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SANITARY SEWER

- Provide full depth to plat line or beyond for future. Set manhole at plat line.
- SDR 35 for depths of 20 feet or less. SDR 26 for all depths over 20 feet deep. All service pipe shall be SDR 26 or SCH 40.
- Precast manholes with integral base and plastic coated steps required.
- Casting Neenah® R-1642-B with self-sealing lid, labeled “sanitary sewer”.
- Green space crossings shall begin and end in Roadways unless otherwise approved. Avoid locating manholes in green space.
- Maximum distance between manholes shall be 400 LF unless otherwise approved.
- Service shall be stubbed to 10 LF beyond the R.O.W. line.
- Depth at end of service line shall be a minimum of 11 feet with riser to curb stop elevation.
- 2” x 2” marker with steel rod within 6” of the ground surface.
- A manhole shall be set at the end of each line. Having a manhole at the end of two line flowing in opposite directions will not be allowed.
- All new sanitary sewer mains shall be jetted, vacuumed, and televised prior to acceptance by the City. City shall be provided with 2 copies of televising DVDs.

WATERMAIN

- Standard material shall be 8” ductile iron CL-52. Larger watermains may be required to meet pressure and flow requirements.
- For horizontal directional drilling applications, standard watermain material shall be HDPE DR 11 DIPS (Ductile Iron Pipe Size).
- All fire hydrants shall be Waterous® WB 67 with 16” break off section; 8’6” bury depth typical. The hydrant lead shall contain a 6” gate valve. Color and threads shall match City of Buffalo Standards. Two (2) Flexstake® 804R with hydrant decals shall be included, forward extra Flexstake to utility director.
- Watermain shall have 8’ of cover, standard.
- Services shall be 1” type K copper, McDonald®; curb box = 5610 with 60” rod = 5660, curb stop = 6104, lid = 5607-L, corp. stop = 4701. Services 1.5” and larger shall have a saddle, McDonald® 3825. Coupling fittings shall be 4755.
- For commercial properties requiring a fire suppression service, a separate domestic water service line shall be installed off of the fire suppression line outside of the building. A curb stop shall be installed on the domestic water service line outside of the building and shall be accessible to the City of Buffalo at all times.
- Curb stop box shall be set at 9’ beyond the R.O.W. line and marked with a steel fence post with a blue painted top.
- Mega Lugs® and/or coated rods are required for tying watermains.
- Valves shall be set as to provide isolation to each 15-20 lots. When tying into existing main begin with a valve, unless within multi-phased project.
• Plan for and provide for complete flushing of all new watermain. No dead ends without a hydrant or temporary flushing capabilities.
• Green space crossings shall have valves in roadway at each end. Also plan green space crossings so as to avoid bends or mechanical joints in green space.
• Plan for 400 LF centerline measured spacing on hydrants. Set hydrants on R.O.W. or property lines and at intersections. Avoid setting hydrant valves in sidewalk.
• All valve boxes shall be set so as to provide 6” of elevation adjustment each way.
• Hydrants installed below water table shall have factory plugged drain holes and shall be furnished with a blue pumper nozzle.
• All valve box assemblies shall be furnished with a valve umbrella anchorage assembly as manufactured by Adaptor, Inc., Oak Crest, WI, or equivalent.
• All copper fittings shall be flared type, no compression type will be allowed.
• All fitting shall be coated with a 6-8 mil nominal thickness fusion bonded epoxy conforming to the requirements of ANSI/AWWA C550 and C116/A21.16.
• Two sacrificial zinc anode caps shall be installed per each gland on every watermain fitting.
• All fittings shall be secured using Core-Blue-T-Bolts.

STORM SEWER

• RCP shall be used under all public roadways.
• HDPE shall be allowed in green space only.
• HDPE aprons will not be accepted. Galvanized metal or approved equal only.
• Storm sewer manhole castings shall be R-1733-B, labeled “Storm Sewer”.
• Catch basin castings in roadway shall be bicycle safe, R-3250-1, R3250-CL, R-3067-DL or R-3067V.
• Field catch basin casting shall be Neenah R-4342 or R-2561 lastings.
• Riprap material shall be Granite.
• Hydraulic calculations shall be based on a 10-year storm.
• Storm ponds shall be labeled with the bottom, NWL, HWL = 100 year and overflow elevations.
• Storm ponds must be contained within Outlots
• All storm sewer lines existing outside of the road R.O.W shall be contained within a utility easement a minimum of 20-feet in width.
• Access must be provided to all storm sewer structures, flared end sections, pipes, and ponds. Access may be provided via grading easements such that gradients do not exceed 8.00%
• Model 2,10,100 year & 10”rainfall events.

STREETS

• Street section design shall be for a 9-ton on a collector and 7 ton on a local road based on the soils report.
• Through residential streets shall be 38-feet face to face. All other local residential streets shall be 32-feet face-to-face. All streets within commercial areas shall be 38 feet face to face. These widths are subject to the approval of the City Engineer.
• All cul-de-sacs shall have a minimum radius of 50 feet face of curb to face curb.
• Crown of streets shall be a minimum of 2.5%.
- Wear course shall be placed after freeze-thaw cycle or in accordance with City Policy #44. City Policy #44 is located in Appendix A.
- Standard curb shall be B618.
- A Traffic Control Signage plan shall be included with all plans.
- Boulevards shall be graded to 2.00%.
- Islands in cul-de-sacs shall not be permitted.
- Sidewalks shall be located along one side of all streets; cul-de-sacs may be excluded. Sidewalks shall be 5” thick and 5’ wide with a 4’ set back from the back of curb.
- Bike paths shall be 10’ wide and set back 2’ minimum from the back of curb.
- Raising of manholes shall be at the direction of the City Engineer. All sanitary sewer manholes covered by the base course shall be brought to grade immediately after the base course is placed. They shall be raised again just prior to the final lift of bituminous is placed. This is done for emergency access, cleaning and testing.
- All traffic signs including street name signs shall be installed by the developer in accordance with the city standards.
- All gate valves covered by the base course shall be brought to the grade of the base course immediately following placement. They shall be raised again prior to the final lift of bituminous.
- Provide 100’ of profile for existing streets proposed for extension.
- Roll tests shall be conducted on prepared subgrade prior to placing Select Granular Borrow and on prepared Class 5 aggregate base prior to paving bituminous base.
- Traffic control shall satisfy MMUTCD Standards.
- 4” perforated drain tile without geotextile sock shall be required in the subgrade under the back of curb on all streets. Granular material required for backfill shall conform to the requirements of MnDOT 3149H course filter aggregate.

**GRADING AND EROSION CONTROL**

- Low openings shall be at a minimum of 2’ above E.O.F and a minimum of 3’ above the 100 year H.W.L. of adjacent ponds and wetlands.
- Any wetland mitigation required for the project must be permitted prior to final plan approval and plans for their construction must be contained in the submitted project plans and specifications.
- Erosion control shall be in place prior to the start of any work.
- Provide at least two bench marks for each project.
- Provide a SWPPP for each project.
- Construct storm ponds or temporary ponds early in grading. Install wood fiber blanket from the NWL to the top of pond and along any channelized inflow or overflow routes. After ponds have been completed, seed with a temporary seed mix or native seed mix in the case of permanent ponds.
- The minimum overland drainage grade shall be 1.00%. A minimum grade shall be designed whenever possible.
- All sloped 3:1 or steeper shall be seeded and covered with appropriate erosion control blanket.
- Emergency overflows shall be clearly noted on grading plan sheets and street utility plans. All EOF’s shall be seeded, blanketed and protected with construction or silt fence so as to protect the finished grade during the home building process.
- Low floor elevations for homes shall be 3’ above the ordinary high water level or the highest known water level whichever is greater.
- Wetlands to be preserved shall be encircled with silt fence, prior to the start on any work. Leave a minimum of a 20’ vegetation buffer.
- Place 4’ of sod behind back of curb after small utilities and sidewalk installation is complete.
- Rock entrance shall be installed for all new home construction sites.
- All erosion control shall be completed in accordance with the Minnesota Pollution Control Best Management Practices.
- All silt fence shall be removed by the Developer after vegetation has been established and home construction is completed in that area.

**OTHER**

- Portable Biffs are required at all home construction sites. Each individual home construction site shall have a biff for use by construction workers.

**PROJECT FINALIZATION**

- The City of Buffalo Standard Punch List form must be completed.
- Record drawings shall be submitted in both digital and reproducible formats.
- The City of Buffalo Project Final Request form must be completed and submitted.

**RECORD DRAWINGS**

- A Record Grading Plan shall be submitted by the Developer and include the following:
  - Location and finished grade elevations along all swales, berms, and ditches.
  - Location and finished grade elevations for all pond cross sections and emergency overflow locations.
- A Record Street and Utility Plan shall be submitted by the Developer and include the following:
  - As built elevations of all sanitary and storm sewer manhole and catch basin rims and inverts and flared end sections.
  - As built elevations, grades and locations of all utility lines.
  - Detailed location sketches of any services not installed exactly per the plan.
  - Benchmark elevations within the development.
  - Contractor’s Name and Construction Completion Date.
- Upon completion of the improvements, the Developer shall promptly deliver to the City Engineering staff one set of draft Record Drawings for review. Upon review and after any required changes have been made, the Developer shall deliver the following to the City Engineering staff:
  - Two sets of full size drawings
  - One electronic copy of all plan sheets in a .pdf format and one electronic copy of the AutoCAD base drawing in a .dwg format. The base drawing shall include property lines, easement lines, all proposed utility lines, street names, and other information that may be required by the City Engineer.

**OTHER APPLICABLE CITY CODES**

- CHAPTER 7, Sections 7.06, 7.07, 7.08 and 7.20.
• CHAPTER 11.
• CHAPTER 12.
• You can find the City Code Online at http://ci.buffalo.mn.us.

*Note: Trademarked materials may be replaced by an approved equal, an approval shall be made by the City of Buffalo Engineering Department.
City of Buffalo – Standard Punch List

Project Name_________________________ Date_________________
General Contractor___________________________________________
Project Engineer____________________________________________
Punch List Type;  Grading Only _______ End of First Season_________ Final ________
Inspector(s) completing punch list ______________________________
Standard items:
1. Grading complete according to plan___________________________
2. Turf established___________________________________________
3. Ponds constructed and stabilized____________________________
4. Wetland Mitigation complete if required for project____________________________
5. Emergency overflows installed and stabilized____________________
6. Sewer mains flushed, mandrilled and air tested____________________
7. Sewer manholes clean, doghouses built, inverted correct, rings and castings <18”, rings cleaned for watertight seal
8. Watermain hydro tested, flushed and BAC-T results to water department_________
9. Gate valve boxes plumb, operable, no broken sections, to grade with +6”
   adjustment, all valves turned on except perimeter (City crews will charge system for final operation)__________________________
10. Hydrants to grade, paint condition, flagged______________________
11. Storm structure inverted clean, doghouses built, rings finished smooth, grates installed for correct flow direction, drain tile cut off flush with inside__________________________
12. Sediment cleaned from ponds, outlets and related structures__________________
13. Services marked in accordance with details_______________________
14. Inspect pavement and curb for damage, settlements_____________________
15. Sidewalks installed and in good condition___________________________
16. Sod installed in boulevards_____________________________________
17. Street signs installed if required______________________________
18. Wear course to proceed in accordance with City Policy #44___________
19. Streets swept, asphalt cleaned from catch basins____________________
20. Final check of sanitary manholes for construction debris_______________

List additional items or attach additional sheets.

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
City Inspector signature required when complete________________________ Date_______
# City of Buffalo Project Final Checklist

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<td>General Contractor</td>
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1. Are all contract items completed?  
   Yes_______No_______
2. Is Project Punch List completed, signed off and attached?  
   Yes_______No_______
3. Are record drawings complete and submitted?  
   Yes_______No_______
4. Are lien waivers submitted by the general contractor?  
   Yes_______No_______
5. Are Maintenance Bonds in place and submitted to City?  
   Yes_______No_______
STANDARD DETAILS
Typical Sections

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Erosion Control

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Detail # 3002  Rock Ditch Check
Detail # 3003  Silt Fence - Heavy Duty
Detail # 3004  Silt Fence – Machine Sliced
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Detail # 3012  Inlet Protection - Preassembled
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Detail # 3016A  Culvert End Riprap
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Storm Sewer & Culverts

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Detail # 4007  Storm Sewer Structure, Design “J”
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Detail # 4012  Drain Tile Service
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Detail # 4014A  Alternate Precast Concrete Pond Skimmer
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Sanitary Sewer

Detail # 5001  Sanitary Sewer Manhole
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Detail # 5016  Rock Excavation for DIP Watermain & Sanitary Sewer
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**Watermain**

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Detail # 6004  Ductile Watermain Trench Detail
Detail # 6005  Hydrant Location
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Detail # 6007  Water Service Detail (New Construction)
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**Curb & Gutter**

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Detail # 7005  Pedestrian Curb Ramp (Concrete Flares)
Detail # 7006  Pedestrian Curb Ramp (Straight Edges)
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Detail # 7010  Paver Brick Sidewalk

**Signs & Markers**

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TECHNICAL SPECIFICATIONS
SECTION 02220 - REMOVING PAVEMENT AND MISCELLANEOUS STRUCTURES

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the removal of pavement and miscellaneous structures as indicated on the drawings or as specified herein.

