Inlet Protection for Construction Sites and as shown on Drawing 01-975-110A. Manufactured bags shall conform to Table 1 of Conservation Practice Standard 1060.

#### 2.06 STONE TRACKING PADS AND TIRE WASHING STATION

- A. Stone tracking pads and tire washing stations shall conform to Conservation Practice Standard 1057–Stone Tracking Pad and Tire Washing.

#### 2.07 DITCH CHECKS

- A. Ditch checks shall conform to Conservation Practice Standard 1062–Ditch Check (Channel) and as shown on Drawing 01-975-113A.

#### 2.08 MULCHING

- A. Mulching for construction sites shall conform to Conservation Standard Practice 1058–Mulching for Construction Sites.

#### 2.09 VEGETATIVE BUFFER FOR CONSTRUCTION SITES

- A. Vegetative buffer shall conform to Conservation Standard Practice 1054–Vegetative Buffer for Construction Sites.

#### 2.10 TEMPORARY SEEDING

- A. Temporary seeding for construction site erosion control shall conform to Conservation Standard Practice 1059–Seeding for Construction Site Erosion Control.

## 2.11 BEDDING DIKE

- A. Where shown on the Drawings or requested by ENGINEER in the field, CONTRACTOR shall install clay bedding dikes to prevent groundwater from flowing continuously through the bedding material installed for the sanitary sewer. Bedding dikes shall be 4 feet long and shall extend from the bottom of the trench excavation to within 2 feet of the ground surface and 1 foot beyond the normal trench width on both sides of the trench.

## 2.12 SEDIMENT TRAPS AND SEDIMENT BASINS

- A. Sediment traps and sediment basins shall conform to WDNR Technical Standards Sediment Trap No. 1063 and Sediment Basin No. 1064.

## 2.13 CONCRETE WASHOUT FACILITY

- A. CONTRACTOR shall provide a temporary concrete washout facility in accordance with the National Pollutant Discharge Elimination System (NPDES). Concrete washout facility shall be located a minimum of 50 feet from any storm drain inlet, open drainage facility, water body, construction traffic, and access area. Provide appropriate signage to inform equipment operators of the washout location.

## 2.14 DUST CONTROL

- A. Dust control shall conform to WDNR Technical Standard Dust Control on Construction Sites No. 1068.

## PART 3–EXECUTION

### 3.01 GENERAL

- A. Install erosion control devices before any soil disturbance or construction activities begin.
- B. Proceed carefully with construction adjacent to stream channels to avoid washing, sloughing, or deposition of materials into the stream. If possible, the work area should be diked off and the volume and velocity of water that crosses disturbed areas be reduced by means of planned engineering works (diversion, detention basins, berms).
- C. Unless noted on Drawings, do not remove trees and surface vegetation.
- D. Stage Construction grading activities to minimize the cumulative exposed area. Conduct temporary grading for erosion control per WDNR Technical Standard Temporary Grading Practices for Erosion Control No. 1067.
- E. Expose the smallest practical area of soil at any given time through construction scheduling. Make the duration of such exposure before application of temporary erosion control measures or final revegetation as short as practicable. CONTRACTOR shall limit section area of disturbance in channels to a maximum of 300 feet per crew. In general, it is expected that streambank stabilization measures will be installed within 5 days of initial disturbance.

- F. CONTRACTOR shall provide a “qualified” inspector to inspect erosion control and sediment controls once in place. Inspector shall have prior experience with and knowledge of installation and maintenance of erosion and pollution controls. Unless stricter requirements are mandated by DNR or by any local permits, project site erosion control inspection shall be conducted every seven days and after each one-half-inch rainfall or greater. CONTRACTOR shall maintain hard copies of the inspection reports for the duration of the Project.
- G. Any necessary repairs to erosion and sediment control facilities shall be provided within 24 hours to all corrective measures noted on the inspection reports to address pollution issues. CONTRACTOR shall submit to OWNER a written notice stating the times, dates and actions taken to rectify the defective erosion and sediment controls.
- H. CONTRACTOR shall also make any necessary additions for erosion and sediment control as may result from on-site conditions or the progress of the Work or as may be required by DNR or OWNER.
- I. Disturbed areas shall be stabilized with temporary or permanent measures within 14 calendar days of the soil disturbance or redisturbance.
- J. All temporary erosion and sediment control measures shall be removed within 30 days after final stabilization is achieved or after the temporary measures are no longer needed. All sediment accumulated in temporary and permanent facilities shall be removed and properly disposed of and the area restored.
- K. Immediately stabilize stockpile and surround stockpiles as needed with silt fence or other perimeter control if stockpiles will remain inactive for 7 days or longer.
- L. Sweep and clean up all sedimentation and trash that moves off-site due to construction activity or storm events before the end of the same workday.
- M. Temporary restrooms are to be located a minimum of 50 feet away from any storm drain inlet, open drainage facility, or water body. The location of the temporary rest rooms must be approved by OWNER. Sanitary waste shall be collected from portable units provided by CONTRACTOR a minimum of two times per week to avoid overflowing and maintain sanitary conditions around the unit.
- N. All petroleum products stored on-site shall be stored in adequate containers. All fueling sources shall have spill kits immediately available. All hazardous storage areas must be placed in areas away from stormwater flow patterns and storm sewer basins and inlets.
- O. Concrete trucks shall not be permitted to wash out or discharge surplus concrete or drum wash water on the site. Specific areas for this activity shall be designated by CONTRACTOR and provided with adequate siltation basins and other facilities so that discharge is contained and cleansed before entering the site storm sewer system.
- P. The vegetative growth associated with temporary and permanent seeding, sodding, vegetative channels, etc. shall be maintained periodically and supplied with adequate water and fertilizer nutrients. If necessary, the vegetative cover shall be removed and reseeded as needed.

- Q. The conditions of the construction site for the winter shut down period shall address proper sediment and erosion control early in the fall growing season so that slopes and other bare earth areas may be stabilized. Stabilization shall be land applied soil stabilizer Type B and/or erosion mat urban Class I, Type B for non-channel. Erosion mat Class II, Type B shall be used for channel use. Soil stabilizers and erosion mat shall be in accordance with the Wisconsin Department of Transportation erosion control and stormwater product acceptability lists to provide a stable, temporary, and/or permanent vegetative cover. All areas to be worked beyond the end of the growing season must incorporate soil stabilization measures.
- R. Disturbed areas and areas used for storage of materials and equipment that are exposed to precipitation shall be inspected for evidence of, or the potential for pollutants entering the drainage system. Erosion and sedimentation control measures shall be observed to review that they are operating correctly. Where discharge locations or points are accessible they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impact to receiving waters and adjacent properties. Locations where vehicles enter or leave the site shall be inspected for evidence of off-site sediment tracking.
- S. Make provisions for watering following seeding or planting of disturbed areas whenever more than seven consecutive days of dry weather occur.

### 3.02 EROSION MAT

- A. Erosion mats shall be installed in accordance with manufacturer's requirements and with Conservation Practices Standards 1052 and 1053 and as shown on Drawing 01-975-112A.
- B. Place erosion mats immediately after seeding operations have been completed. Before mat placement, remove all material or clods over 1 1/2 inches in diameter and all organic material or other foreign material which may interfere with the mat bearing completely on the soil.
- C. Any small stones or clods which prevent contact of the mat with the soil shall be pressed in the soil with a small lawn-type roller or by other means. The mat shall have its lateral edge so impressed in the soil so as to permit runoff water to flow over it.
- D. The matting strips shall be rolled on or laid in direction of flow. Spread mat evenly and smoothly in a natural position without stretching and with all parts bearing on soil. Place blanket with netting on top. Overlap adjacent strips at least 4 inches. Overlap strip ends at least 10 inches. Make overlaps with upgrade section on top.
- E. Bury upgrade end of each strip of fabric or blanket at least 6 inches in a vertical slot cut in the soil and press soil firmly against the imbedded fabric or blanket.
- F. Anchor mats in place with vertically driven staples, driven until their tops are flush with the soil. Space staples on 3-foot centers along mat edges and stagger space at 3-foot centers through the center. Place staples at 10-inch centers at end or junction slots.
- G. Reseed areas damaged or destroyed during erosion mat placing operations as specified for original seeding.
- H. Dispose of surplus excavated materials during erosion mat placing operation as specified for original seeding.

- I. Following mat placement, uniformly apply water to the area to moisten seed bed to 2-inch depth and in a manner to avoid erosion.
- J. Maintain erosion mat and make satisfactory repairs of damage from erosion, traffic, fires, or other causes until Work is accepted.

### 3.03 SILT FENCE

- A. Silt fence shall be constructed in conformance with the criteria specified in Conservation Practice Standard 1056–Silt Fence.
- B. Remove sediment from behind silt fences and sediment barriers before sediment reaches a depth that is equal to one-half of the fence and/or barrier height. Repair breaks and gaps in silt fence and barriers immediately.

### 3.04 SOIL STABILIZER

- A. Soil Stabilizer Type A shall be applied with conventional hydraulic seeding equipment. CONTRACTOR shall take care so that surrounding surfaces, structures, trees, and shrubs are not over-sprayed. Before Work is accepted any over-spray must be satisfactorily cleaned from surfaces. The finished application shall be 3/16-inch to 1/4-inch thick. For permanent slope applications, CONTRACTOR shall sow seed separately before applying the soil stabilizer so that the seed has direct contact with the soil.
- B. Soil Stabilizer Type B shall be applied with conventional hydraulic seeding equipment or by dry spreading. CONTRACTOR shall apply material at the manufacturer's recommended rate. For permanent slope applications, CONTRACTOR shall apply an approved mulch when the soil stabilizer is applied or after it is applied to protect the seed.