1.2 SPECIFICATIONS REFERENCES

A. Mn/DOT Specification Section 2104 shall apply to the removal of pavement and miscellaneous structures, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.3 SUBMITTALS

A. No exception to the referenced specification is made.

PART 2 -- PRODUCTS

2.1 NO EXCEPTION TO THE REFERENCED SPECIFICATION IS MADE.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Remove existing bituminous, curb and gutter, walks, drives, steps and other specified items where shown on the plans and/or required for the construction of the project.

B. Saw cut bituminous and concrete surfaces prior to excavation, to produce a clean-cut breakage joint.

C. Dispose of all concrete and bituminous removal items, rubbish and debris outside of the construction zone. It shall be the Contractor's responsibility to secure all required permits and pay all fees associated with the disposal of the material and to secure the disposal site.

D. Remove existing mailboxes, street signs and similar structures, which must be removed to construct the project. Restore these facilities to the original location or a location designated by the City, when work has progressed past the location of the structure. The Contractor shall reinstall or replace those structures, which are damaged or lost during the course of construction with new materials or components.

E. The Contractor shall take full responsibility to protect structures or other surface improvements from damage that are not to be removed. If damage to these facilities occurs due to the construction of the project, the Contractor shall replace or repair them.

F. The City Engineer will designate which existing hydrants, valves and boxes, manhole castings and other items removed as part of the construction, are to be salvaged. All other items shall be disposed by the Contractor.
G. In general, all existing watermain, sanitary sewer and storm sewer pipe being replaced by new improvements shall be considered as debris and removed during the construction process. In certain instances, existing pipes may be abandoned in place, with the approval of the City Engineer.

H. Where existing pipes are to be abandoned in place, the exposed pipe ends shall be bulkheaded shut with a watertight non-shrink concrete grout at a thickness of not less than one pipe diameter.

****END OF SECTION****
PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to clearing and grubbing trees, stumps and brush as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2101 shall apply to clearing and removing trees, stumps and brush, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 NO EXCEPTION TO THE REFERENCED SPECIFICATION IS MADE.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. All trees, stumps, brush, seed, grass, roots or other undesirable material within the construction limits shall be disposed of by the Contractor.

B. Disposal methods shall be approved by the City Engineer and shall meet all local, State and federal regulations.

C. Burning or burial will not be allowed within city limits.

****END OF SECTION****
SECTION 02310 - EXCAVATION & EMBANKMENT - SITE GRADING

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the excavation and embankment of the site improvements as indicated on the drawings or as specified herein.

1.2 DEFINITIONS

A. Building Pad - The area under any proposed building, or an area delineated on the plans as the site for a future building.

B. Building Pad Hold-Down - The elevation that the proposed building pad is to be constructed to. This elevation does not represent the finished grade elevation of the proposed building.

C. Compacted Volume (CV) – The volume of material actually placed as determined by computing the difference between original and final cross-sections by the average end area method.

D. Excavated Volume (EV) – The volume of material actually excavated as determined by computing the difference between original and final cross-sections by the average end area method.

E. Excess Material - Material that is not needed to complete the earthwork balance.

F. Structural Improvements - For the purposes of this specification, structural improvements shall refer to any roadway, sidewalk, trail, building, sign, or other improvements requiring suitable soil to support the anticipated loadings.

G. Subcut - Excavation performed below the proposed subgrade or building pad hold-down elevation shown on the plans for the purposes of removing unsuitable material.

H. Subgrade - The top surface of a roadbed upon which the pavement structure (including aggregate base and/or granular subbase) is to be constructed. This is also a general term denoting the soil foundation upon which a proposed improvement is to be placed.

I. Suitable Material - Sand, silty sand or low plasticity clay soils with no organic content. The City Engineer shall make the final determination as to what material will be considered suitable.

J. Topsoil - Any soil, generally black in color, containing organic material.

K. Unsuitable Material - Soil with organic content including topsoil, swamp deposits, peat, muck, or other material deemed by the City Engineer to be unsuitable for fill or embankment construction.

1.3 SPECIFICATION REFERENCES

A. Mn/DOT Specification No. 2105 shall apply to the excavation and embankment for the site improvements, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.
PART 2 -- PRODUCTS

2.1 MATERIALS

A. All suitable excess excavated material shall remain the property of the Owner.

B. Some excavated material may become the property of the Contractor and shall be removed from the site and disposed of at a site secured by the Contractor. These materials include:

1. Materials which are unsuitable for construction.
2. Materials in excess of the project requirements.

2.2 SOURCE QUALITY CONTROL

A. The Contractor shall arrange for having the following testing performed:

1. One (1) gradation test per each 500 tons or 275 cubic yards (CV) of select granular borrow.
2. One (1) gradation test for stabilizing aggregate.

B. All testing shall be performed by an independent testing laboratory approved by the City Engineer.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. At the end of each day the Contractor shall eliminate surface indentations, including those caused by sheeps foot rollers and tractor cleats, and roll the surface with a steel wheel or rubber tired roller.

B. Sufficient common excavation shall be utilized by the Contractor to replace the soil shrinkage from excavation which occurs through the course of construction handling and compaction. The Contractor shall make his own estimate of the amount of shrinkage that will occur.

C. Material suitable for embankment shall be segregated and stockpiled at a site selected by the Contractor.

D. Salvage, stockpile and restore topsoil at the locations shown on the plan. Furnish and install topsoil borrow material as necessary.

E. Material suitable for curb backfill shall be segregated and stockpiled at a site selected by the Contractor. Following curb construction, the material shall be placed behind the curb to the subgrade level of the topsoil. All excess material shall be hauled and disposed of as specified.

F. All site grading shall be compacted using the Specified Density Method:

1. Under areas with proposed paved or structural improvements:
   (a) 100% Standard Proctor from the proposed pavement subgrade elevation down 3 feet.
   (b) 95% Standard Proctor from the bottom of excavation up to 3 feet below the subgrade elevation.

2. Under areas with no proposed paved or structural improvements:
   (a) 95% Standard Proctor.
3.2 FIELD QUALITY CONTROL

A. The Contractor shall arrange for and pay all costs associated with having the following testing performed:

   1. One (1) compaction test (including Standard Proctor) per each 500 SY per each 3 foot of depth of embankment.

B. All testing shall be performed by an independent testing laboratory approved by the City Engineer.

C. Samples for testing shall be taken from material in place, in building sites and/or paved areas. All sampling methods shall be approved by the City Engineer.

D. Should any of the specified tests fail, the Contractor may arrange and pay for additional tests as may be necessary to satisfy the City Engineer that the specified gradation requirements have been met.

***END OF SECTION***
SECTION 02320 - TRENCH EXCAVATION, BEDDING AND BACKFILL

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to maintenance of utility service, trench excavation, bedding and backfill necessary for the construction of underground utilities and structures, as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Reference CEAM Specification No. 2600 shall apply to excavating, installing bedding, and backfilling all trench excavation construction necessary for the completion of work, except as modified herein.

1. All references to Mn/DOT specifications shall mean the specific edition, including Supplemental Specifications and Technical Memoranda as identified in Section 01420 of these Specifications.

2. CEAM Specification 2600.3.A1 Maintenance of Traffic is hereby deleted, See Section 01555 of these Specifications.

3. CEAM Specification 2600.3.A2 Establishing Line and Grade is modified by Section 01720 of these Specifications.

4. CEAM Specification 2600.3.A3 Protection of Surface Structures:
   (a) Street signs shall be considered as items of essential service.
   (b) The last sentence in the third paragraph is deleted.

5. CEAM Specification 2600.3.A5 Removal of Surface Improvements - All rubble and debris to be disposed of off-site, shall be disposed of at a location secured by the Contractor and in a manner in compliance with applicable Local, State and Federal regulations.

6. CEAM Specification 2600.3.B3 Excavation Limits and Requirements - OSHA limitations shall also apply to the top of trench width determination. The seven day written notice is waived if changing soil conditions and OSHA compliance apply.

7. CEAM 2600.3.C1 Jacking/Boring - The Contractor is responsible for protecting all existing utilities above the elevation of the pipe invert minus 2 times the wall thickness of the casing pipe being installed. In addition, bentonite materials shall not be permitted to flow back into the excavation during the non-open cut construction.

8. CEAM 2600.3.F1 Turf Restoration is hereby deleted, See Section 02920 of these Specifications.

9. CEAM 2600.3.F1 Pavement Restoration is hereby deleted, See applicable sections of these Specifications.

10. CEAM 2600.4 Method of Measurement Paragraphs B and C are hereby deleted. See applicable sections of these Specifications.

B. Reference Mn/DOT Specification No. 2451 shall apply to granular materials for foundation, bedding and encasement of utility line construction, except as modified herein.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.
1.3 SUBMITTALS

A. No exception to the referenced specification is made.

PART 2 -- PRODUCTS

2.1 GRANULAR MATERIALS

A. Aggregate Bedding - Granular foundation material (rock) shall meet MnDOT specification 2451 for aggregate bedding as modified below. This material may be required for stabilization of the foundation below the pipe bottom, around the pipe fittings and under fire hydrants. The material shall be crushed rock meeting the following gradation by weight. The use of the material shall be reviewed by the City Engineer prior to the installation of the material.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1½”</td>
<td>95 - 100</td>
</tr>
<tr>
<td>¾</td>
<td>20 - 60</td>
</tr>
<tr>
<td># 4</td>
<td>0 - 5</td>
</tr>
</tbody>
</table>

B. Granular Backfill - Granular backfill material to be used above the pipe zone up to the top of subgrade if unsuitable native material is encountered shall conform with MNDOT Specification 3138, Class 3, modified to permit the following gradation limits. The use of the material shall be reviewed by the City Engineer prior to the installation of the material.

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1½”</td>
<td>100</td>
</tr>
<tr>
<td># 4</td>
<td>35 - 100</td>
</tr>
<tr>
<td># 10</td>
<td>20 - 80</td>
</tr>
<tr>
<td># 40</td>
<td>5 - 40</td>
</tr>
<tr>
<td># 200</td>
<td>0 - 15</td>
</tr>
</tbody>
</table>

C. Granular Bedding and Encasement - Bedding and encasement materials used in the pipe zone area (6” below the pipe to 12” over the pipe) shall meet the same gradation and specification as granular backfill, above.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Temporary Service

1. It will be necessary to maintain utility service during the construction period. Before proceeding with the project, the Contractor shall establish a work plan and submit the plan to the appropriate
utility personnel and the City Engineer for review and comment. The plan shall outline the method to be used to maintain service to the affected consumers and estimate the duration of any anticipated interruptions of service. The Contractor is the sole party responsible to notify the Utility and consumers who may be affected by limitations and/or interruption of utility service. Temporary watermain serving more than 4 residences shall be 4-inch diameter. Each service shall have a shut off valve. Commercial and industrial temporary watermain shall be a minimum of 6-inch diameter.

2. Planned service interruptions shall not exceed six (6) hours in any 72 hour period unless previously approved by the Utility.

3. The Contractor shall coordinate water main shut-downs with the water utility at least 24 hours prior to the requested shut-down.

4. If needed, the Contractor shall furnish, install and maintain equipment to bypass and control the storm and/or sanitary sewer flow around the construction zone. Failure to operate and maintain the bypass equipment could result in direct damage claims as well as consequential damage claims to the Contractor.

3.2 EXCAVATION AND PREPARATION OF TRENCH

A. Interference and Protection of Underground Structures

1. If an existing utility is shown on the plans and there is no bid item for removing and restoring, or working around the utility, the Contractor shall be required to remove and restore, or protect the utility.

2. The inverts of existing sewers (storm & sanitary), culverts, subdrains, etc. shall be protected during construction. The Contractor is responsible to inspect and clean, if necessary, all lines which have become compromised by the construction operations.

B. Excavation Limits and Requirements

1. The trench for all flexible pipe shall be undercut six-inches below the pipe barrel to permit the installation of granular bedding or foundation material.

2. The trench for all rigid pipe shall be undercut three-inches below the pipe barrel to permit the installation of granular bedding or foundation material.

3. The Contractor shall install and operate a dewatering system to maintain all trenches free of water wherever necessary. The Contractor shall make his own subsurface investigations and determine what dewatering methods to utilize to prevent such damage.

4. The Contractor shall be responsible for any damage to adjacent structures or buildings caused by the dewatering operations.

5. Use of granular foundation material in lieu of performing dewatering is permitted, at the Contractor's expense.

C. Preparation and Maintenance of Foundation

1. Flexible Pipe Materials

(a) In ordinary trench conditions, the pipe shall be bedded in compacted granular bedding, which extends from 6" below the bottom of the pipe to the spring line of the pipe. The Contractor shall bed and encase the pipe in ASTM Class II bedding and encasement material to 90% Standard Proctor Density or as recommended by the pipe manufacturer, whichever is denser.

(b) Where the trench foundation has been found to be unstable and not suitable for bedding, the Contractor shall install compacted aggregate foundation material from 6" below the bottom
of the pipe to the bottom of the pipe. Bedding material shall then be placed to the spring line of the pipe.

2. Rigid Pipe Materials
   (a) In ordinary trench conditions, the pipe shall be bedded in compacted granular bedding, which extends from 3’ below the bottom of the pipe to the spring line of the pipe. The Contractor shall bed and encase the pipe in ASTM Class II bedding and encasement material to 90% Standard Proctor Density or as recommended by the pipe manufacturer, whichever is denser.
   (b) Where the trench foundation has been found to be unstable and not suitable for bedding, the trench shall be undercut until acceptable conditions are found. The Contractor shall then install compacted foundation material to meet the line and grade specified on the plan.

3.3 INSTALLATION OF PIPE AND FITTINGS

A. The Contractor shall keep accurate records as to the location of the service connections, field tile, utility crossings, etc., either constructed or encountered during the construction. Measurements to service lines shall be taken from the two nearest permanent structures (i.e., hydrants, valves, manholes, buildings) as directed by the City Engineer. Final payment for the project will not be made until the information is in the possession of the City.

B. When connection to an existing conduit is required at an existing or proposed manhole, the Contractor shall expose and verify the elevation of the existing conduit prior to laying any pipe toward, or away from, the connection point. If the elevation of the existing conduit does not match the elevation shown on the plans, the Contractor shall notify the City Engineer, at which time the City Engineer may adjust the proposed grades.

C. Connection and Assembly of Joints
   1. For sanitary sewer, watermain, forcemains, and culverts, all joints shall be watertight.
   2. For storm sewers and subdrains, all joints shall not permit the intrusion of soil or backfill materials.
      (a) If reinforced concrete pipe is used, the Contractor may at its own discretion choose to wrap each joint with a geotextile filter fabric, as specified, rather than place mastic in the joint.

D. Bulkheading Open Pipe Ends
   1. The Contractor shall furnish, install and maintain a temporary, water-tight plug adequately blocked in place to prevent flooding of the existing downstream sewer system. The plug shall be placed at the beginning of the project or at the end of each working day at the end of the day's operation.
   2. When flows are diverted from an existing sewer or tile to be abandoned in place, the Contractor shall construct a water-tight plug on the open end of the abandoned pipe.
   3. Permanent watertight plugs shall be constructed with an approved concrete grout with a thickness of not less than 1 pipe diameter.

3.4 BACKFILLING OPERATIONS

A. Flexible Pipe Materials
   1. Granular material shall be furnished, placed and compacted to bed and encase the pipe to an elevation 12 inches above the pipe bell the full width of the trench. If the depth of cover becomes critical according to manufacturer’s recommendations, the Contractor shall bed and encase the
pipe in ASTM Class II bedding and encasement material to 90% Standard Proctor Density or as recommended by the pipe manufacturer, whichever is denser.

B. All trench backfill shall be compacted in accordance with the Specified Density Method:

1. Under areas with proposed paved or structural improvements:
   (a) 100% Standard Proctor from the proposed pavement subgrade elevation down 3 feet.
   (b) 95% Standard Proctor from the bottom of excavation up to 3 feet below the subgrade elevation

2. Under areas with no proposed paved or structural improvements:
   (a) 95% Standard Proctor

3.5 SOURCE QUALITY CONTROL

A. The Contractor shall arrange for having the following testing performed:

   (a) One (1) gradation test per each 500 tons or 275 cubic yards (CV) of granular material.

3.6 FIELD QUALITY CONTROL

A. The Contractor shall arrange for having the following testing performed:

   1. One (1) compaction test (including Standard Proctor) on subgrade per each 300 lineal feet of trench per 3 feet of depth

B. The Contractor shall cooperate fully with the individuals performing the tests.

C. Samples for testing shall be taken from material in place, in the trench at locations approved by the City Engineer. All sampling methods shall be approved by the City Engineer.

D. Should any of the specified tests fail, the Contractor may arrange and pay for additional tests as may be necessary to satisfy the City Engineer that the requirements have been met.

****END OF SECTION****
SECTION 02330 - EXCAVATION AND EMBANKMENT - ROADWAY & PAVEMENT

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performance of all work and services necessary or incidental to the excavation and embankment for roadways and pavements as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2105 shall apply to excavation and embankment, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. All excess excavated material shall become the property of the Contractor and shall be removed from the site and disposed of at a site secured by the Contractor.

B. Unsuitable excess excavated material shall become the property of the Contractor and shall be removed from the site and disposed of at a site secured by the Contractor.

C. Excavated material unsuitable for embankment and backfill construction shall become the property of the Contractor and shall be removed from the site and disposed of at a site secured by the Contractor.

D. Stabilizing aggregates for use in backfilling subgrade excavations shall be material generally produced and referred to as “1½-inch dust free aggregate” or other coarse aggregate found to be in general compliance by the City Engineer. Aggregate base, Class 5 may also be used at the direction of the City Engineer.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. At the end of each day the Contractor shall eliminate surface indentations, including those caused by sheep foot rollers and tractor cleats, and roll the surface with a steel wheel or rubber tired roller.

B. Subgrade excavation shall be performed, as directed by the City Engineer, for the removal of any unstable soils which may be encountered. Such excavation shall be backfilled with suitable excess common excavation material or stabilizing aggregate as directed by the City Engineer. If the Contractor proceeds without approval from the City Engineer or City, all work and material to restore the roadbed to the proper grade shall be at the Contractor’s expense.

C. Once the subgrade has been tested and accepted by the City Engineer, no traffic or construction equipment shall be permitted to operate directly on the subgrade without the prior approval of the City Engineer. All equipment shall be restricted to operating only in areas where the aggregate base has been installed to its full design depth.
D. Material suitable for curb backfill shall be segregated and stockpiled at a site selected by the Contractor. Following curb construction, the material shall be placed behind the curb to the subgrade level of the topsoil.

E. The Contractor shall salvage and stockpile all topsoil removed during the course of the construction. This topsoil shall be used where required for turf establishment as directed by the City Engineer.

F. Sufficient excavated material shall be utilized by the Contractor to replace loss volume due to soil shrinkage from trench excavation, which may occur through the course of construction. The Contractor shall make his own determination of the amount of shrinkage that will occur.

G. All embankment shall be compacted using the Specified Density Method:
   1. Under areas with proposed paved or structural improvements:
      (a) 100% Standard Proctor from the proposed pavement subgrade elevation down 3 feet.
      (b) 95% Standard Proctor from the bottom of excavation up to 3 feet below the subgrade elevation
   2. Under areas with no proposed paved or structural improvements:
      (a) 95% Standard Proctor

3.2 SOURCE QUALITY CONTROL

A. The Contractor shall arrange for having the following testing performed:
   1. One (1) gradation test per each 500 tons or 275 cubic yards (CV) of select granular borrow.
   2. One (1) gradation test for stabilizing aggregate.

B. Samples for testing shall be taken from material in stock at locations approved by the City Engineer. All sampling methods shall be approved by the City Engineer.

3.3 FIELD QUALITY CONTROL

A. "Blue top" stakes shall be provided by the Contractor at 100 foot intervals to confirm that the subgrade is constructed to the required grades and elevations. Methods other than "blue top" staking may be allowed, if approved by the City Engineer.

B. The Contractor shall arrange for and pay all costs associated with having the following testing performed:
   1. One (1) compaction test (including Standard Proctor) on subgrade per each 500 SY of roadway per each 3 feet of subgrade excavation depth.

C. All testing shall be performed by an independent testing laboratory approved by the City Engineer.

D. The Contractor shall cooperate fully with the individuals performing the tests.

E. Samples for testing shall be taken from material in place, in the roadway at locations approved by the City Engineer. All sampling methods shall be approved by the City Engineer.

F. Should any of the specified tests fail, the Contractor may arrange and pay for additional tests as may be necessary to satisfy the City Engineer that the requirements have been met.

*****END OF SECTION*****
SECTION 02335 - SUBGRADE PREPARATION

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performance of all work and services necessary or incidental to the subgrade preparation as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2112 shall apply to the subgrade preparation, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 NO EXCEPTION TO THE REFERENCED SPECIFICATION IS MADE.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. At the end of each day the Contractor shall eliminate surface indentations, including those caused by sheep foot rollers and tractor cleats, and roll the surface with a steel wheel or rubber tired roller.

B. The Contractor shall disc, scarify, shape and compact the upper six inches of the street subgrade or existing base, adding water or drying as may be necessary to give uniform and desired density.

C. If the subgrade is unstable and the instability is due to excessive moisture, the subgrade shall be scarified and dried over a reasonable time period. When the material has reached acceptable moisture limits, the material shall be returned to the roadbed and compacted into place to the proper elevation. The roadbed will once again be tested. If the material continues to be unstable, the City Engineer may authorize the removal of the undesirable material as subgrade excavation.

D. Once the subgrade has been tested and accepted by the City Engineer, no traffic or construction equipment shall be permitted to operate directly on the subgrade without the prior approval of the City Engineer. All equipment shall be restricted to operating only in areas where the aggregate base has been installed to its full design depth.

E. The subgrade shall be compacted in accordance with the Specified Density Method:

1. Under areas with proposed paved or structural improvements:
   (a) 100% Standard Proctor from the proposed pavement subgrade elevation down 3 feet.
   (b) 95% Standard Proctor from the bottom of excavation up to 3 feet below the subgrade elevation

2. Under areas with no proposed paved or structural improvements:
   (a) 95% Standard Proctor
3.2 FIELD QUALITY CONTROL

A. "Blue top" stakes shall be provided by the Contractor at 100 foot intervals to confirm that the subgrade is constructed to the required grades and elevations. Methods other than "blue top" staking may be allowed, if approved by the City Engineer.

B. The compacted subgrade shall be tested using Nuclear, ASTM D 2922, or Sand Cone, ASTM D 1556 test methods.

C. The Contractor shall arrange for and pay all costs associated with having the following testing performed:
   1. One (1) compaction test (including Standard Proctor) on subgrade per 500 SY of roadway.

D. All testing shall be performed by an independent testing laboratory approved by the City Engineer.

E. The Contractor shall cooperate fully with the individuals performing the tests.

F. Samples for testing shall be taken from material in place, in the roadway at locations approved by the City Engineer. All sampling methods shall be approved by the City Engineer.

G. Should any of the specified tests fail, the Contractor may arrange and pay for additional tests as may be necessary to satisfy the City Engineer that the requirements have been met.

****END OF SECTION****
PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to temporary erosion control as indicated on the plans or as specified herein or as directed by the City Engineer.

B. Three distinct elements of temporary erosion control are the responsibility of the Contractor:

1. **Erosion Control** – The requirement is to prevent the separation of soil particles from the soil surface and is generally met with good construction practices.

2. **Rapid Stabilization** - This stabilization process is directed at areas of a critical or unique characteristic to prevent the separation of soil particles from the soil surface. This work may be required at any time during the contract on small areas that may or may not be assessable with normal equipment.

3. **Sediment Control** – The installation and maintenance of barrier control devices across drainage ways to prevent fugitive soil particles from leaving the site.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2573 shall apply to temporary erosion control.