### 3.05 INLET PROTECTION

- A. All storm drains that are or will be functioning during construction shall be provided with inlet protection. Inlet protection shall be provided in conformance with the criteria specified in Conservation Practice Standard 1060–Storm Drain Inlet Protection for Construction Sites.

### 3.06 STONE TRACKING PADS AND TIRE WASHING

- A. Tracking pads (tire washing stations as required) shall be installed in accordance with the criteria in Conservation Practice Standard 1057–Stone Tracking Pad and Tire Washing.
- B. Surface water must be prevented from passing through tracking pads. Flows shall be diverted away from tracking pads and conveyed under and around them such as with culverts.
- C. Any sediment tracked onto a road shall be removed before the end of each day. Flushing sediment shall not be allowed.

### 3.07 DITCH CHECKS

- A. Ditch checks shall be provided in conformance with the criteria specified in Conservation Practice Standard 1062–Ditch Checks.

3.08 MULCHING

- A. Mulching shall be provided in conformance with the criteria specified in Conservation Practice Standard 1060–Mulching for Construction Sites.

3.09 VEGETATIVE BUFFER

- A. Vegetative buffer shall be provided in conformance with the criteria specified in Conservation Practice Standard 1060–Vegetative Buffer for Construction Sites.

3.10 SEEDING FOR EROSION CONTROL

- A. Temporary seeding for erosion control shall be provided in conformance with the criteria specified in Conservation Practice Standard 1059–Seeding for Construction Site Erosion Control.

3.11 SEDIMENT TRAPS AND SEDIMENT BASINS

- A. Sediment traps for erosion and sedimentation control during interim construction stages shall be installed in accordance with the criteria in Conservation Practice Standard 1063–Sediment Trap and sediment basins with the criteria in 1064–Sediment Basin. They shall be constructed prior to any disturbances and shall be placed so they function during all phases of the Work.

END OF SECTION

## SECTION 32 92 19

### SEEDING

#### PART 1–GENERAL

##### 1.01 SUMMARY

- A. Work Included:
  - 1. Preparation of subsoil.
  - 2. Topsoil.
  - 3. Seeding, erosion mat, and fertilizing.
  - 4. Maintenance.
- B. Except for paved, riprapped, or built-up areas, all areas of the site which are disturbed and areas noted on the Drawings shall be seeded. Prior to seeding, disturbed areas shall be graded to subgrade for placement of topsoil.
- C. CONTRACTOR shall proceed with restoration of property and cleanup of all disturbed areas concurrently with the installation of utilities and street construction.

##### 1.02 MEASUREMENT AND PAYMENT

- A. The Work provided shall be measured and paid for at the Unit Price Bid. The Unit Price Bid shall include all labor, equipment, materials, and miscellaneous items for the Work.

##### 1.03 REFERENCES

- A. FS O-F-241–Fertilizers, Mixed, Commercial.
- B. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the State of Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, current edition, including all issued supplemental specifications.

##### 1.04 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging, and location of packaging.

##### 1.05 DELIVERY, STORAGE, AND PROTECTION

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

## PART 2–PRODUCTS

### 2.01 SEED MIXTURE

- A. Seed materials shall conform to Section 630 of the Standard Specifications for No. 40 Seed.
- B. Weed content shall not exceed 0.5% in mixture.

### 2.02 SOIL MATERIALS

- A. Topsoil shall consist of salvaged topsoil or hauled-in topsoil in accordance with Section 625 of the Standard Specifications.

### 2.03 ACCESSORIES

- A. Erosion mat shall be in accordance with the WisDOT Erosion Control Product Acceptability List (PAL).
- B. Fertilizer shall be in accordance with Section 629 of the Standard Specifications for Type A fertilizer. Fertilizer shall be provided for seed locations.
- C. Water shall be clean, fresh, and free of substances or matter which could inhibit vigorous growth of grass.
- D. CONTRACTOR shall be responsible for watering in accordance with Section 630 and Section 631 of the Standard Specifications.

## PART 3–EXECUTION

### 3.01 GENERAL

- A. CONTRACTOR shall proceed with restoration of property and cleanup of all disturbed areas concurrently with the installation of utilities and street construction.

### 3.02 EXAMINATION

- A. Verify that prepared soil base is ready to receive the work of this section.

### 3.03 PREPARATION OF SUBSOIL

- A. Prepare subsoil to eliminate uneven areas and low spots. Maintain lines, levels, profiles, and contours. Make changes in grade gradual. Blend slopes into level areas.
- B. Remove foreign materials, weeds, and undesirable plants and their roots. Remove contaminated subsoil in accordance with local, state, and federal regulations.
- C. Scarify subsoil to a depth of 3 inches where topsoil is to be placed. Repeat deep (> 12 inches) subsoiling or cultivation in areas where equipment used for hauling and spreading topsoil has compacted subsoil.

### 3.04 PLACING TOPSOIL

- A. Place topsoil in accordance with Section 625 of the Standard Specifications.
- B. Spread topsoil to a minimum depth of 6 inches over area to be seeded. Rake until smooth.
- C. Place topsoil during dry weather and on dry unfrozen subgrade.
- D. Remove vegetable matter and foreign nonorganic material from topsoil while spreading.
- E. Grade topsoil to eliminate rough, low or soft areas, and to provide positive drainage.
- F. Manually spread topsoil around trees, plants, and buildings to prevent damage.
- G. Leave stockpile area and site clean and raked, ready to receive landscaping.

### 3.05 FERTILIZING

- A. Apply fertilizer in accordance with Section 629 of the Standard Specifications.
- B. Apply fertilizer after smooth raking of topsoil and prior to installation of seed, no more than 18 hours before seeding.
- C. Do not apply fertilizer at same time or with same machine as will be used to apply seed.
- D. Mix fertilizer thoroughly into upper 2 inches of topsoil.
- E. Lightly water to aid the dissipation of fertilizer.

### 3.06 SEEDING

- A. Apply seed in accordance with Section 630 of the Standard Specifications. Apply evenly in two intersecting directions. Rake in lightly or roll the seeded area after seeding.
- B. Planting season shall be between April 15 and June 15, or between August 15 and October 15.
- C. Do not sow immediately following rain, when ground is too dry or during windy periods.
- D. Seeding shall be maintained by CONTRACTOR until grass is well established. Grass is well established when it covers the entire seeded areas to a height of 2 inches.
- E. Place erosion control mats per Section 31 25 00–Slope Protection and Erosion Control.

### 3.07 MAINTENANCE

- A. Mow grass at regular intervals to maintain at a maximum height of 2 1/2 inches. Do not cut more than one-third of grass blade at any one mowing.
- B. Immediately remove clippings after mowing.
- C. Water to prevent grass and soil from drying out.

- D. Roll surface to remove minor depressions or irregularities.
- E. Control growth of weeds. Apply herbicides in accordance with manufacturer's instructions. Remedy damage resulting from improper use of herbicides.
- F. Immediately reseed areas which fail to show adequate catch. Bare spots shall not exceed 5 square feet in area and not exceed 3% of the total seeded areas.
- G. Protect seeded areas with warning signs during maintenance period.
- H. Immediately reseed areas which do not show a satisfactory stand of established grass.
- I. Correct damage resulting from erosion, gullies, rills, or other causes by filling with topsoil, tamping, refertilizing, and reseeding if damage occurs prior to acceptance of work.
- J. Maintain seeded lawns for not less than 60 days after substantial completion.
- K. If seeded in fall and not given full 60 days of maintenance, or if not considered acceptable at that time, continue maintenance the following spring until acceptable lawn is established.
- L. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations such as rolling, regrading, and replanting as required to establish a smooth acceptable lawn free of eroded or bare areas.

### 3.08 TEMPORARY WINTER RESTORATION

- A. Temporary winter seed restoration and erosion control shall be installed in accordance with Wisconsin Department of Natural Resources Standards. All costs associated with the placement and maintenance shall be included in Unit Price Bid for Temporary Winter Restoration.
- B. Stabilization shall be land applied soil stabilizer Type B and/or erosion mat urban Class I, Type B for non-channel. Erosion mat Class II, Type B shall be used for channel use. Soil stabilizers and erosion mat shall be in accordance with the Wisconsin Department of Transportation erosion control and stormwater product acceptability lists to provide a stable, temporary, and/or permanent vegetative cover. All areas to be worked beyond the end of the growing season must incorporate soil stabilization measures.

END OF SECTION

## SECTION 33 00 10

### BURIED PIPING AND APPURTENANCES

#### PART 1–GENERAL

##### 1.01 SUMMARY

- A. Work Included:
  - 1. All underground piping, valves, and appurtenances of every description.
  - 2. Excavation, dewatering, and backfilling for all work under this section unless otherwise noted.
  - 3. Concrete foundations and anchor bolts for all equipment furnished under this section.
  - 4. Underground piping connections to all equipment, whether furnished under this section or not.
- B. Measurement and Payment: Payment for all work, including materials, equipment, and miscellaneous items necessary to complete the installation, will be made at the Unit Price Bid for buried piping and appurtenances. Any work, including materials, equipment, and miscellaneous items necessary to complete the installation that is not listed as a Unit Price Bid item, shall be incidental to complete the work in accordance with the Contract.

##### 1.02 REFERENCED SPECIFICATIONS

- A. WisDOT Specifications in the Standard Specifications shall refer to the State of Wisconsin Department of Transportation, Division of Highways, Standard Specifications for Highway and Structure Construction, Latest Edition, including the Effective ASP 6.
- B. Conservation Practice Standards in the Standard Specifications shall refer to the Wisconsin Department of Natural Resources Conservation Practice Standards-Construction Site and Sediment Control.