B. Mn/DOT Specification Section 3889 shall apply to ditch checks.

C. Mn/DOT Technical Memorandum No. 02-15-ENV-04 shall apply. In the event of a difference between Specification 2573 and the Technical Memorandum, the Technical Memorandum shall apply.

D. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Erosion Control

   1. No exception to the referenced specification.

B. Rapid Stabilization

   1. **Method 1** – Type 1 mulch @ 2 tons/acre and disc anchoring.

   2. **Method 2** – Applying type 1 mulch and tacking it with type 1 hydraulic soil stabilizer @ 200 pounds/acre.

   3. **Method 3** – Seed mixture 190RS @ 20 pounds/1,000 gallons.
(a) Fertilizer 10-10*-20 @ 100 pounds/1,000 gallons.
(b) Type 6 Hydraulic Soil Stabilizer 625 pounds/1,000 gallons.
(c) Water ratio 1,000 gallons.

4. **Method 4** – Erosion Control Blanket, Category III.
   (a) Seed Mixture 190RS @ 2 pounds/100 square yards.
   (b) Fertilizer 10-10*-20 @ 8 pounds/100 square yards.

5. **Method 5** – Rip Rap Class 1
   (a) Geotextile Type III.

C. **Sediment Control Devices**

1. "Bale Check" as specified in the referenced specification.
2. "Silt Fence:
   (a) Heavy Duty, as specified in the referenced specification.
   (b) Preassembled, as specified in the referenced specification.
   (c) Machine sliced, as specified in the referenced specification.
3. InfraSafe prefabricated sediment control barrier as manufactured by Royal Environmental Systems, or approved equal. Unless otherwise shown on the plans, barrier devices shall be wrapped with geotextile fabric or surrounded with aggregate to filter the water during periods of limited flow.
4. Ditch Checks
   (a) Type 3 – Bioroll Blanket System
   (b) Type 7 – Rock Check

PART 3 -- EXECUTION

3.1 **GENERAL**

A. Prior to construction, the City, City Engineer and Contractor shall observe the existing storm water outfall system and discharge area and shall document the existing conditions. Upon completion of surface restoration (i.e., paving and turf establishment), the storm water outfall system and discharge area shall be observed and all increased sediment deposits shall be removed and disposed of by the Contractor. All increases in sediment deposits shall be considered to have originated from the project site.

B. Prior to construction, the City, City Engineer and Contractor shall review the project to identify critical areas that could require rapid stabilization during the construction process, and develop a plan to either mitigate disturbance to those areas or identify the methods of rapid stabilization most appropriate.

C. Exit areas or roads shall be kept clean of excess soil by routine sweeping.

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* Phosphorous content at the time of stabilization shall be as noted, unless the local jurisdiction or the State restrict the use of phosphorous to some lesser percentage. In that event, the local jurisdiction percentage shall apply. If no local standard exists, the State restriction shall apply, once it becomes effective (January 1, 2004).
D. The Contractor shall salvage, transport and place cohesive materials excavated from the work for use in constructing the berm for temporary sediment traps.

3.2 CONSTRUCTION REQUIREMENTS

A. A goal of the project during construction is to get the cleanest water possible into the storm drainage systems as quickly as possible and protect critical and unique areas. Every effort shall be required by the Contractor to achieve these goals.

B. The Contractor shall control drainage and erosion on the project including: haul roads, temporary construction, waste disposal sites, plant and storage locations, and borrow pits, other than commercially operated sources. The contractor shall clean up the area, shape the area to allow storm runoff with a minimum of erosion and/or siltation, replace topsoil, and establish vegetative cover to the satisfaction of the City Engineer on areas where the potential for pollution has been increased due to the Contractor's operations.

C. If Contractor fails to install and/or perform the appropriate erosion, rapid stabilization and sediment control practices, as determined by the City Engineer, the City Engineer may issue a written order to the Contractor. The Contractor shall respond within 24 hours with sufficient personnel, equipment and/or materials and conduct the required work or be subject to a $500 per calendar day deduction for non-completion.

D. When the City Engineer determines that the erosion, rapid stabilization and/or sediment control practices installed by the Contractor have failed, the Contractor shall correct the cause and alleviate all sediment deposition, to the fullest extent possible. If the corrective action is not taken in a timely manner, the City Engineer may issue a written order to the Contractor. The Contractor shall respond within 24 hours with sufficient personnel, equipment and/or materials and conduct the required work or be subject to a $500 per calendar day deduction for non-completion.

E. Unless the project has received approval or certification for depositing fill into surface waters, the Contractor shall remove all deltas and sediment deposited in drainage ways or catch basins and re-stabilize the areas where sediment removal results in exposed soil. The removal and stabilization shall take place within 7 calendar days of discovery unless precluded by legal, regulatory, or physical access restraints. If precluded, removal and stabilization must take place within 7 calendar days of obtaining access. The Contractor is responsible for contacting all local, regional, State, and Federal authorities before working in surface waters and obtaining applicable permits.

F. Where applicable, the Contractor will be required to co-sign for a "General Storm Water Permit" for construction activity with the Minnesota Pollution Control Agency (MPCA). The application form and information is included an appendix of these specifications. The Developer will initiate the Permit process and pay the required "Application Fee." The Contractor will be required to comply with all of the terms and conditions of the Permit, which also includes performing the required inspections of the erosion control devices and maintaining an Inspector's Log for the MPCA Storm Water Permit. A copy of the proposed log form is available from the City Engineer.

3.3 EROSION CONTROL

A. Unless precluded by snow cover, all exposed soil areas, including topsoil stockpiles, shall have temporary erosion control or permanent cover for the exposed soil areas within the following time frames (for the purpose of this provision, exposed soil areas do not include surcharge areas or stockpiles of sand, gravel, aggregate, concrete, or bituminous).
3.4 RAPID STABILIZATION

A. Unless precluded by snow cover, all exposed soil areas, including topsoil stockpiles, with a continuous positive slope within 100 feet of surface waters, or from a curb, gutter, storm sewer inlet, temporary or permanent drainage ditch, or other storm water conveyance system, shall have rapid stabilization or permanent cover for the exposed soil areas within the following time frames (for the purpose of this provision, exposed soil areas do not include surcharge areas or stockpiles of sand, gravel, aggregate, concrete, or bituminous).

<table>
<thead>
<tr>
<th>Type of Slope</th>
<th>Temporary Protection or Permanent Cover Where the Area Has Not Been, or Will Not Be, Worked by the Contractor for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steeper than 1 Vertical to 3 Horizontal</td>
<td>7 Days</td>
</tr>
<tr>
<td>Between 1:3 and 1:10</td>
<td>14 Days</td>
</tr>
<tr>
<td>Flatter than 1:10</td>
<td>21 Days</td>
</tr>
</tbody>
</table>

B. The City Engineer may order the work at any time during the contract and will be for small critical areas, which may or may not be accessible with normal equipment. These methods should be used for areas within 100 feet of Waters of the State and to stabilize the critical areas within the timeframe designated in the NPDES permit.

C. Minimum Areas / Quantities for application (approximate)

1. **Method 1** - 1-2 acres.
2. **Method 2** - 1-2 acres.
3. **Method 3** – 4,000 gallons.
4. **Method 4** - 200-400 square yards.
5. **Method 5** - 10-20 tons.

D. Placement

1. Shaping of the area prior to placement of any of the materials shall be as directed by the City Engineer.
2. **Method 1**, Apply type 1 mulch and anchor with disc anchoring - Prior to placement the soil surface shall be in a loose condition so that the *mulch* can be anchored. The mulch shall be placed in the areas directed by the City Engineer and to obtain approximately 90% ground coverage. Wherever possible the mulch shall be placed by blow equipment and in inaccessible areas may have to be placed by hand. Immediately after placement, the mulch shall be anchored with a disc-anchoring tool per specification 2575.3H.
3. **Method 2**, Apply type 1 mulch and tack it with type 1 hydraulic soil stabilizer - The same placement procedure applies, as in Method 1 except the mulch shall be sprayed with type 1...
hydraulic soil stabilizer at a rate of 220 g/ha (200 pounds/per acre) per specification 2575.3H. No disc anchoring.

4. **Method 3, Hydro spread of seed, fertilizer and hydraulic soil stabilizer.** - Rate of slurry application shall be variable depending on surface roughness, slope configuration and degree of undulation. Amount of material applied shall be such to obtain shall be such to obtain 100% soil surface coverage. To obtain the coverage, two (2) passes may be necessary. In inaccessible areas, the mix may be pumped through a hose.

5. **Method 4, Hand install seed, fertilizer and erosion control blanket.** - The fertilizer seed and erosion control blanket shall be placed as described in 2575.3. The upgrade end of each blanket strip shall be buried at least 150mm (6 inches) in a vertical check slot. Staples shall be placed at seams, and throughout the blanket at a maximum spacing of 2 feet.

6. **Method 5, Place geotextile and rock in various configurations.** - Rock and geotextile shall be placed in the areas and to the configurations directed by the City Engineer.

3.5 **SEDIMENT CONTROL DEVICES**

A. The Contractor shall install Sediment Control Devices where control is required and/or where directed by the City Engineer. The control measures as shown on the plans shall be considered the minimum requirements with additional measures required dependent on construction sequencing and scheduling.

B. Inlet Protection shall be used around catch basins and/or other surface water accesses to any existing or proposed storm water conveyance system.

C. The Contractor shall take all steps necessary to prevent excess soil erosion of the project. Temporary erosion control devices shall be constructed, maintained and left in place to such time as permanent erosion control measures are in place or instructed to remove them by the City Engineer.

D. The Contractor shall construct temporary sediment traps with granular outlets within the disturbed roadway area and shall stockpile a sufficient quantity of suitable fill material to regrade sedimentation ponds and temporary ditches to match the subgrade elevation.

****END OF SECTION****
SECTION 02375 - GEOFIBER EROSION CONTROL MATS

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the installation of geofiber erosion control mats as shown on the drawings, as specified herein, and/or as specified by the City Engineer.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 3888 shall apply, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Geofiber erosion mats shall be manufactured of synthetic fibers for the stabilization of erosion-prone slope surfaces. All geofiber mats shall be filamentous, nylon material with not less than 0.5 percent by weight of carbon black and minimum filament diameter of 0.40 mm. Mat weight shall be approximately 0.75 pounds per square yard with a minimum mat thickness of 0.70 inches. Tensile strengths in the mat roll length and width directions shall be a minimum of 140 and 80 kilograms per meter, respectively.

B. The mat material shall be ENKAMAT, type 7020 as manufactured by American Enka Company, or approved equal conforming to the specified characteristics.

C. Staples for anchoring the erosion mats shall be No. 11 gage, or heavier, wire, “U”-shaped with a length of not less than 18 inches from the top of the curve to the end of the staple and a head width of 2 inches.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Where shown on the Plans, the Contractor shall furnish and install a geofiber erosion control matting as shown in the detail on the Plans.

B. The Contractor shall fill and grade the designated surface to the line and grade shown on the Plans to form a shallow swale in the detention pond bank.

C. The geofiber mats shall be installed along the graded area where shown on the Plans and marked in the field by the City Engineer. Starting at the upper end, roll out the center mat along the center of the swale. Repeat with side strips overlapping the center strip or subsequent inside strips by 3-inches. Place staples along the overlap at 3 to 5 foot intervals. Staked, shingle style joints with a 6-inch minimum overlap shall be used where roll length make transverse joints unavoidable.

D. All outside edges including upstream and downstream end of the mats shall be stapled and anchored to a depth of 12-inches and extended outward another 12-inches at the 12-inch bury depth to prevent
undercutting of mats. Contractor shall conform to manufacturer’s recommendations regarding use of check slots.
SECTION 02377 - RIPRAP

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to construct the rip-rap and geotextile fabric as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2511 shall apply to the construction of rock rip-rap, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. All rip-rap shall be Granite.

B. The class rip-rap and fine filter aggregate to be used shall be as shown on the plans and specified in Mn/DOT Specification 3601.

C. The geotextile fabric shall meet the requirements of Mn/DOT 3733, Type IV, unless otherwise shown on the plans.

D. The Contractor may choose the type of filter material, except as restricted for geotextile filters, unless the type is specified on the plans.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. When placing rip-rap around flared-end-sections, the rip-rap must be placed such that no rip-rap exists above apron flow-lines.

****END OF SECTION****
SECTION 02446 - TRENCHLESS PIPELINE

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to trenchless pipeline construction. Various methods will be considered, providing they can generally follow the design profile in constructing the pipeline from the starting access point to the ending access point without the need to excavate an intermediate access.

B. The INSTALLER for all forms of trenchless pipeline installation shall meet or exceed the experience requirements as stated in CEAM 2600.3.C2.

1.2 SPECIFICATION REFERENCES

A. This specification references ASTM D1248 and D3350, and PPI PE 3408, and for potable water systems AWWA C906 which are made a part hereof by such reference and shall be the latest edition and revision thereof. In case of conflicting requirements between this specification and the above referenced sections, this specification will govern.

B. Reference CEAM Specification No. 2600.3 Non-Open Cut Pipe Installation shall apply to the water main and service line construction, except as modified herein or as shown on the plans.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.3 SUBMITTALS

A. Items to be submitted to the City Engineer

1. The diameter, wall thickness and type of material to be used. Pipe strength determination shall include calculations based on new material properties and long term properties.

2. The manufacturer's certificates of compliance with provisions of the referenced standards and these specifications.

3. A copy of the license or certificate verifying the trenchless construction equipment manufacturer's or licensor's approval of the INSTALLER.

4. Evidence of the INSTALLER's experience including a list of similar projects completed within the previous 2 years.

5. In lieu of the requirement of previous experience by the INSTALLER with the technique and equipment associated with trenchless pipeline construction, the manufacturer of the trenchless construction equipment may provide an experienced representative on site during the set-up, fusing, trenchless construction, back reaming, and insertion phases of the entire project.
(a) If the Contractor anticipates exercising this option, a statement from the manufacturer of the trenchless construction equipment agreeing to this requirement shall be submitted to the City Engineer.

B. Video Tapes

1. All video tapes and construction logs, or copies thereof, shall become the property of the City.
2. Two copies of all video tapes shall be submitted: One to the City and one to the City Engineer.

C. Construction Profile

1. The Contractor shall monitor and plot the constructed pipeline profile to scale throughout the length of the trenchless construction.
   (a) The horizontal profile shall be on a consistent scale where 1 inch measures no more than 100 feet.
   (b) The Contractor shall note on the profile any deviations (horizontal or vertical) from the planned alignment which encroach on the separation space as required by CEAM 2600.3.A2.
   (c) The Contractor shall note on the profile any horizontal deviations in excess of 4 feet from the planned alignment.
   (d) The vertical profile shall be on a consistent scale where 1 inch measures no more than 10 feet.

2. Duplicate copies of the profile shall be submitted.

PART 2 -- PRODUCTS

PART 3 -- PRODUCTS

3.1 TRACER WIRE

A. Tracer wire shall meet the requirements one of the following:

   1. 1/8” galvanized aircraft wire clear PVC coated to 3/16”.
   2. 1/8” 304 stainless steel wire clear PVC coated to 3/16”.

B. Connectors

   1. Connectors shall be “wire nut” or “twist on” type connectors filled with silicone waterproofing sealant suitable for direct bury applications according to UL 486D test standard. Connectors shall be DryConn™ connectors as manufactured by King Innovation or approved equal.

3.2 PIPE MATERIAL & STRUCTURAL REQUIREMENTS

A. All pipe shall be made from virgin material. No rework except that obtained from the manufacturer’s own production of the same formulation shall be used.

B. The pipe shall be homogenous throughout and shall be free of visible cracks, holes, foreign material, blisters, and/or other deleterious faults.
C. The internal material color shall be light and reflective to facilitate better viewing with televising equipment.

D. Any section of pipe with a gash, blister, abrasion, nick scar, or other deleterious fault greater than 10 percent (10%) of the wall thickness, shall not be used and must be removed from the site. However, a defective portion of pipe, as defined above, may be cut out and butt-fused in accordance with the procedures herein.

E. Any section of pipe having other defects such as concentrated ridges, discoloration, excessive spot roughness, pitting, variable wall thickness or any other defect of manufacturing and/or handling shall not be used and shall be removed from site.

F. WASTE WATER APPLICATIONS - FORCEMAINTS & GRAVITY SEWERS

1. Restrained Joint DIP Pipe and Fittings
   (a) Flex-Ring Joint Pipe (DIP), as manufactured by American Ductile Iron Pipe or equal. The pipe shall be pressure pipe with a 350 psi working pressure for diameters up to and including 12 inch, and 250 psi for diameters 14 inch to and including 20 inch. Structurally stronger pipe may be needed to ensure resistance to damaging stresses relative to the trenchless construction technique.
   (b) Joints shall be Flex-Ring Restrained Joint couplings as manufactured by American Ductile Iron Pipe or equal.

2. High Density Polyethylene (HDPE) Pipe and Fittings
   (a) The pipe material shall be extra high molecular weight, high density polyethylene (EHMW-HDPE, PE3408) conforming with the minimum structural standards of ASTM D3350 with cell classification 345434C as manufactured by Driscopipe 4000/4100 Series, or equal. All HDPE pipe material shall meet the requirements of ASTM D1248 for a Type III, Class C, Category 5, Grade P34 material.
   (b) The grade used shall be resistant to aggressive soils or corrosive substances present. Unless otherwise specified, the dimensions and tolerances of the pipe barrel should conform to ductile iron or cast iron pipe equivalent outside diameters.
   (c) The dimension ratio (DR) shall be 11.
   (d) HDPE pipe shall have butt-fused joints.
   (e) In gravity sewers with grades less than 0.80%, the lower 1/3 of the fusing bead shall be removed.
   (f) The Contractor shall verify the lengths of conduit necessary in the field before fabrication.
   (g) Polyethylene fittings and adaptors shall be butt-fused, EHMW-HDPE, PE3408 meeting the same resin requirements as specified for the pipeline. In addition, the fittings shall meet the applicable requirements of ASTM D2513 and ASTM D3261.
   (h) Mechanical joint forcemain joints shall be restrained using ductile iron clamps (series Ebau Iron, Inc. or equal) supplied with a sufficient number of ductile iron bolts to restrain the working and test pressures for this application.

3. Restrained Joint PVC Pipe and Fittings
(a) Restrained Joint Polyvinyl Chloride (PVC) pressure pipe with a 150 psi working pressure. The working pressure dictates a maximum standard dimension ratio (DR) of 18, however, structurally stronger pipe may be needed to ensure resistance to damaging stresses relative to the trenchless construction technique. The grade used shall be resistant to aggressive soils or corrosive substances in accordance with the requirements of ASTM D-543.

(b) Restrained joints shall be Certa-Lok C900/RJ Restrained Joint PVC couplings as manufactured by CertainTeed, or equal.

G. POTABLE WATER APPLICATIONS

1. Restrained Joint DIP Pipe and Fittings

   (a) Flex-Ring Joint Pipe (DIP), as manufactured by American Ductile Iron Pipe or equal. The pipe shall be pressure pipe with a 350 psi working pressure for diameters up to and including 12 inch, and 250 psi for diameters 14 inch to and including 20 inch. Structurally stronger pipe may be needed to ensure resistance to damaging stresses relative to the trenchless construction technique.

   (b) Joints shall be Flex-Ring Restrained Joint couplings as manufactured by American Ductile Iron Pipe or equal.

2. High Density Polyethylene (HDPE) Pipe and Fittings

   (a) The pipe material shall be extra high molecular weight, high density polyethylene (EHMW-HDPE, PE3408) conforming with the minimum structural standards of ASTM D3350 with cell classification 345434C as manufactured by Driscopipe 4000/4100 Series, or equal. All HDPE pipe material shall meet the requirements of ASTM D1248 for a Type III, Class C, Category 5, Grade P34.

   (b) The pipe to be used shall be (HDPE) pressure pipe conforming to the requirement of AWWA C-906 of a 160 psi working pressure. The grade used shall be resistant to aggressive soils or corrosive substances present. Unless otherwise specified, the dimensions and tolerances of the pipe barrel should conform to ductile iron or cast iron pipe equivalent outside diameters.

   (c) The dimension ratio (DR) shall be 11.

   (d) HDPE pipe shall have butt-fused joints.

   (e) The Contractor shall verify the lengths of conduit necessary in the field before fabrication.

   (f) Polyethylene fittings and adaptors shall be butt-fused, EHMW-HDPE, PE3408 meeting the same resin requirements as specified for the pipeline. In addition, the fittings shall meet the applicable requirements of ASTM D2513 and ASTM D3261.

   (g) Mechanical joint forcemain joints shall be restrained using ductile iron clamps (series Ebac Iron, Inc. or equal) supplied with a sufficient number of ductile iron bolts to restrain the working and test pressures for this application.

   (h) Directionally drilled pipe shall have ¼-inch stainless steel cable trace wire installed with the pipe. Trace wire shall be tied to the carrier pipe at 100-foot intervals.

3. Restrained Joint PVC Pipe and Fittings

   (a) Restrained Joint Polyvinyl Chloride (PVC) pressure pipe conforming to the requirements of AWWA C-900 and a 150 psi working pressure. The working pressure dictates a
maximum standard dimension ratio (SDR) of 18, however, structurally stronger pipe may be needed to ensure resistance to damaging stresses relative to the trenchless construction technique. The grade used shall be resistant to aggressive soils or corrosive substances in accordance with the requirements of ASTM D-543.

(b) Restrained joints shall be Certa-Lok C900/RJ Restrained Joint PVC couplings as manufactured by CertainTeed, or equal.

H. ELECTRIC CONDUIT APPLICATIONS

1. The pipe material shall conform to the minimum structural standards of ASTM D3350 with cell classification 345434C and F-714 for wall thickness tolerances.
2. The dimension ratio (DR) shall be 11.
3. The Contractor shall verify the lengths of conduit necessary in the field before fabrication.
4. A PE to PVC adapter shall be furnished and installed at each end of the placed conduit. The PVC end inside diameter shall match the PE inside diameter. The PVC end shall be schedule 40.
5. Each end of the conduit shall be gradually sloped upward to an elevation 3-feet below the existing ground grade. A PVC cap shall be furnished and installed at the end of each electric conduit.

I. STEEL CASING APPLICATIONS

J. RAILROAD CROSSINGS

1. The casing shall be new welded or seamless steel pipe conforming to the Standards of ASTM A53, Grade B with a yield strength of 36,000 psi. The wall thickness for the pipe to be bid shall be:

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<tr>
<th>Nominal Pipe Diameter</th>
<th>Minimum Wall Thickness</th>
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<tbody>
<tr>
<td>Inches</td>
<td>Inches</td>
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<tr>
<td>34 and 36</td>
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</tbody>
</table>

K. STREET AND HIGHWAY CROSSINGS

1. Casing pipe shall be welded steel pipe, new material, with a minimum yield strength of 35,000 PSIG (pounds per square inch gauge). The following minimum wall thickness shall be used:
### Outside Casing Diameter  Minimum Wall Thickness

<table>
<thead>
<tr>
<th>Diameter Range</th>
<th>Minimum Wall Thickness</th>
</tr>
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<tbody>
<tr>
<td>12” to 24”</td>
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<tr>
<td>30”</td>
<td>0.375”</td>
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<tr>
<td>36” to 42”</td>
<td>0.500”</td>
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</table>

### PART 4 -- EXECUTION

#### 4.1 CONSTRUCTION REQUIREMENTS:

**A. FUSING/FABRICATION**

1. Polyethylene Pipe
   (a) The pipe shall be assembled and joined at the site using the butt-fusion method to provide a leak proof joint prior to insertion. All equipment and procedures used shall be in strict compliance with the manufacturer’s recommendations and specifications.
   (b) Threaded or solvent welded joints or connections are not permitted.
   (c) Fusing shall be performed by personnel certified as fusion technicians by the manufacturer of the polyethylene pipe and/or the fusing equipment.
   (d) The butt-fused joints shall maintain true alignment and shall have uniform roll-back beads from the fusing process. The joint shall be watertight and shall have a tensile strength equal to that of the pipe.
   (e) Adequate cooling time shall be allowed prior to the release of the pressure from the fusing unit.
   (f) All joints shall be subject to acceptance by the City Engineer prior to insertion.
   (g) All defective joints shall be cut out and replaced.

**B. BLOCKING AND ANCHORING OF PIPE**

1. A thrust block of cast-in-place concrete, which covers the installed fitting, is not permitted. Pre-cast concrete thrust blocks and other restraining devices such as adjustable rods or cables, shall be provided at all bends or wherever the force main changes direction.
2. HDPE pipe shall be anchored and restrained against pipe relaxing at all manhole connections, all connections between new and existing pipes, and all transitions between pipe types. HDPE flanged adapters connecting to anchored flanged fittings are approved as detailed on the plans. Alternative anchoring techniques may be considered, provided that the alternative is submitted in writing to the City Engineer.