#### PART 2–PRODUCTS

##### 2.01 MATERIALS OF CONSTRUCTION

- A. All materials used in the manufacture, assembly, and painting of piping and valves in contact with water shall be compatible with potable water supplies and in contact with chemical feed systems shall be compatible with the chemicals being used. All glues, solvents, solders, etc., shall likewise be compatible. For instance, no lead-base solders shall be used.
- B. Size and Type:
  - 1. All materials shall conform to the size and type shown on the Drawings or called for in the specifications.
  - 2. In joining two dissimilar types of pipe, standard fittings shall be used when available. In the event standard fittings are not available, the method of joining shall be standard selected by CONTRACTOR and submitted for review by ENGINEER.

- C. Materials provided shall be suitable for the conditions in which they are being installed and used. CONTRACTOR shall review installation requirements of the Contract with material suppliers and incorporate any additional installation requirements necessary to meet the required use within the price bid for the Work.
- D. All pipe and materials used in performance of the Work shall be clearly marked as to strength, class, or grade. Pipe and materials not so marked shall be subject to rejection.
- E. When requested by ENGINEER, material suppliers shall furnish certificates of compliance indicating that all tests required by various Standards have been conducted and that the test results comply with the Standards.
- F. Piping appurtenances shall be made of the materials specified. All appurtenances not designated as to type shall be selected by CONTRACTOR and submitted for review by ENGINEER.

## 2.02 MANHOLES AND UNDERGROUND UTILITY STRUCTURES

- A. General: All provisions of Drawing 01-975-43A, enclosed in these specifications, except those contrary to provisions delineated herein or on the Drawings shall apply to manholes.
- B. Manhole Chimney Adjusting Rings:
  - 1. Provide concrete manhole adjusting rings.
  - 2. Precast concrete adjusting rings for standard manholes shall have an inside diameter of 26 inches, be not less than 2 inches nor more than 6 inches high, and shall have a wall thickness of 6 inches unless otherwise specified. The rings shall contain a minimum of one No. 2 reinforcing rod centered within the ring. The joints between rings and between rings and castings shall be sealed with preformed flexible joint sealant as specified herein.
- C. Manhole Chimney Seals:
  - 1. Existing manholes exposed during the construction period shall have the adjustment rings replaced and a new internal and external chimney seal installed. Existing castings shall be reused.
  - 2. External chimney seals shall be Cretex, or equal.
  - 3. Internal chimney seals shall be made of a rubber type product, with a minimum thickness of 3/16 inch, a minimum unstretched width of 8 inches and be extruded or molded from a high-grade rubber compound conforming to the applicable requirements of ASTM C923. The bands used for compressing the sleeve against the manhole shall be fabricated from stainless steel conforming to ASTM A240, Type 304, for sheet and ASTM A479, Type 304, for rods. Any screws, bolts, or nuts used on these bands shall be stainless steel conforming to ASTM F593 and F594, Type 304. The internal seal or its appurtenances shall not extend far enough into the manhole opening to restrict entry into or exit from the manhole.
  - 4. Manhole frame-chimney seals shall be designed to prevent the leakage of water into the manhole at the area of the joint between the manhole frame and chimney continuously throughout a 20-year design life. The seal shall remain flexible, allowing repeated vertical movements of the frame because of frost lift, ground movement, or other causes of up to 2 inches and/or repeated horizontal movements of the frame because of thermal movement of the pavement or other causes of up to 1/2 inch, both rates of movement occurring at rates not less than 0.10 inch per minute. If the seal is an internal seal, it and its appurtenances shall not extend far enough into the manhole opening to restrict entry or exit from the manhole.

5. The seal shall be made of only materials that have been successfully used in sanitary sewer construction for at least 10 years and have proven to be resistant to sanitary sewage; corrosion or rotting under wet or dry conditions; the gaseous environment in sanitary sewers and at road surfaces including common levels of ozone, carbon monoxide and other trace gases at the sites of installations; the biological environment in soils and sanitary sewers; chemical attacks by road salts, road oil and common street spillages or solvents used in street construction or maintenance; the temperature ranges, variations and gradients in and between manhole frames and chimneys in the climate of the location of construction; variations in moisture conditions and humidity; fatigue failure caused by a minimum of 30 freeze thaw cycles per year; or vibrations because of traffic loadings; fatigue failure because of repeated variations of tensile, compressive and shear stresses and repeated elongation and compression; and any combination of the foregoing. The materials used shall be compatible with each other and the manhole materials.

D. Mortar: Mortar shall meet the requirements of ASTM C270. Mortar shall be one part Portland cement and 2 1/4 parts washed mortar sand.

E. O-Rings: O-rings shall meet the requirements of ASTM C443.

2.03 BURIED PIPING

A. Ductile Iron Piping and Fittings:

1. As shown on the Drawings, ductile iron shall conform to AWWA C151/A21.51 with mechanical joints or push-on joints. Pipe wall thickness shall be furnished as required by AWWA C150 for buried piping with the depth of cover as shown on the Drawings for laying condition 4, minimum Special Thickness Class or Pressure Class as listed below, unless otherwise shown or specified.

Pipe Size (Inches)	Special Thickness (Class)	Pressure Class
3	53	---
4	53	---
6	53	---

2. Each pipe and fitting shall have the weight, class or nominal thickness, country where cast, casting period, manufacturer’s mark, the year in which the pipe was produced, and the letters DI or DUCTILE cast or stamped thereon. Improper or incomplete marking will be cause for rejection of the pipe or fitting.

3. CONTRACTOR shall furnish certification data representing each class of pipe or fitting furnished. The certification report shall clearly state that all pipe and fittings furnished meet the appropriate AWWA specification. Ductile iron pipe shall consist of pipe centrifugally cast in metal or sand-lined molds. Pipe wall shall be homogeneous from inside to outside and shall be completely free of laminations, blisters, or other imperfections. Defects may be removed at the factory only.

4. Except as otherwise specified, underground pipe shall have mechanical joints or push-on joints conforming to AWWA C110 and C111, as well as AWWA C153 (compact), with vulcanized styrene butadiene rubber gaskets conforming to AWWA C111. Gaskets that include metal locking segments vulcanized into the gasket to grip the pipe and provide joint restraint are not acceptable. Bolts on mechanical joints shall be high-strength low-alloy steel (Corten, or equal), conforming to AWWA C111. Certificate to that effect shall be provided.

5. Restrained joints shall be provided in accordance with Part 3–Execution. Mechanical joints shall be restrained with MEGALUG® Series 1100 or 1100 SD, by EBAA Iron Sales, Inc., UNIFLANGE Series 1400 by Ford Meter Box Co., Inc., or equal, restraint. Push-on joints for ductile iron piping shall be restrained with MEGALUG® Series 1700 or 1100 HD, by EBAA Iron Sales, Inc., UNIFLANGE Series 1450 by Ford Meter Box Co., Inc., Flex-Ring or Lok-Ring by American Cast Iron Pipe Company, TR Flex by U.S. Pipe Company, TR Flex by McWane, or equal.
  - a. Pipe restraint fittings shall be provided as follows:
    - (1) For ductile iron pipe with ductile iron mechanical joints MEGALUG® Series 1100 or 1100SD by EBAA Iron Sales, Inc.; Series D SLDE or SSLD by Sigma; Series 3000 or 3000S by Star Pipe Products; or equal.
    - (2) For ductile iron pipe with ductile iron push on joints MEGALUG® Series 1100HD or 1700 by EBAA Iron Sales, Inc; Series SLDEH or SSLDH by Sigma; Series 3100P or 3100S by Star Pipe Products; Flex Ring or Lok Ring by American Cast Iron Pipe Company; TR Flex by U.S. Pipe Company; or equal.
    - (3) For PVC pipe with ductile iron mechanical joint fittings–MEGALUG® Series 2000 PV, 1100SV, or 2000SV by EBAA Iron Sales, Inc.; Series D SLCE or PVM by Sigma; Series 1000C or 4000 by Star Pipe Products; or equal.
    - (4) For PVC pipe with PVC push on joints (not solvent welded)–MEGALUG® Series 1100HV, 1900, or 2800 by EBAA Iron Sales, Inc.; Series SLCEH, PWP (greater than 12-inch only), or D PWP (12 inches or less) by Sigma; Series 4100P by Star Pipe Products; or equal.
  - b. Gland body, wedges, and wedge actuating components shall be ductile iron conforming to ASTM A536 Grade 65 45 12. Bolts and tie rods shall be high strength low alloy steel conforming to AWWA C111.
  - c. Gaskets that include metal locking segments vulcanized into the gasket to grip the pipe to provide joint restraint are not acceptable.
6. Joint restraint shall be provided for any pipe requiring pressure testing.
7. Underground pipe shall have mechanical joint or push-on joint ductile iron fittings conforming to AWWA C110 and C111 or AWWA C153 compact fittings with a minimum rated working pressure of 150 psi. Gaskets for fittings shall be as specified for underground piping.
8. Unless otherwise specified, underground piping and fittings shall be shop primed or asphaltic-coated outside. Asphaltic coating shall conform to applicable standards herein for the pipe and fittings.
9. Piping and fittings for installation in manholes, wet wells or other such structures, and elsewhere exterior as shown on the Drawings or specified shall be flanged.
10. All buried ductile iron piping and appurtenances shall be polyethylene encased in accordance with AWWA C105. Polyethylene encasement shall be Class C (carbon black) and shall be minimum 8 mil thickness. Tape for securing the film shall be a thermoplastic material with a pressure sensitive adhesive face capable of bonding to metal, asphaltic coating, and polyethylene. Tape shall have a minimum thickness of 8 mils and a minimum width of 1 inch. The polyethylene film envelope shall be as free as is commercially possible of gels, streaks, pinholes, particles of foreign matter, and undispersed raw materials. There shall be no other visible defect, such as holes, tears, blisters, or thinning out at folds. For buried pipe polyethylene encasement shall be V-BIO polyethylene encasement and shall meet ANSI/AWWA C105-A21.5 Polyethylene Encasement for Ductile Iron Pipe. V-BIO to include an anti-microbial Biocide as well as a corrosion inhibitor. Specifications to include 8 mil thickness, tensile strength of 3,600 psi per ASTM D882, elongation of

800% min per ASTM D882, and dielectric strength of 800 V/mil thickness per ASTM D149. Installation of V-BIO polyethylene encasement shall be per ANSI/AWWA C105-A21.5 Polyethylene Encasement for Ductile Iron Pipe.