**C. INSTALLATION OF PIPELINES THROUGH CASINGS**

1. The Contractor shall install the carrier pipe through the casing pipe using stainless steel casing spacers, manufactured by Cascade Waterworks Mfg. or approved equal to support the entire length of the carrier pipe in the casing. Casing spacers shall be uniformly spaced as recommended by the manufacturer to prevent shifting of the pipe as detailed on the Plans. The line and grade at any point within the carrier pipe shall not vary by more than 0.5 foot from the horizontal plan line and 0.2 foot from the vertical grade. Following the installation of the
carrier pipe in the casing, the ends of the pipe shall be sealed with an appropriate grout to form a watertight seal.

2. Once the carrier pipe is securely installed inside the casing pipe, the Contractor shall fill the annular space with sand fill.

D. TRENCHLESS METHODOLOGY

1. The remaining specifications in this section pertain to directional drilling techniques as the most common type of trenchless technology. Other trenchless technologies may also be used, provided that the Contractor submits a set of specifications for the proposed alternate technology.

   (a) DRILLING

   (1) The Contractor shall initially drill a pilot hole which follows the route of the pipeline to be constructed.

   (2) The Contractor shall monitor the route taken by the drilling unit utilizing the downhole survey calculation methods discussed in API Bulletin D20 entitled Directional Drilling Survey Calculation Methods and Terminology. A surface monitoring system may be allowed in lieu of the downhole calculation method. Approval of surface monitoring shall be at the discretion of the City Engineer based on the City Engineer’s evaluation of the particular system proposed for use.

   (3) The Contractor shall provide the City Engineer with an “asbuilt” profile of the pilot hole prior to the back reaming and pipe insertion as which time the City Engineer shall review it for tolerance compliance.

   (4) The back reamer shall be designed to create a void in the surrounding soil through which the new pipe may be threaded.

   (5) The size of the reaming tool shall be in accordance with the manufacturer’s specifications to achieve the sizing indicated on the plans, or in the Schedule of Unit Prices.

   (6) Upon commencement, pipe insertion shall be continuous and without interruption from one structure to another, except as approved by the City Engineer.

   (b) INSERTION

   (1) Drill holes shall only be allowed at locations approved by the City Engineer.

   (2) In so far as possible, the equipment used shall be located in such a way as to minimize the noise impact on surrounding properties.

   (3) The Contractor shall utilize a disconnect swivel which shall be set to limit the stress within the pipe to less than its elastic limit.

   (4) The Contractor shall install all necessary pulleys, rollers, bumpers, alignment control devices and other equipment necessary to protect the pipe from damage during insertion. Dragging the pipe on the ground is not permitted. All break over bends should be made with a radius long enough to insure that the pipe is not overstressed.

   (5) Lubrication, as recommended by the manufacturer, may be used during installation.

   (6) Buoyancy control may be used during pull back.
(7) The manufacturer’s recommended cooling/relaxation time, but not less than 4 hours, shall pass after insertion is complete and before the connection of services, sealing of the annular space, and/or the backfilling of the insertion pit. A sufficient excess of new pipe, but not less than four inches (4”) shall protrude into terminating structures.

(8) The annular space at each structure shall be sealed with a material recommended by the manufacturer for a minimum of eight inches (8”) to form a smooth, uniform, watertight joint.

(9) Under no circumstance shall the pipe be stressed beyond its elastic limit.

4.2 FIELD QUALITY CONTROL

A. TOLERANCES

1. General
   (a) Terminating connections to existing structures and conduits shall be made with a smooth grade for the adjacent 50 feet and shall permit the appropriate hydraulic operation at the conduit connection.

   (b) Periodically, the City Engineer may require the Contractor to excavate a verification pit to expose the conduit for the City Engineer to determine compliance with the line and grade specified. As long as tolerances are being met, as determined by the City Engineer, the frequency shall not exceed 2 excavations in each 500 feet or be required in obviously inaccessible locations. The Contractor shall then backfill, compact and restore the surface of the excavation.

2. Pressure Systems
   (a) Horizontal alignment of the finished profile shall be within 2 feet of the planned alignment.

   (b) Vertical alignment of the finished profile shall be within 2 feet of the planned vertical alignment but in no event shall the invert elevation be closer to the existing ground surface or the future proposed ground surface, whichever is lower, than the minimum bury depth shown on the plans.

   (c) The final vertical alignment shall not conflict with future proposed gravity conduit grades shown on the plans, if any.

   (d) The final vertical alignment of forcemains shall not have high points, which could permit the development of air locks at any location other than those identified on the plans.

3. Gravity Systems
   (a) Horizontal alignment of the finished profile shall be within 2 feet of the planned alignment.

   (b) Vertical alignment of the finished profile shall be within 0.3 feet of the planned vertical alignment but in no event shall the invert elevation prevent the appropriate hydraulic operation with upstream or downstream conduits.

   (c) The final vertical alignment shall not conflict with future proposed gravity conduit grades shown on the plans, if any.

   (d) The final vertical alignment shall not have sags, which could permit sediment to accumulate at any location.
(e) The final vertical alignment of gravity conduits (storm and sanitary) shall not be shallower than the basement elevations of adjoining properties less adequate vertical distance to allow gravity piping from the basement to reach the installed conduit.

B. POST TELEVISIONING

1. After completion of the project, the Contractor shall perform a televised inspection of the line. The video tape shall include a voice description, as appropriate, with stationing of services and intermediate structures, if any.

2. The rate of movement of the televising camera shall not exceed 30 feet per minute.

3. Televising shall be conducted in a downstream direction, unless otherwise approved by the City Engineer.

4. On gravity sewer systems immediately PRIOR to televising, the televising contractor shall discharge sufficient water into each line televised to fill any sags.

5. The Contractor shall submit two copies of a written report with two copies of a DVD to the City.

6. Televising shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by close circuit television. The interior of the pipe shall be carefully inspected to determine the location of any conditions, which may prevent proper operation and it shall be noted so that these conditions can be corrected. A DVD and suitable log shall be kept for later reference by the City.

C. PRESSURE TESTING

1. Trenchless conduit used as carrier pipe:
   (a) Watermain – Refer to the requirements in Section 02510 – Domestic Water Systems.
   (b) Forcemain – Refer to the requirements in Section 02535 - Forcemains.
   (c) Gravity sewer - The Contractor shall perform a hydrostatic pressure test as specified in CEAM Specification 2611.3G to a pressure of 100 p.s.i.

2. Trenchless conduit is used as a host pipe (electrical conduits, casings, etc.):
   (a) Sewer Casings – No pressure test required.
   (b) Electrical - The City Engineer may require the Contractor to perform an air pressure test as specified in CEAM Specification 2621.

****END OF SECTION****
SECTION 02510 - DOMESTIC WATER SYSTEM

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to water main and service line construction as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Reference Section 02320 of these Specifications for trench excavation, bedding and backfill, except as modified herein.

B. Reference CEAM Specification No. 2611 shall apply to the water main and service line construction, except as modified herein.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.3 SUBMITTALS

A. Work plan for temporary service.

PART 2 -- PRODUCTS

2.1 WATER MAIN MATERIAL

A. The following water pipe materials will be allowed for use on this project:

1. Ductile Iron Pipe, Class 52 with conductive gaskets or conductivity strips shall be used.

2.2 WATER MAIN FITTING MATERIALS

A. The following pressure pipe fitting materials will be allowed for use on this project:

1. Mechanical Class 350 ductile iron, cement lined fittings shall be used. Adaptors, back-up rings, and oversize sleeves shall be provided for transitions and connections to dissimilar types of pipe materials. All sleeve fittings shall be long mechanical joint.

2. All fittings shall be coated with a 6-8 mil nominal thickness fusion bonded epoxy conforming to the requirements of ANSI/AWWA C550 and C116/A21.16.

3. All fittings, valves, hydrants and retaining rods shall be protected by using sacrificial zinc anode caps such as 175P190 Protecto Caps as manufactured by Ebaa Iron or an approved equal. Contractors shall supply 2 Protecto Caps per mechanical joint gland installed.

4. All fittings, valves, hydrants, etc. shall be secured utilizing COR-BLUE T-BOLTS as manufactured by NSS Industries or approved equal.

B. All fittings shall have been manufactured in the year of construction or prior calendar year.
2.3 FIRE HYDRANTS

A. Hydrants shall be Waterous Improved Pacer Style, Model WB-67, with safety flange and stem coupling. The bury length shall be 8'-6", unless otherwise noted on the plans. The break-off height shall be 16-inches. The hydrant shall be painted red.

B. All hydrants shall have been manufactured in the year of construction or prior calendar year.

C. The local fire department shall be contacted before ordering hydrants to obtain the correct nozzle threads and type of operating nut and cap bolts.

D. The Contractor shall supply a hydrant wrench to the City for each project.

E. Each hydrant shall be supplied with two (2) FLEXSTAKE® 804R with hydrant decals. Forward extra FLEXSTAKE® to UTILITY DIRECTOR.

2.4 VALVE AND VALVE HOUSING

A. All water valves shall have been manufactured in the year of construction or prior calendar year.

B. Valve Housing

1. Cast-iron screw type valve boxes shall be installed where indicated on underground valves. The cast-iron valve boxes shall be of either the two piece of three piece style and shall be furnished with a stay-put cover with raised letters indicating "WATER." The shaft shall be 5 1/4" inside diameter.

2. All valve box assemblies shall be furnished with a valve umbrella anchorage assembly. The valve umbrella anchorage assembly shall be manufactured by Adaptor, Inc., Oak Crest, WI, or equivalent.

3. High Density Polyethylene valve housings will not be allowed.

C. Gate Valves

1. All valves up to and including 12 inch diameter shall be gate valves conforming to the referenced specification.

2. Gate valve operating stem with 2" square nut shall extend to within 1 foot of the surface per standard detail.

3. The contractor shall supply a gate valve wrench to the City on each project

D. Butterfly Valves

1. All valves greater than 12 inch diameter shall be butterfly valves conforming to the referenced specification.

2. All butterfly valves shall be manufactured with the rubber seat bonded to the body. Valve discs shall be furnished with 316 stainless steel seating edge.

2.5 WATER SERVICE PIPE AND FITTINGS

A. Fittings

1. Water service pipe and fittings shall conform to the provisions of 2611.2D and the following:

   (a) Saddles shall be provided for all corporation stops larger than 1½ inches.
(b) The water service materials style commonly used by the Utility are:

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<th>Item</th>
<th>Main Type</th>
<th>A. Y. McDonald</th>
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</thead>
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<td>Service Saddle</td>
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<tr>
<td>Coupling Fitting</td>
<td></td>
<td>4755</td>
</tr>
</tbody>
</table>

2. Curb boxes shall be eight feet long at full extension and shall be adjusted as required to match finished grade. Curb boxes shall be provided with a stationary rod. The Contractor shall supply to the City one curb box key on each project.

3. All copper fittings shall be flared type. Compression type will not be allowed.

B. The listed fittings are to be considered as a basis for quality. The Utility should be contacted before ordering to verify the manufacturers’ type and style.

2.6 RESTRAINED JOINT RETAINER GLANDS

A. No exception to the referenced specification is made.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Temporary Service

1. Before proceeding with the project, the Contractor shall establish a work plan and submit the plan to the utility personnel and City Engineer for review and comment. The plan shall outline the method to be used to maintain service to the affected consumers and estimate the duration of any anticipated interruptions of service. The Contractor is the sole party responsible to notify the Utility and consumers who may be affected by limitations and/or interruption of water service. Planned service interruptions shall not exceed six (6) hours in any 72 hour period unless previously approved by the Utility. Temporary watermain serving more than 4 residences shall be 4-inch diameter. Each service shall have a shut off valve. Commercial and industrial temporary watermain shall be a minimum of 6-inch diameter. The Contractor shall supply a water meter to accurately measure the quantity of water used for temporary service. A water meter shall be placed at all connections between the City’s water system and the temporary service pipe.

2. The Contractor shall include water main shut-downs with the water utility at least 24 hours prior to the requested shut-down.

3. If the Contractor fails to provide water service to affected residents within the constraints specified above, an amount equal to $ 500.00 may be deducted from the amount due the Contractor for each occurrence.
3.2 INSTALLATION OF PIPE AND FITTINGS

A. Aligning and Fitting of Pipes

1. The Contractor, together with the utility's personnel, shall jointly examine and operate all curb stops and mainline valves prior to final acceptance.

B. Blocking and Anchoring of Pipe

1. A thrust block of cast-in-place concrete, which covers the installed fitting, is not permitted. Precast concrete thrust blocks and other restraining devices such as adjustable rods or cables, shall be provided at all bends, tees, hydrants and plugged crosses or wherever the water main changes direction or dead ends. Valves shall be tied to the nearest tee.

C. Polystyrene Insulation

1. The Contractor shall install polystyrene insulation in those areas where the water main or services may be susceptible to frost or freezing, or as directed by the City Engineer.

D. Water Service Installation

1. Field flaring shall be performed with current standards of the plumbing industry and manufacturer recommendations.

2. The Contractor shall keep accurate records as to the location of the service connections, as specified in the referenced specification. Project will not be accepted until the information is in the possession of the City.

3. No warranty is expressed or implied as to the location, size or material type of existing service lines. The Contractor shall furnish and install all fittings required to make the connections.

4. The Contractor shall install new service pipe, at 8 foot bury depth, from the corporation stop to 10-feet beyond the property line, or as shown on the plans, or as directed by the City Engineer.

5. The water services shall be constructed after the main has been hydrostatically tested and disinfected.

6. The corporation stops shall be opened prior to complete backfilling to verify that no leakage occurs in the service line.

3.3 FIELD QUALITY CONTROL

A. No exception to the referenced Specification is made.

3.4 HYDROSTATIC TESTING AND DISINFECTION

A. Leakage tests shall be conducted at a 150 psig test pressure with no drop in pressure. Individual tests from valve to valve are required. These tests shall be conducted prior to the bacteriological tests required with the disinfection of the main.

B. Water services, including corporation and curb stops, shall be tested. The Contractor may choose to include services at the time of watermain testing (150 psig) or as a separate operation at a reduced pressure of 100 psig. If performed separately, testing shall be done with the corporation stops open.

C. The Contractor shall disinfect the watermain in accordance with the provisions of AWWA Standard Specification C-651, Disinfecting Watermains. After performing and obtaining passing hydrostatic test results, two samples of the water, taken 24 hours apart, shall be taken from each section of the new pipe and sent to an approved testing laboratory to establish the bacteriological conditions prior to placing the line in service. In the event unsatisfactory results are obtained, the Contractor shall take
whatever steps are necessary to correct the sanitary conditions. The Contractor shall then re-take the bacteriological tests until satisfactory results are obtained. The Contractor shall be responsible for all costs associated with the required testing.

D. A representative of the City of Buffalo shall be notified a minimum of 24 hours prior to any flushing operations and shall be present at the time of flushing. Flushing durations will be recorded and the corresponding water usage will be billed at the current City rate at the time of flushing. The Contractor shall be responsible for all associated water usage costs.

3.5 ELECTRICAL CONDUCTIVITY TEST

A. The Contractor shall perform a conductivity test within one week after completion of pressure testing of the main on all iron pipe water mains to establish that electrical thawing may be carried out in the future. The system (pipeline, valves, fittings and hydrants) shall be tested for electrical continuity and current capacity. The electrical test shall be made after the hydrostatic pressure test and while the line is at normal operating pressure. Backfilling shall have been completed. The line may be tested in sections of convenient length as approved by the Engineer.

B. Direct current of 350 amperes + 10%, shall be passed through the pipeline for 5 minutes. Current flow through the pipe shall be measured continuously on a suitable ammeter and shall remain steady without interruption or excessive fluctuation throughout the 5-minute test period.

C. Insufficient current or intermittent current or arcing, indicated by large fluctuation of the ammeter needle, shall be evidence of defective contact in the pipeline. The cause shall be isolated and corrected. Thereafter, the section in which the defective test occurred shall be retested as a unit and shall meet the requirements.

D. Sources of Direct Current for these tests may be motor generators, batteries, arc welding machines, etc. Direct Current arc welding machines will probably be the usual source. These machines are available in adequate capacity for these tests and are equipped with controls for regulating the current output. All such equipment shall be furnished by the Contractor, subject to the approval of the Engineer.

E. Cables from the power source to the section of system under test should be of sufficient size to carry the test current without overheating or excessive voltage drop. Usable sizes will probably be in the range of 2/0 to 4/0 A.W.G.

F. Connections for the test shall be made at hydrants. The hydrants shall be in the open position with the caps on during the test. The cable shall be clamped to the body of the hydrant.

Note: After the test the hydrant shall be shut off and a cap loosened to allow hydrant drainage or the hydrant shall be pumped dry. Tighten cap after drainage.

G. When using arc welding machines, the current control should be set at minimum before starting. After starting the machines, advance the control until the current indicated on the ammeter is at the desired test value. Caution: In case of open circuits at joints or connections, the voltage across the defective joint or connection will be in order of 50-100 volts.

****END OF SECTION****
SECTION 02516 - DOMESTIC WATER SERVICES TO BUILDINGS

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to water service and fire line construction between the curb stop and/or gate valve and the building.

1.2 SPECIFICATION REFERENCES

A. Reference Section 02320 of these Specifications for trench excavation, bedding and backfill, except as modified herein.

B. Reference CEAM Specification No. 2611 shall apply to the water main and service line construction, except as modified herein.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.3 SUBMITTALS

A. Work plan for temporary service.

PART 2 -- PRODUCTS

2.1 PRODUCTS FURNISHED BY THE CITY

A. The following materials will be furnished by the City:

1. Water Meter
2. Meter Horn
3. Remote Reader
4. Remote Wire

2.2 WIRE STAPLES

A. Staples, rated for wiring, with a rounded crown shall be used. Arrow number T-25 for wiring up to ¼ inch in diameter, 9/16 inch long or equal.

2.3 WATER MAIN MATERIAL

A. The following water pipe materials will be allowed for use on this project:

1. Ductile Iron Pipe, Class 52 with conductive gaskets or conductivity strips shall be used.

2.4 WATER MAIN FITTING MATERIALS

A. The following pressure pipe fitting materials will be allowed for use on this project:
1. Mechanical Class 350 ductile iron, cement lined fittings shall be used. Adaptors, back-up rings, and oversize sleeves shall be provided for transitions and connections to dissimilar types of pipe materials. All sleeve fittings shall be long mechanical joint.

2. All fittings, valves, hydrants and retaining rods shall be protected by using sacrificial zinc anode caps such as 175P190 Protecto Caps as manufactured by Ebaa Iron or an approved equal. Contractors shall supply 2 Protecto Caps per mechanical joint gland installed.

3. All fittings, valves, hydrants, etc. shall be secured utilizing COR-BLUE T-BOLTS as manufactured by NSS Industries or approved equal.

B. All fittings shall have been manufactured in the year of construction or prior calendar year.

2.5 FIRE HYDRANTS

A. Hydrants shall be Waterous Improved Pacer Style, Model WB-67, with safety flange and stem coupling. The bury length shall be 8'-6'', unless otherwise noted on the plans. The break-off height shall be 16-inches. The hydrant shall be painted red.

B. All hydrants shall have been manufactured in the year of construction or prior calendar year.

C. The local fire department shall be contacted before ordering hydrants to obtain the correct nozzle threads and type of operating nut and cap bolts.

D. The Contractor shall supply a hydrant wrench to the City for each project.

E. Each hydrant shall be supplied with two FLEXSTAKE® 804R with hydrant decals. Forward extra FLEXSTAKE to UTILITY DIRECTOR.

2.6 VALVE AND VALVE HOUSING

A. All water valves shall have been manufactured in the year of construction or prior calendar year.

B. Valve Housing

1. Cast-iron screw type valve boxes shall be installed where indicated on underground valves. The cast-iron valve boxes shall be of either the two piece of three piece style and shall be furnished with a stay-put cover with raised letters indicating "WATER." The shaft shall be 5 1/4'' inside diameter.

2. All valve box assemblies shall be furnished with a valve umbrella anchorage assembly. The valve umbrella anchorage assembly shall be manufactured by Adaptor, Inc., Oak Crest, WI, or equivalent.

3. High Density Polyethylene valve housings will not be allowed on this project.

C. Gate Valves

1. All valves up to and including 12 inch diameter shall be gate valves conforming to the referenced specification.

2. Gate valve operating stem with 2” square nut shall extend to within 1 foot of the surface.

3. The contractor shall supply a gate valve wrench to the City on each project

D. Butterfly Valves

1. All valves greater than 12 inch diameter shall be butterfly valves conforming to the referenced specification.
2. All butterfly valves shall be manufactured with the rubber seat bonded to the body. Valve discs shall be furnished with 316 stainless steel seating edge.

2.7 WATER SERVICE PIPE AND FITTINGS

A. Residential service pipe shall be Type K copper with a minimum diameter of 1-inch.

B. Temporary water shall be 4” minimum and each service shall have a shut off valve.

C. Fittings

1. Water service pipe and fittings shall conform to the provisions of 2611.2D and the following:
   (a) Saddles shall be provided for all corporation stops larger than 1½ inches.
   (b) The water service materials style commonly used by the Utility are:

<table>
<thead>
<tr>
<th>Item</th>
<th>Main Type</th>
<th>Ford</th>
<th>A. Y. McDonald</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporation Stop:</td>
<td>DIP</td>
<td>FB600-3</td>
<td>4701</td>
</tr>
<tr>
<td>Service Saddle:</td>
<td>DIP</td>
<td>101B, 202B, or equal.</td>
<td>3825</td>
</tr>
<tr>
<td>Curb Stop:</td>
<td>DIP</td>
<td>B22-444M</td>
<td>6104</td>
</tr>
<tr>
<td>Curb Box:</td>
<td>DIP</td>
<td>EM2-80-56, 78R w/78” rod.</td>
<td>5610</td>
</tr>
<tr>
<td>Curb Box Lid</td>
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</tr>
<tr>
<td>Stationary Rod</td>
<td></td>
<td>5607L</td>
<td>5660</td>
</tr>
<tr>
<td>Coupling Fitting:</td>
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</tbody>
</table>

2. Curb boxes shall be eight feet long at full extension and shall be adjusted as required to match finished grade. Curb boxes shall be provided with a stationary rod. The Contractor shall supply to the City one curb box key on each project.

3. All copper fittings shall be flared type. Compression type will not be allowed.

D. The listed fittings are to be considered as a basis for quality. The Utility should be contacted before ordering to verify the manufacturers’ type and style.

2.8 RESTRAINED JOINT RETAINER GLANDS

A. No exception to the referenced specification is made.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

3.2 INSTALLATION OF PIPE AND FITTINGS

A. Aligning and Fitting of Pipes

1. The Contractor, together with the utility’s personnel, shall jointly examine and operate all curb stops and mainline valves prior to final acceptance.
B. Blocking and Anchoring of Pipe

1. A thrust block of cast-in-place concrete, which covers the installed fitting, is not permitted. Pre-cast concrete thrust blocks and other restraining devices such as adjustable rods or cables, shall be provided at all bends, tees, hydrants and plugged crosses or wherever the water main changes direction or dead ends. Valves shall be tied to the nearest tee.

C. Polystyrene Insulation

1. The Contractor shall install polystyrene insulation in those areas where the water main or services may be susceptible to frost or freezing, or as directed by the City Engineer.
   (a) All waterlines must be insulated if less than eight feet (8’) deep with a minimum of two inch (2”) thick by four feet (4’) wide polystyrene insulation. Water lines less than six feet (6’) deep must be insulated with three inch (3”) thick by eight feet (8’) wide polystyrene insulation.
   (b) Water lines placed under driveways must be insulated with a minimum of two inch (2”) thickness by four foot (4’) wide polystyrene insulation.

D. Water Service Installation

1. Field flaring shall be preformed with current standards of the plumbing industry and manufacturer recommendations.
2. The Contractor shall keep accurate records as to the location of the service connections, as specified in the referenced specification.
3. No warranty is expressed or implied as to the location, size or material type of existing service lines. The Contractor shall furnish and install all fittings required to make the connections.
4. The Contractor shall install new service pipe, at 8 foot bury depth, from the corporation stop to the building, or as directed by the City.
5. The water services shall have a valve installed inside the building. No couplings are allowed between the curbstop and the valve inside the building unless approved by the City of Buffalo.
6. The water service shall be flushed after installation.
7. After inspection by the City the curb stop shall be shut off.