11. Cutting in and Repair Tees and Sleeves and Tapping Tees: Cutting-in and repair tees and sleeves and tapping tees shall be of ductile or cast iron with the same rated working pressure of the pipe in which they are installed but no less than 150 psi.
12. Exterior Joints, Fittings, and Gaskets: Joints, fittings, and gaskets shall have the same rated working pressure of the pipe in which they are installed but no less than a minimum rated working pressure of 150 psi.

B. Force Main:

1. Force main pipe shall be PVC piping, pressure class 235 psi, DR 18, meeting the requirements of AWWA C900 or AWWA C905.
2. Markings on the pipe shall include the following: Nominal pipe size, type of plastic pipe material, DR number, AWWA designation with which the pipe complies, and manufacturer's name.
3. Fittings on PVC pipe shall be ductile iron mechanical joint conforming to requirements specified for ductile iron fittings with appropriate transition fittings and gaskets.
4. Push-on joints for PVC piping shall be restrained with MEGALUG® Series 1500 (AWWA C900) by EBAA Iron Sales, Inc., Uni-Flange® Series 1350 by Ford Meter Box Co., Inc., or equal. PVC piping with ductile iron mechanical joint fittings shall be restrained with MEGALUG® Series 2000 PV by EBAA Iron Sales Inc., Uni-Flange® Series 1500 by Ford Meter Box Co., Inc., or equal.

C. PVC Pipe (AWWA) and PVC Pressure Pipe Fittings (4 Inches and Larger):

1. PVC water main shall be AWWA PVC pressure-rated pipe and shall conform to the requirements of AWWA C900 for pipe from 4 inches to 60 inches. Pipe shall be furnished with integral elastomeric bell and spigot joints.
2. PVC pipe diameter shall conform to ductile iron pipe sizes (DIPS). The type of PVC material, nominal pipe size, standard dimension ratio, and pressure class shall be not less than pressure class 235 and not greater than pipe dimension ratio 18.
3. Markings on pipe shall include the following: Nominal pipe size, type of plastic pipe material, DR number, AWWA Designation with which the pipe complies, manufacturer's name, and the seal or mark of the laboratory making the evaluation of the suitability of the pipe for transport of potable water.
4. All fittings for PVC pressure pipe shall be iron pipe fittings as specified herein.
5. Provide tracer wire for underground PVC piping as specified herein, unless otherwise noted.

D. HDPE Pipe and Fittings:

1. HDPE pressure rated pipe shall conform to the requirements of AWWA C906 for pipe from 4 inches through 65 inches. HDPE pipe shall be manufactured from material conforming to PE Code PE4710.
2. HDPE pipe outside diameter shall conform to ductile iron pipe sizes (DIPS). The type of HDPE material, nominal pipe size, standard dimension ratio, and pressure rating shall be not less than pressure class 250 and not greater than a dimension ratio (DR) 9.
3. Markings on the pipe shall include the following: Nominal pipe size, type of plastic pipe material, DR number, pressure class rating, manufacturer's name, and the seal or mark of the laboratory making the evaluation of the suitability of the pipe for the transport of potable water.

4. Fittings for HDPE pipe shall conform to AWWA C906 and shall have the same pressure rating as the pipe in which they are installed.
- E. Miscellaneous Pipe:
1. Piping needed for repair or reconstruction of existing utilities and appurtenances shall be of the same type and strength as the existing. The type of jointing used in repair and reconstruction shall be reviewed by ENGINEER. Special fittings shall be furnished and installed as necessary for repair, reconstruction, or connection of existing facilities.
  2. All special fittings on or for connection to utilities shall be specifically built for the type of gasket used. Special fittings shall have joints of the same type as the utility to which the connection is being made.
- F. Tracer Wire:
1. Provide minimum 10-gauge solid insulated copper tracer wire with buried thermoplastic pressurized pipe. Wire shall be continuous, terminate, and be accessible at valve boxes, manholes, fire hydrants, or at test stations as specified below. Tracer wire shall be located 12 inches above the top of the pipe. Any splices in copper wire shall be made with a 3M™ DBR/Y-6 splice kit, or equal.
  2. The tracer wire shall run into and up the sides of all manholes and be secured near the casting.
  3. CONTRACTOR shall perform continuity testing of all tracer wire in the presence of OWNER ENGINEER.

## PART 3—EXECUTION

### 3.01 INSTALLATION

- A. Underground Piping:
1. Utility lines shall be laid and installed to the lines and grades specified with valves, fittings, manholes, and other appurtenances at the specified locations; spigots centered in bells; and all manholes and riser pipes plumb. Force main shall be installed at the depth indicated. Gravity sewer mains and laterals shall maintain a minimum 6.5 feet of cover but shall be deep enough to provide service to buildings. Water main, force main, and other pressure mains shall be installed to within (plus or minus) 0.1 feet of designed grades. Sanitary and storm sewer and laterals shall be installed to within (plus or minus) 0.03 feet of designed grades. Service lines shown on the Drawings are approximate.
  2. Deviations Occasioned by Underground Facilities: Wherever significant obstructions not shown on the Drawings are encountered during the progress of the Work, CONTRACTOR shall proceed in accordance with the General Conditions to notify owners and protect the facilities. Existing items unnecessarily damaged during the performance of the Work shall be repaired and replaced at the expense of CONTRACTOR.
  3. Prior to commencing pipe laying, CONTRACTOR shall notify ENGINEER of the intended date for starting Work. ENGINEER may request at CONTRACTOR's expense the removal and relaying of pipe which was installed prior to notification of ENGINEER.
    - a. Proper implements, tools, and facilities shall be provided and used by CONTRACTOR for the safe and convenient prosecution of the Work. All pipe, fittings, and appurtenances shall be carefully lowered into the trench piece by

piece with a crane, rope, or other suitable tools or equipment, in such manner as to prevent damage to materials. Under no circumstance shall pipe be dropped or rolled into the trench.

- b. Materials shall be as shown on the Drawings or as specified herein.
- 4. Material Inspection: CONTRACTOR shall inspect the pipe, fittings, and appurtenances for defects when delivered to the jobsite and prior to lowering into the trench. Defective material shall be removed from the jobsite. All material shall be clean and free of deleterious substances prior to use in the Work.
- 5. Except where noted or specified, all ductile iron underground piping shall be laid in accordance with AWWA C600 or AWWA C605 with the conditions that (a) blocking shall not be used to support pipe and (b) all bends and fittings shall be restrained as specified below, and pipe joints shall be restrained in all directions from all bends and fittings to the length as specified below.
- 6. Pipe Length:
  - a. The minimum length of pipe to be restrained shall be as shown in the following table.
  - b. The following table assumes horizontal orientation of fittings, 150 psi test pressure plus a 100 psi water hammer allowance, ductile iron pipe, and a 3-foot bury. Lengths shall be adjusted for other conditions and fittings. For other fittings and for more specific requirements, see the Drawings.
  - c. The use of 90-degree bends in vertical applications shall not be allowed.

**REQUIRED LENGTH OF RESTRAINED PIPE BEYOND FITTING IN FEET**

Fitting	Minimum Length—Ft
90 Degree Bend (≤ 6 inches)	36
45 Degree Bend (≤ 8 inches)	18
22 1/2 Degree Bend ≤ 16 inches	18
11 1/4 Degree Bend ≤ 16 inches	9

- 7. Force main and water main shall be installed in accordance with AWWA C600 for iron pipe, AWWA C605 for PVC pipe, and AWWA M55 for HDPE pipe. All plugs, caps, tees, hydrants, bends, and other fittings for water mains and force mains shall be provided with restrained joints.
- 8. Any pipe or fittings cracked in cutting or handling or otherwise not free from defects shall not be used. Pipe must be kept clean of mortar, cement, clay, sand, or other material. When PVC piping is installed during hot weather, it shall be laid in the trench with slack or permitted to cool to ground temperature before it is cut to length for making final connections. PVC expansion joints shall be provided where needed.
- 9. At times when pipe laying is not in progress, the open ends of pipe shall be closed with plugs to prevent the entry of foreign material. Acceptable plugs include Foreman Nite Caps by APS, mechanical joint cap or plug, bladder plug, or test plug. All foreign material shall be removed from the pipe prior to acceptance.
- 10. The locations and elevations of existing piping and manholes are approximate. Where necessary, existing piping shall be exposed by CONTRACTOR to confirm location and elevation before installing new piping. Any changes in pipe location or elevation shall be approved by OWNER.
- 11. General Excavation:
  - a. Pipe Laying:
    - (1) All pipe shall be laid accurately to the line and grade as designated. Preparatory to making pipe joints, all surfaces of the portions of the pipe to be joined or of the factory made jointing material shall be clean and dry.

Lubricants, primers, adhesives, and other joint material shall be used and installed as recommended by the pipe or joint manufacturer's specifications. The jointing materials or factory fabricated joints shall then be placed, fitted, joined, and adjusted in such a workmanlike manner as to obtain the degree of watertightness specified. Pertinent specifications from the joint and pipe manufacturer which outline procedures to be followed in making the joint shall be furnished to ENGINEER.

- (2) Wyes, tees, and special fittings shall be installed as called for on the Drawings, or as requested by ENGINEER. Wyes, tees, and special fittings, shall, in general, be jointed with the same type of joint as used in the pipe.
  - (3) In joining two dissimilar types of pipe, manufactured adapters and fittings shall be used. Adapters and fittings shall be configured to maintain invert elevations at same level.
  - (4) Joint deflections shall not exceed the limits established by the pipe manufacturer for the pipe and joint being used.
  - (5) Joints that are damaged because of carelessness, improper handling, or failure to prevent imperfections in manufacture shall be subject to rejection and gaskets shall be subject to rejection whenever they show surface cracking, tears, or splice separation.
  - (6) At times when pipe laying is not in progress, the open ends of pipe shall be closed with plugs to prevent the entry of foreign material. All foreign material shall be removed from the pipe prior to acceptance.
  - (7) After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The pipe shall be secured in place with specified backfill material tamped around it except at the bells.
  - (8) Pipe shall be brought home by using a cross member and levers or jacks. It will not be permissible to push pipe home with motor powered excavation equipment.
  - (9) Force main and water main shall be installed in accordance with AWWA C600 for iron pipe, AWWA C605 for PVC pipe, and AWWA M55 for HDPE pipe. All plugs, caps, tees, hydrants, bends, and other fittings for water mains and force mains shall be provided with restrained joints.
- b. Abandoning Utilities: Utilities to be abandoned shall, unless otherwise noted on the Drawings, be abandoned in place. Open ends of pipes shall be plugged with 12 inches of concrete. Manhole barrels, valve boxes and other such structures shall be removed to a point 3 feet below existing or final ground surface, whichever is lower, and shall then be filled with backfill material compacted to that of the trench backfill. An approximate 9-inch-diameter opening shall be made in the bottom of the structure to allow for groundwater movement.
- c. Connections to and Modifications of Structures and Mains: Unless otherwise noted on the Drawings, openings in existing structures to allow for connection of mains shall be core drilled, and the mains themselves shall be connected by use of watertight connections as specified in the Standard Specifications. Flow channels in the bottoms of existing structures shall be modified as necessary to provide smooth transition for incoming flow and/or orientation of mains. These modifications may include breaking out and reforming flow channels.

### 3.02 FIELD QUALITY CONTROL

- A. CONTRACTOR shall include the cost of all televising, testing, cleaning, and disinfection in the price bid.

- B. Work shall be tested as specified in this section. Unless indicated in writing before testing begins, tests shall be witnessed by ENGINEER and others as necessary. Test results shall be recorded, and reports or appropriate certificates shall be submitted to ENGINEER in triplicate.
- C. New piping shall be tested. Prior to conducting the pressure and leakage test, CONTRACTOR shall backfill the trench for its full depth. All bends and special connections to the main shall be adequately blocked and tied prior to the test. Any damage caused to the main or its appurtenances during performance of these tests shall be corrected by CONTRACTOR at its expense. Should underground piping fail test, CONTRACTOR shall be responsible for removal and replacement of backfill, and relay new pipe if necessary, to repair the defective pipe. Under no circumstances shall defects be sealed from the interior of the pipe, and only where specifically allowed by ENGINEER, shall defects be sealed from the exterior of the pipe. Piping, interior or exposed, shall be subject to test before being covered with insulation or paint. Piping and appurtenances shall be watertight or airtight and free from visible leaks. Manholes and precast reinforced concrete wet wells and appurtenances shall be free of any visible leaks. Any leakage shall be sealed by methods acceptable to OWNER, from the exterior of the manhole or structure. Precast reinforced concrete manhole risers and tops shall be tested in accordance with ASTM C497.
- D. Piping shall be flushed or blown out after installation prior to testing. CONTRACTOR shall provide all necessary piping connections, water, air, test pumping equipment, water meter, bulkheads, valves, pressure gauge and other equipment, materials, and facilities necessary to complete the specified tests. CONTRACTOR shall provide all temporary sectionalizing devices and vents for testing.
- E. Pressure Tests:
1. Pressure tests shall be performed as required by AWWA C600 and AWWA C605, unless otherwise noted herein.
  2. When test medium for piping is water, all air shall be removed from piping by flushing, opening vents, loosening flanges, utilizing equipment vents and/or installation of corporations at high points in system. Test pumping equipment used shall be centrifugal pumps or other pumping equipment that will not place shock pressures on the main. Power plunger pumps will not be permitted for use on closed pipe systems. Pumps shall be disconnected during test periods. Presence or absence of air will be determined during pressurization of the piping system.
  3. The test pressure in all lines shall be held for two hours, during which time the leakage allowance shall not exceed that specified. In case repairs are required, the pressure test shall be repeated until the pipeline installation conforms to the specified requirements. Pumps, air compressors, instrumentation, and similar equipment shall not be subjected to the pressure tests.
  4. During performance of the hydrostatic pressure test. Force main shall be tested to 200% of normal operating pressure in the main, but to no more than the pressure rating of the pipe.
  5. CONTRACTOR shall keep a record of all tests performed. These records shall show the individual lengths of main tested and test results.
  6. Where connections are made to existing mains, it shall be the responsibility of CONTRACTOR to provide the necessary hydrostatic tests on all new mains installed. This may necessitate, but is not limited to, the installation of temporary valves and restraint to isolate the new system from the existing system. All materials, Work, and

equipment necessary for this Work shall be furnished by CONTRACTOR at its expense.

7. All testing of pipelines shall proceed concurrently with installation. CONTRACTOR is encouraged to conduct daily preliminary testing of its Work.
  8. Water from disinfection testing shall not be discharged to a stream, creek, river, storm sewer tributary thereto, or to a navigable water without first neutralizing the chlorine residual in the water and complying with local, state, and federal laws thereto.
  9. Gauges used for testing shall have increments as follows:
    - a. Tests requiring a pressure of 10 psi or less shall use a testing gauge having increments of 0.10 psi or less.
    - b. Tests requiring a pressure of greater than 10 psi by less than or equal to 100 psi shall use a testing gauge having increments of 1 psi or less.
    - c. Tests requiring a pressure of greater than 100 psi shall use a testing gauge having increments of 2 psi or less.
- F. Continuity Testing: CONTRACTOR shall provide all equipment, labor, and materials necessary to perform continuity testing of all ductile iron water mains installed. Tests shall be performed using an ohmmeter to demonstrate that electrical continuity exists across all joints. CONTRACTOR shall make all necessary repairs to establish continuity across joints.

### 3.03 CLEANING AND DISINFECTION

- A. All equipment and materials shall be clean before installation.
- B. Broken concrete, rubble fill, and other excess material shall be removed from the site and wasted.
- C. All waste disposal areas and all areas used for the storage of materials or the temporary deposit of excavated earth shall be leveled off, cleaned up, and returned to condition that existed prior to construction.
- D. All surplus material, tools, and equipment shall be removed, and the premises shall be left free of everything of the kind.

### 3.04 CLEANUP

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

### 3.05 DEMOLITION

- A. All exterior piping removals, including manholes and appurtenances and abandonment, shall be by CONTRACTOR. The locations and elevations of existing piping are

approximate. Where necessary, existing piping shall be exposed before installing new piping. Any changes in pipe location or elevation shall be reviewed by ENGINEER.

- B. CONTRACTOR shall remove or abandon all existing piping and appurtenances as noted. Unless otherwise shown or specified, piping and appurtenances to be removed shall become the property of CONTRACTOR and shall be removed from the site for salvage or disposal. Unless otherwise shown or specified, piping shown or specified to be abandoned shall have each end plugged with concrete or nonshrink grout. Wherever excavations cross piping to be abandoned, piping shall be removed to the limits of the excavation and the ends shall be filled as specified above.
- C. Valve boxes and exposed valves and operators on piping to be abandoned shall be removed. All concrete surfaces to remain shall be patched as required to provide a smooth surface. Repiping and connections to new piping shall be as specified for new piping.
- D. It is the responsibility of CONTRACTOR to remove items, including piping and appurtenances, as specified, and patch all holes resulting therefrom unless specified or shown otherwise. The intent of these specifications is to require that the removal of materials, patching of all existing holes, and repiping be done in a workmanlike manner. All costs shall be included in the Unit Price Bid.

END OF SECTION

## SECTION 33 05 07

### TRENCHLESS CONSTRUCTION

#### PART 1–GENERAL

##### 1.01 SUMMARY

- A. Work Included: Provide all utilities required through the use of trenchless construction techniques as shown on the drawings or as specified.
- B. Unit Prices: The unit price for horizontal directional drilling, tunneling, boring, jacking, and pipe bursting shall include all labor, materials, and equipment to complete the Work.
- B. Measurement and Payment:
  - 1. Payment for horizontal directional drilling, tunneling, boring, jacking, and pipe bursting shall be for work successfully performed.
  - 2. Measurement for horizontal directional drilling, tunneling, boring, jacking, and pipe bursting will be based on the linear footage of pipe installed.

#### PART 2–PRODUCTS

##### 2.01 PIPE AND APPURTENANCES

- A. High Density Polyethylene Pressure Pipe (HDPE): See Section 33 00 10–Buried Piping and Appurtenances for HDPE pipe specifications.
- B. Tracer Wire: Tracer wire shall be installed on all trenchless piping. CONTRACTOR shall attach a continuous 7 by 19 strand core, 1/4-inch-diameter vinyl-coated galvanized aircraft cable pulled with the horizontal directional drilling operation as tracer wire. Aircraft cable shall be attached to the pipe at 20-foot intervals. If the HDD is through rock, CONTRACTOR shall provide a minimum of two aircraft cables attached to the pipe. Tracer wire shall be successfully tested before acceptance.

#### PART 3–EXECUTION

##### 3.01 HORIZONTAL DIRECTIONAL DRILLING

- A. Where shown on the Drawings, horizontal directional drilling shall be provided using HDPE pipe.
- B. A certificate of “Compliance with Specification” shall be furnished for all materials to be supplied. Test reports prepared by an independent testing laboratory shall be provided certifying that polyethylene pipe conforms to the requirements of ASTM D3350.
- C. Subject to compliance with the complete requirements of these Standard Specifications, manufacturers offering HDPE pipe products that may be incorporated into the Work include Performance Pipe, Poly Pipe, or equal.

- D. Fusion Welding: Polyethylene pipe shall be joined using the butt fusion welding process. Provide a fused flanged adapter with ductile iron follower flange and a ductile iron flanged pipe for interconnections with ductile iron and/or PVC piping.
- E. CONTRACTOR may use a drilling fluid which is completely biodegradable. Clay based drilling fluids will also be allowed. Drilling fluid shall be subject to the review of OWNER. CONTRACTOR shall provide their own clean water for drilling fluid. At no time shall the drilling fluid be discharged to a surface water. This includes drilling fluid that may surface along the directionally drilled pipe route. CONTRACTOR shall provide other drilling fluids or procedures as needed to prevent a discharge of drilling fluids to surface waters at no additional cost to OWNER.
- F. The boring unit shall have a tracking device that is capable of providing depth and location at all points of the boring path. Record Drawings showing horizontal and vertical locations of the conduit shall be created by CONTRACTOR based on the tracker information and submitted to OWNER.
  - 1. Finished Pipe:
    - a. CONTRACTOR shall submit detailed information to OWNER of the procedure and the steps to be followed for the installation of the directional drilling method selected, even if the process is named in the Standard Specifications. All such instructions and procedures submitted shall be carefully followed during installation. Any proposed changes in installation procedures shall require submittal of revised procedures.
    - b. The installed pipe shall be continuous over the entire directionally drilled length and shall be free from visual defects, such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness, and other deformities. Pipe with gashes, nicks, abrasions, or any such physical damage that may have occurred during storage and/or handling, which are deeper than 10% of the wall thickness, shall not be used and shall be removed from the construction site.
    - c. Provide depth of cover at water resource crossings as shown in the Drawings. Cover is measured from the top of the finished product to the bed or bank of a navigable water or the soil surface of wetlands and other waters of the state.
  - 2. Pipe Jointing:
    - a. Sections of polyethylene pipe shall be assembled and joined on the jobsite above ground. Pipe ends to be joined shall be cut square, then joined, by the heating and butt fusion method in strict conformance with the manufacturer's printed instructions.
    - b. The butt fusion method for pipe jointing shall be carried out in the field by operators with prior experience in fusing polyethylene pipe with similar equipment using proper jigs and tools per standard procedures outlined by the pipe manufacturer. These joints shall have a smooth, uniform, double rolled back bead made while applying the proper melt, pressure, and alignment. It shall be the sole responsibility of CONTRACTOR to provide an acceptable butt fusion joint. The replacement pipe shall be joined on the site in appropriate working lengths near the insertion pit.
  - 3. Insertion or Access Pits:
    - a. The location and number of insertion or access pits shall be planned by CONTRACTOR and submitted in writing prior to excavation. The pits shall be located such that their total number shall be minimized and the length of replacement pipe installed in a single pull shall be maximized. The maximum length of continuous liner shall not exceed the pipe bursting system manufacturer's recommendations.

- b. Upon completion of the directional drilling operation by CONTRACTOR, CONTRACTOR shall backfill the excavation, perform clean up and all site restoration, as indicated on the Drawings. All surfaces shall be restored in kind with thicknesses matching those removed.
4. Process Limitations:
- a. Though the installation process may be licensed or proprietary in nature, CONTRACTOR shall not change any material, thickness, design values, or procedures stated or approved in the submittals. CONTRACTOR shall submit, in writing, full details about component materials, their properties and installation procedures, and abide by them fully during the entire course of the Project.
  - b. All allowable directional drilling methods are considered to be structurally equal processes as far as end product required. The minimum required performance criteria, and/or standards, physical/structural properties, chemical resistance tests, and the replacement pipe thicknesses as given in this Standard Specification shall be strictly complied with.
- G. It is CONTRACTOR's responsibility to examine the proposed line segment and notify if conditions exist that could cause problems with the directional drilling method. Such conditions could include nearby services that could be damaged by the operations, existing slabs that could be damaged, or less than acceptable depth of cover.

### 3.02 FINISHED PIPE

- A. The installed pipe shall be continuous over the entire length and shall be free from visual defects, such as foreign inclusions, concentrated ridges, discoloration, pitting, varying wall thickness, and other deformities. Pipe with gashes, nicks, abrasions, or any such physical damage which may have occurred during storage and/or handling, which are deeper than 10% of the wall thickness shall not be used and shall be removed from the construction site.

END OF SECTION

## SECTION 33 11 13.19

### CONDUCTIVE TRACE WIRE FOR NONMETALLIC PIPE INSTALLATION

#### PART 1–GENERAL

##### 1.01 SUMMARY

- A. This section covers the requirements for installation of a conductive trace wire with non-metallic pipe underground.

##### 1.02 MEASUREMENT AND PAYMENT

- A. Work performed under this section shall be included in the unit price for pipe installation, as applicable, unless otherwise indicated in the Bid Form.

##### 1.03 SYSTEM DESCRIPTION

- A. Install electrically continuous trace wire with access points as described herein to be used for locating nonmetallic pipe with an electronic pipe locator after installation.

##### 1.04 SUBMITTALS

- A. Submit copies of shop drawings showing materials being offered and catalog data verifying the products meet the requirements of this section. CONTRACTOR shall submit four copies of each submittal, which will be retained by ENGINEER, plus the number of copies that are to be returned to CONTRACTOR by ENGINEER after review is completed.

#### PART 2–PRODUCTS

##### 2.01 PRODUCTS

- A. Trace wire to be 10-gauge minimum solid copper with thermoplastic insulation recommended for direct burial. Wire connectors to be 3M DBR, or approved equal and shall be watertight and provide electrical continuity.
- B. Tracer wire installed on trenchless piping shall be 7 by 19 strand core, 1/4-inch diameter, vinyl-coated, galvanized aircraft cable.

#### PART 3–EXECUTION

##### 3.01 ERECTION/INSTALLATION/APPLICATION AND/OR CONSTRUCTION

- A. Trace wire shall be installed in the same trench and inside bored holes and casing with nonmetallic pipe during pipe installation. It shall be secured to the pipe as required so that the wire remains adjacent to the pipe. The trace wire shall be securely bonded together at all wire joints with an approved watertight connector to provide electrical continuity, and it shall be accessible at all new water valve boxes, water meter boxes, fire hydrants, sewer manholes, sewer cleanouts, gas valves and gas meter risers, as applicable to the utility line

being installed. At manholes, the wire shall be installed from the exterior of the manhole to the interior by installing a 24-inch loop in the wire underneath the manhole frame. A single branch wire shall be terminated at each access location (new water valve boxes, water meter boxes, etc. as previously listed), and the wires shall be spliced underground using the specified connector. For lines with more than 5 feet of cover, the wire shall be installed directly over the pipe at a depth of 5 feet. If the spacing of valves and meters is greater than one mile, install an intermediate trace wire access assembly as detailed on the Drawings. Where access points for trace wire on gas lines exceeds 500 feet, install test lead boxes such that maximum access point spacing is 500 feet.

- B. For termination of trace wire at locations other than a manhole, a valve box, or a water meter, provide a standard plastic water meter box and terminate the wire inside the meter box.
- C. If horizontal directional drilling (HDD) the pipe, aircraft cable shall be attached to the pipe at 20-foot intervals. If the HDD is through rock, CONTRACTOR shall provide a minimum of two aircraft cables attached to the pipe.

### 3.02 TESTING

- A. CONTRACTOR shall provide line location (tracing) equipment (sending unit and receiver) and shall demonstrate in the presence of ENGINEER that the trace wire functions properly throughout all of the work.
- B. Tracer wire shall be tested before acceptance. See Section 33 00 10–Buried Piping and Appurtenances for continuity testing specifications.

### 3.03 REPAIR/RESTORATION

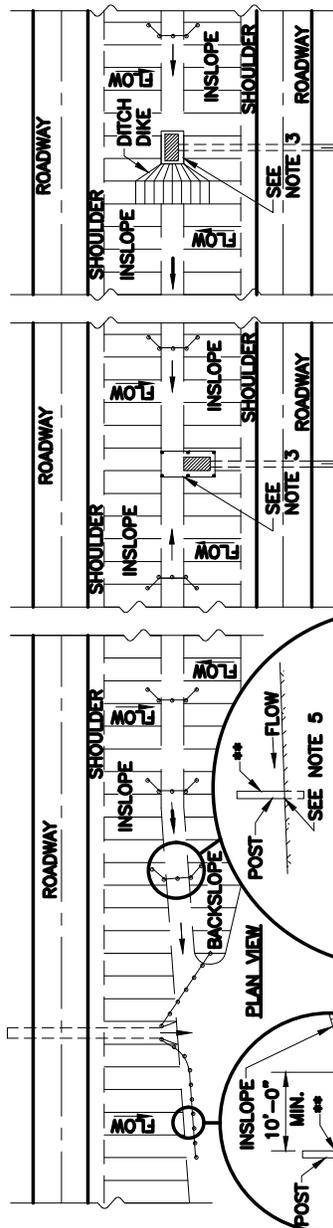
- A. CONTRACTOR shall replace all trace wire that does not function properly or shall make repairs to make the trace wire function properly.

END OF SECTION

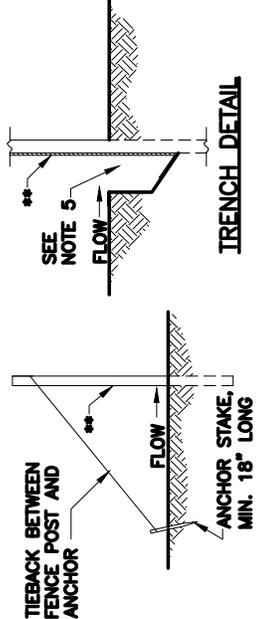
## **DRAWINGS**





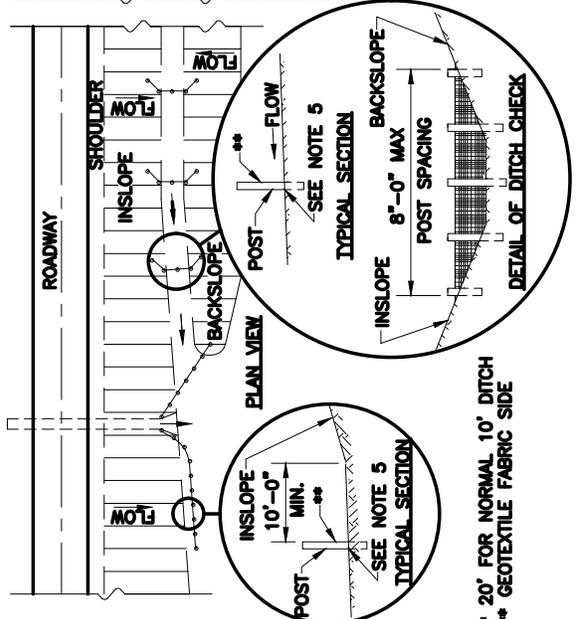


SITUATION 1 PLAN VIEW  
SITUATION 2 PLAN VIEW  
**SILT FENCE AT MEDIAN SURFACE DRAINS**



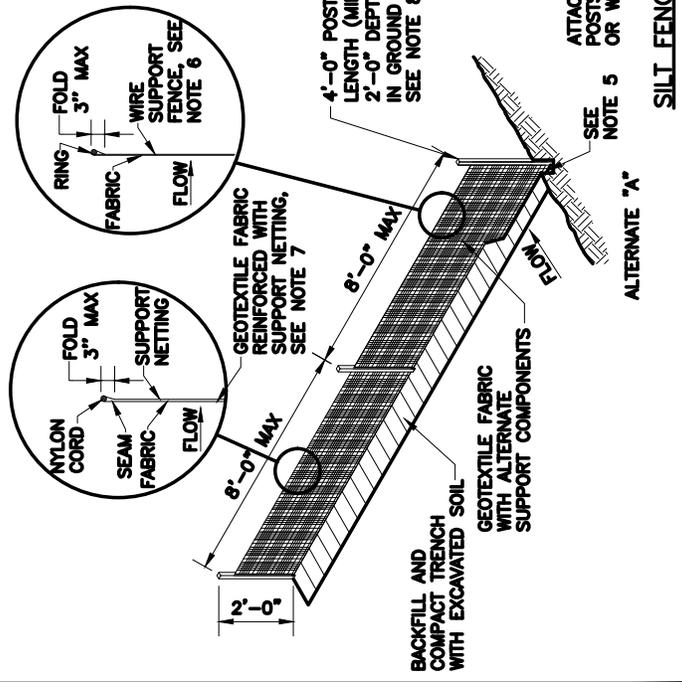
**SILT FENCE TIE BACK**

NOTE: ADDITIONAL POST DEPTH OR TIE BACKS MAY BE REQUIRED IN UNSTABLE SOILS



**TYPICAL APPLICATIONS OF SILT FENCE**

\* 20' FOR NORMAL 10' DITCH  
\*\* GEOTEXTILE FABRIC SIDE



**SILT FENCE**

- NOTES:**
1. DETAILS OF CONSTRUCTION NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND APPLICABLE SPECIAL PROVISIONS.
  2. WHEN POSSIBLE THE SILT FENCE SHOULD BE CONSTRUCTED IN AN ARC OR HORSESHOE SHAPE, WITH THE ENDS POINTING UPSLOPE TO MAXIMIZE BOTH STRENGTH AND EFFECTIVENESS.
  3. CROSS BRACE WITH 2"x4" WOODEN FRAME OR EQUIVALENT AT TOP OF POSTS.
  4. MINIMUM 14 GAGE WIRE REQUIRED, FOLD FABRIC 3" OVER THE WIRE AND STAPLE OR PLACE WIRE RINGS ON 12" C-C.
  5. EXCAVATE TRENCH A MINIMUM OF 4" WIDE AND 6" DEEP TO BURY AND ANCHOR THE GEOTEXTILE FABRIC. FOLD MATERIAL TO FIT TRENCH AND BACKFILL AND COMPACT TRENCH WITH EXCAVATED SOIL.
  6. WIRE SUPPORT FENCE SHALL BE 14 GAGE MINIMUM WOVEN WIRE WITH A MAXIMUM MESH SPACING OF 6". SECURE TOP OF GEOTEXTILE FABRIC TO TOP OF FENCE WITH STAPLES OR WIRE RINGS AT 12" C-C.
  7. GEOTEXTILE FABRIC SHALL BE REINFORCED WITH AN INDUSTRIAL POLYPROPYLENE NETTING WITH A MAXIMUM MESH SPACING OF 1/4" OR EQUAL, A HEAVY DUTY NYLON TOP SUPPORT CORD OR EQUIVALENT IS REQUIRED.
  8. STEEL POSTS SHALL BE STUDDED "TEE" OR "U" TYPE WITH A MINIMUM WEIGHT OF 1.2 LBS/LINEAR FOOT WITHOUT ANCHORS, OR ANCHORS SUFFICIENT TO RESIST POST MOVEMENT ARE REQUIRED. WOOD POSTS SHALL BE A MINIMUM SIZE OF 4" DIAMETER, OR 2 1/2" X 3 1/2", EXCEPT WOOD POSTS FOR GEOTEXTILE FABRIC REINFORCED WITH NETTING SHALL BE A MINIMUM SIZE OF 1 1/8" X 1 1/8" OAK OR HICKORY.
  9. ALTERNATES A AND B ARE EQUAL AND EITHER MAY BE USED.

**SILT FENCE**

**STANDARD DETAIL**

**STRAND ASSOCIATES**  
01-975-111A  
OCTOBER 2011

**NOTES:**  
 1. DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.

2. VARIATIONS IN THE DIMENSIONS OR MATERIALS SHOWN HEREON SHALL BE PERMITTED IF THEY PROVIDE EQUIVALENT PROTECTION AND MATERIAL STRENGTH.

3. LAP JOINTS SHALL NOT BE PLACED IN THE BOTTOM OF V-SHAPED DITCHES.

4. JUNCTION SLOTS ON ADJACENT STRIPS OF MATTING SHALL BE STAGGERED A MINIMUM OF 4 FEET APART.

5. EDGES OF THE EROSION MAT SHALL BE IMPRESSED IN THE SOIL.

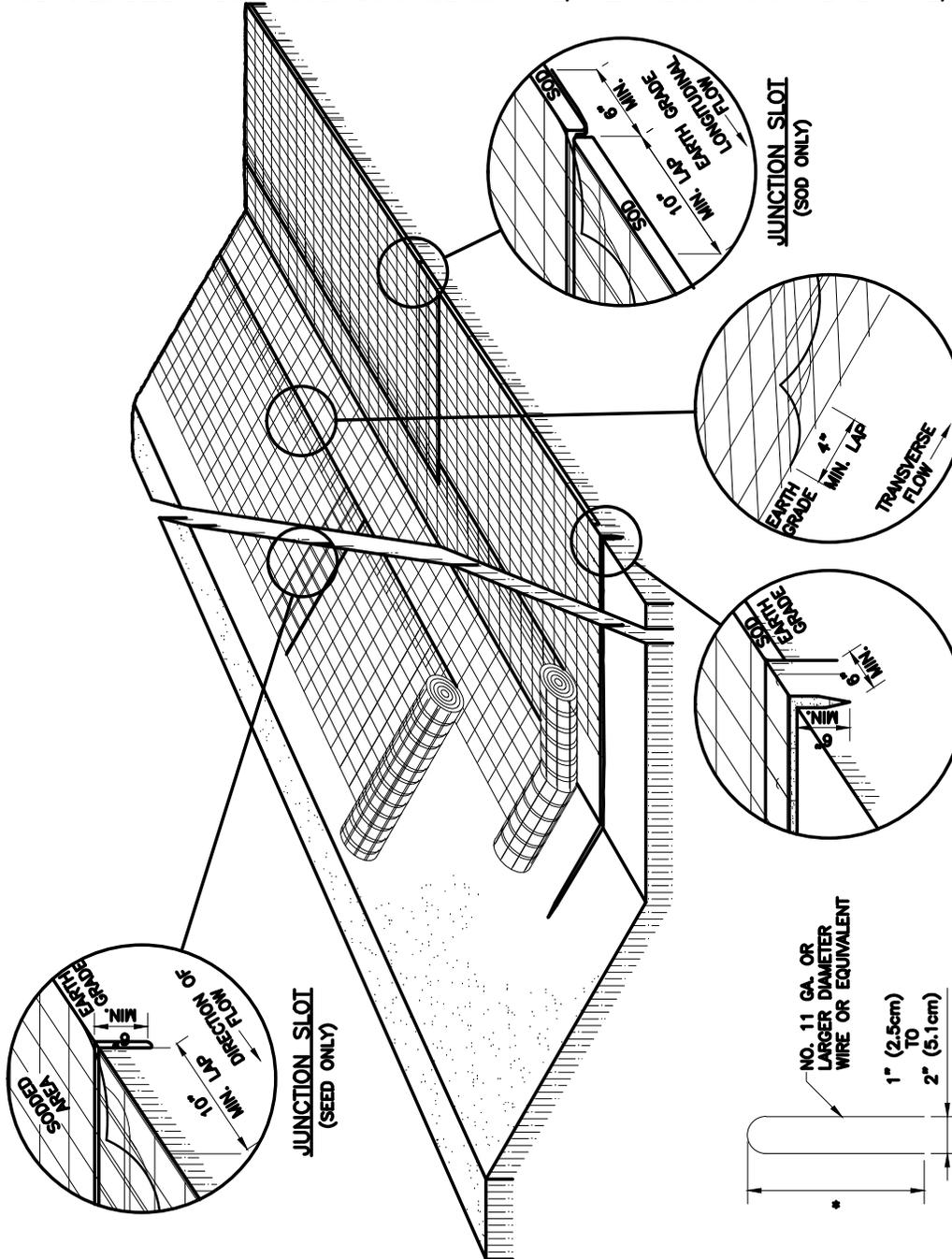
6. EROSION MAT SHALL BE MEASURED AND PAID FOR IN ACCORDANCE WITH THE STANDARD SPECIFICATIONS.

**EROSION\_MAT\_OVER\_SOD**

- ONLY JUTE FABRIC WILL BE PERMITTED OVER SOD.
- FLOOD STAKES FOR SOD MAY BE OMITTED IF THE EXISTING SLOPE AND SOIL CONDITIONS SO PERMIT.
- THE WIDTH OF EROSION MAT SHALL ALWAYS EQUAL THE SOD WIDTH.
- SOD STRIPS MAY BE PLACED EITHER LONGITUDINALLY OR TRANSVERSELY TO THE FLOW LINE OF THE DITCH.

**EROSION\_MAT\_OVER\_SEEDING**

- JUNCTION OR ANCHOR SLOTS SHALL BE AT MINIMUM INTERVALS OF 100 FEET ON GRADES UP TO AND INCLUDING 3 PERCENT, AND 50 FEET ON GRADES EXCEEDING 3 PERCENT.



**LAP JOINT**  
 (SEED AND SOD)

**ANCHOR SLOT**  
 AT BEGINNING AND END OF EROSION MAT  
 (SEED AND SOD)

**DETAIL OF TYPICAL STAPLE**  
 -#6 MIN FOR FIRM SOILS  
 -#8 MIN WHERE BOTH SOD AND MATS ARE BEING USED  
 -#12 MIN FOR LOOSE SOILS

**EROSION CONTROL MAT INSTALLATION**

**STANDARD DETAIL**

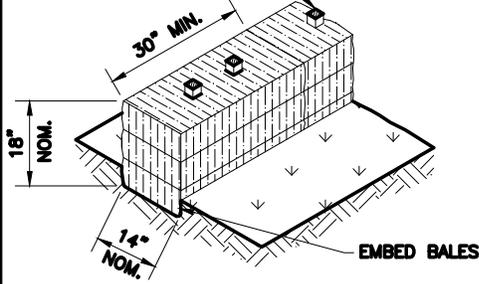


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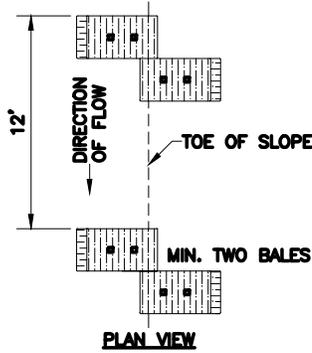
WOOD STAKES (2 PER BALE)  
 NOMINAL 2"x2"x30" MIN.  
 LENGTH OR EQUIVALENT.



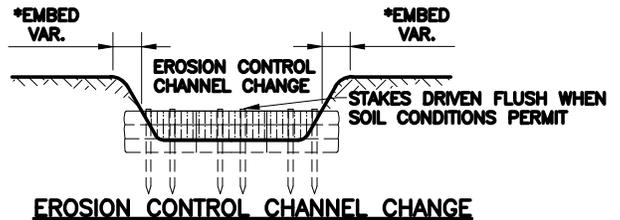
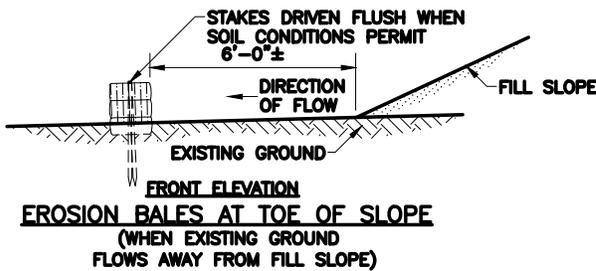
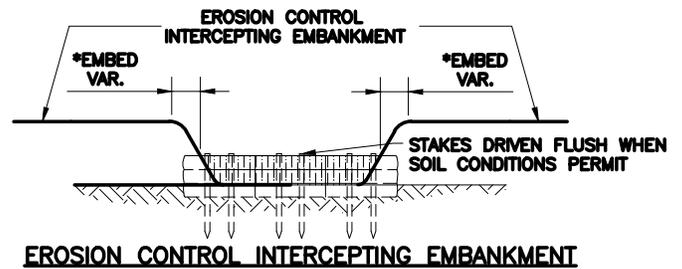
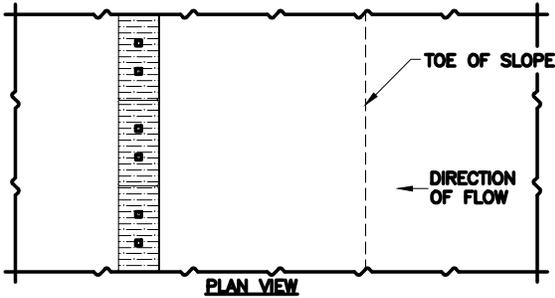
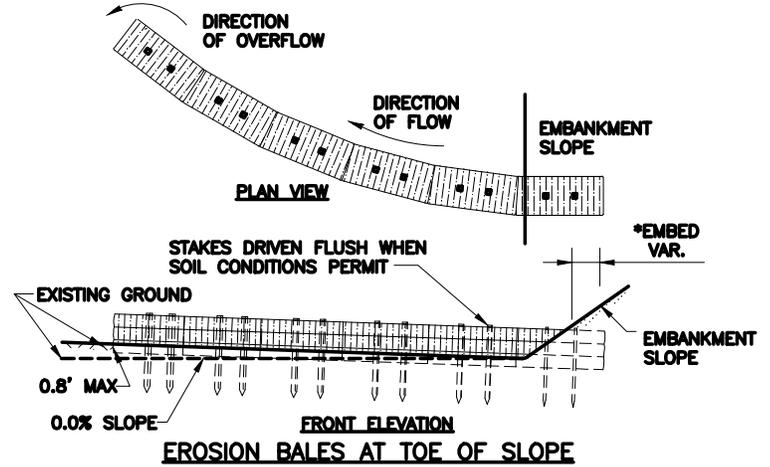
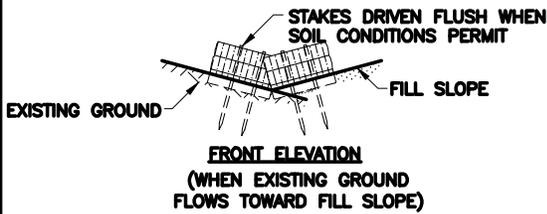
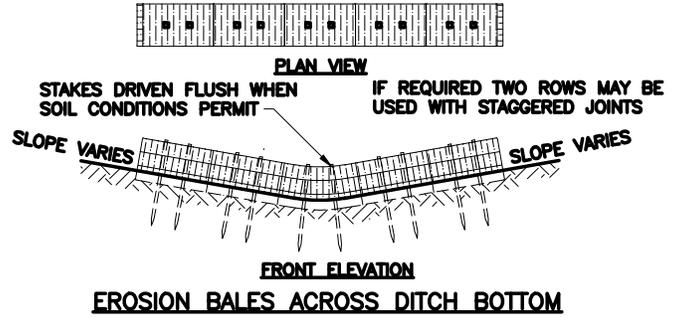
**DETAIL OF EROSION BALE INSTALLATION**

**NOTES:**

1. DETAILS OF CONSTRUCTION, MATERIALS AND WORKMANSHIP NOT SHOWN ON THIS DRAWING SHALL CONFORM TO THE PERTINENT REQUIREMENTS OF THE STANDARD SPECIFICATIONS AND THE APPLICABLE SPECIAL PROVISIONS.
2. BALES SHALL BE PLACED END TO END OR OVERLAPPING AT RIGHT ANGLES TO THE DIRECTION OF FLOW AND FAR ENOUGH UP THE SIDES OF THE DITCH TO PREVENT ERODING AROUND ENDS.
3. BALES SHALL BE PLACED WITH TWINE OR TIE WIRES PARALLEL TO THE GROUND.
4. STAKES TO BE BATTERED IN OPPOSITE DIRECTIONS



NOTE:  
 ALL DIMENSIONS  
 ARE APPROXIMATE



**EROSION CONTROL BALE INSTALLATIONS**

**STANDARD DETAIL**



**STRAND ASSOCIATES**

01-975-113A

OCTOBER 2011

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please visit [www.strand.com](http://www.strand.com)

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\*Corporate Headquarters