3.3 INSTALLATION OF WATER METER AND REMOTE READER

A. It is the responsibility of the plumbing contractor to install the water meter, horn, wire and remote reader.

B. The water service shall be flushed prior to installation of the meter.

C. The meter shall be installed in the mechanical room, no more than 10-feet from a floor drain.

D. The meter shall be installed in a horizontal position.

E. The meter shall be installed at least 12-inches above the finished floor.

F. A valve shall be installed on both sides of the meter.

G. The remote reader shall be installed 6-inches from the front of the house opposite the side of the garage, 5-feet 6-inches above the ground.
H. The remote wiring shall be stapled at intervals not to exceed 3-feet on inside of the wall or floor joist. The wire may be tapped to copper water pipe at 2-foot intervals. The wire used shall be solid copper AWG, size 18 by 3 conductor, color coded.

I. The City Building Official will inspect the meter installation during the plumbing inspection. After the installation is approved, the meter shall be sealed and the water left on.

J. The curb stop must be inspected and approved prior to the Building Final: Call the Public Works Department (763-682-1001) for the inspection.

K. The City shall charge the contractor for labor and material if they have to correct improper installations.

L. Questions should be directed to the Public Works Department at 763-682-1001.

3.4 HYDROSTATIC TESTING AND DISINFECTION

A. All fire lines shall be hydrostatically tested and disinfected.

B. Leakage tests shall be conducted at a 150 psig test pressure with no drop in pressure. Individual tests from valve to valve are required. These tests shall be conducted prior to the bacteriological tests required with the disinfection of the main.

C. Water services, including corporation and curb stops, shall be tested. The Contractor may choose to include services at the time of watermain testing (150 psig) or as a separate operation at a reduced pressure of 100 psig. If performed separately, testing shall be done with the corporation stops open.

D. The Contractor shall disinfect the watermain in accordance with the provisions of AWWA Standard Specification C-651, Disinfecting Watermains. After performing and obtaining passing hydrostatic test results, two samples of the water, taken 24 hours apart, shall be taken from each section of the new pipe and sent to an approved testing laboratory to establish the bacteriological conditions prior to placing the line in service. In the event unsatisfactory results are obtained, the Contractor shall take whatever steps are necessary to correct the sanitary conditions. The Contractor shall then re-take the bacteriological tests until satisfactory results are obtained. The Contractor shall be responsible for all costs associated with the required testing.

****END OF SECTION****
SECTION 02530 - PIPE SEWERS – SANITARY

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to sanitary sewer and service lateral construction as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Reference Section 02320 of these Specifications for trench excavation, bedding and backfill, except as modified herein.

B. Reference CEAM Specification No. 2621 shall apply to the gravity sewers and service laterals construction, except as modified herein.

C. Reference Mn/DOT Specification No. 2506 shall apply to manholes and castings, except as modified herein.

D. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.3 SUBMITTALS

A. Work plan for temporary service

B. Final DVD and log of post construction televised inspection.

C. See Section 01330 - Submittals for additional requirements.

PART 2 -- PRODUCTS

2.1 TRACER WIRE

A. Tracer wire shall meet the requirements one of the following:

1. 1/8” galvanized aircraft wire clear PVC coated to 3/16”.
2. 1/8” 304 stainless steel wire clear PVC coated to 3/16”.

B. Connectors

1. Connectors shall be “wire nut” or “twist on” type connectors filled with silicone waterproofing sealant suitable for direct bury applications according to UL 486D test standard. Connectors shall be DryConn™ connectors as manufactured by King Innovation or approved equal.

2.2 SEWER PIPE AND FITTINGS

A. Under Existing or Proposed Buildings

1. All underground sewers installed through areas to be occupied by buildings shall comply with all appropriate provisions of the State of Minnesota Plumbing Code, Minnesota Rules Chapter 4715.0570.
2. Permitted pipe materials shall be: (The 6B designations are from the plumbing code.):
   (a) 6B (1), PVC Schedule 40, un-threaded, ASTM D2665, with fabricated fittings ASTM D3311.
   (b) 6B (1), PVC Schedule 80, threaded or un-threaded, cellular core, ASTM F891, with fabricated fittings ASTM D3311.
   (c) 6B (3), PVC Schedule 40 (14 - 24 inch only), ASTM D1785, with ASTM D3311 fittings.
   (d) 6B (4), PVC Schedule 40 and 80, SDR 21 and SDR 26 (6 inch and larger)
3. All pipe and fittings must be laid on a continuous granular bed. Installation must comply with ASTM D2321.

B. Solid Wall Polyvinyl Chloride (PVC) Pipe

1. 4" through 6" Diameters: Smooth-walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM D-3034 for the Standard Dimension Ratio (SDR) of 26, unless otherwise specified on the plans.
2. 8" through 15" Diameters: Smooth-walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM D-3034 for the Standard Dimension Ratio (SDR) of 35, for depths of less than 20 feet, unless otherwise specified on the plans. The SDR for depths exceeding 20 feet shall be 26, unless otherwise specified on the plans.
3. Over 15" Diameters: Smooth-walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM F679 with a minimum wall thickness for a minimum pipe stiffness of 46.
4. WYES: All wyes and tees shall be heavy duty.
5. The connection shall be push-on with elastomeric gasketed joints, which are bonded to the inner walls of the gasket recess of the bell socket.
6. The pipe grade used shall be resistant to aggressive soil and corrosive substances in accordance with the requirements of ASTM D-543.

C. Ductile Iron Pipe (DIP)

1. No exception to the referenced specification is made.

D. Reinforced Concrete Pipe (RCP)

1. No exception to the referenced specification is made.

2.3 MANHOLES

A. Precast Concrete Manholes

1. Sanitary sewer manholes shall conform to the Mn/DOT Standard Plate No. 4007C, unless otherwise shown on the plans, including integral base sections and rubber gasketed tongue and groove joints. All pipe openings shall have integral cast watertight seal.
2. Reinforced polypropylene plastic steps shall be furnished for all sanitary sewer manholes eight or more feet in depth.

B. Castings

1. All casting assemblies shall meet the certification requirements of the Minnesota Department of Transportation and be manufactured by a Mn/DOT approved source.
2. The type of casting assembly to be used shall be Neenah 1642 Type B with gasketed cover with self-sealing concealed pick hole, no lug and stamped with “SANITARY SEWER” unless otherwise specified on the plan.

3. When manhole castings are located in the water table or in the “Green Space”, the Contractor shall use American Infrastructure Technologies Multi-Purpose Joint Seal.

C. Adjusting Rings

1. Only concrete adjusting rings shall be permitted.

PART 3 -- EXECUTION

3.1 INSTALLATION OF PIPE AND FITTINGS

A. Sanitary Main Installation

1. Sanitary sewer plugs shall be installed upstream of all connections to existing sanitary sewers.

2. Sewer plugs installed in sanitary sewers shall not be removed prior to approval of the City Public Works Department or City Engineer.

B. Sewer Service Installation

1. The Contractor shall dye water test all existing sanitary sewer service line connections cut, severed or encountered during the construction to determine whether they are still active. Those service lines, which are no longer in use, shall be abandoned by plugging the severed upstream end with a suitable watertight plug.

2. The Contractor shall imprint the concrete curb at the locations of the utility service location in accordance with City standards.

3. The Contractor shall keep accurate records as to the location of the service connections constructed. Measurements to service line shall be taken from the two nearest permanent structures (i.e., hydrants, valves, manholes, buildings) as directed by the City Engineer. Final payment for the project will not be accepted until the information is in the possession of the City.

4. The Contractor shall install new service pipe from the wye branch to 10-feet beyond the property line, as shown on the details.

5. At the end of all services, which are not immediately connected to working services, the Contractor shall furnish and install a wood or metal post which extends to just below the ground surface. If wood is used, there shall be attached to the top of the post a ½” x 24” steel locating rod, capable of being located by a metal detector from the ground surface. Additionally, all ends of sanitary sewer services shall be marked with a steel “T” fence post. Posts shall be painted green.

6. All commercial and industrial sanitary sewer services shall be a minimum of 6-inches in diameter.

3.2 MANHOLE STRUCTURE

A. Connect to Existing Sanitary Sewer

1. When connection to an existing sanitary sewer is made at an existing or proposed manhole, the Contractor shall expose and verify the elevation of the existing sewer prior to laying any sanitary sewer to, or from, the connection point. If the elevation of the existing sewer does not match the elevation shown on the plans, the Contractor shall notify the City Engineer, at which time the City Engineer may adjust the proposed grades.
B. Outside Drop Manhole

1. All pipe materials used to construct the drop section and the incoming pipe shall be ductile iron.
2. Ductile iron pipe shall extend from the tee to 2 feet beyond the point where the elevation of the virgin soil becomes a uniform 6 inches below the invert elevation of the incoming pipe.
3. A section of pipe shall extend a minimum of 6” beyond the interior of the Manhole at the top of the drop. The top ½ of the pipe shall be cut-off.

C. Raise / Lower Existing Manhole

1. Raising and/or lowering an existing manhole to meet a proposed finished rim elevation is performed when the addition and/or deletion of 2” adjusting rings will not exceed a minimum of 2 rings or exceed a maximum of 6 rings. Typically, it will require: the removal of the manhole cone section or the concrete slab top; the addition, removal, or exchange of barrel sections; the replacement of the cone section or the concrete slab top; the installation of the proper number of adjusting rings; and the replacement of the manhole casting and frame.

D. Manhole Base

1. Pre-cast bases shall be used for all manholes.
2. Integral cast base is required unless otherwise shown on the plans or approved by the City Engineer.
3. Manholes shall be placed on a minimum of 6 inches of compacted foundation material.

E. Miscellaneous Work

1. If concrete adjusting rings are used, they shall be set with bituminous mastic or cement mortar and shall be plastered inside and out with a minimum thickness of ½-inch or mortar. Taller 6" or 12" rings shall be used where adjustment requires more than three 2” rings.
2. When manhole casting is in the water table or in “Green Space”, the Contractor shall use American Infrastructure Technologies Multi-Purpose Joint Seal in rings and castings.

3.3 FIELD QUALITY CONTROL

A. Deflection test

1. No exception to the referenced specification is made.

B. Sanitary sewer leakage testing

1. Leakage tests shall be conducted as described in the referenced specification and shall include all manholes. However, leakage testing will not be necessary where existing services are connected directly to the new sewer as it is being constructed.

C. Air Testing

1. No exception to the referenced specification is made.

D. Televising

1. Televising is required after deflection testing has been completed and the sanitary sewer manhole castings have been adjusted to ½” below the bituminous base course.
2. Immediately prior to televising, the televisor shall discharge sufficient clear water into the pipe to assist in identifying sags and mis-alignment.
3. Televising shall be performed by experienced personnel trained in locating breaks, obstacles and service connections by close circuit television. The interior of the pipeline shall be carefully inspected to determine the location of any conditions which may indicate improper installation.

4. A video in DVD format and suitable log shall be kept and 2 copies shall be submitted to the City.

E. Sanitary Sewer Cleaning

1. All newly installed mains shall be jetted and vacuumed prior to acceptance by the City.

2. Sanitary sewer mains shall be cleaned with equipment capable of removing debris from the lines prior to it entering downstream sections of pipe i.e. vacuuming.

3. Sanitary sewer mains shall be cleaned after manhole castings have been raised in the Bituminous Base Course. If after Bituminous wearing course is placed and debris is found in Manholes, additional jetting and vacuuming will be required.

4. Contractor shall be responsible for obtaining water necessary for all cleaning operations and any costs associated with water acquisition. Permission to access City utilities must be approved by the Public Works Director.

5. All debris removed from the sanitary sewer mains shall be disposed of at an approved off-site disposal facility.

****END OF SECTION****
SECTION 02537 - SANITARY SEWER SERVICES TO BUILDINGS

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to sanitary sewer and service lateral construction as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Reference Section 02320 of these Specifications for trench excavation, bedding and backfill, except as modified herein.

B. Reference CEAM Specification No. 2621 shall apply to the gravity sewers and service laterals construction, except as modified herein.

C. Reference Mn/DOT Specification No. 2506 shall apply to manholes and castings, except as modified herein.

D. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.3 PERMITS, BONDS AND INSURANCE

A. The Contractor shall obtain a sewer/water dig-in permit at City Hall prior to starting work; the Contractor will be notified of the permit fee.

B. The Contractor shall provide the City of Buffalo with a Certificate of Insurance and Excavator’s Performance Bond in the amount of $5,000.00 before starting the work.

1.4 QUALITY CONTROL

A. The Contractor shall have the work inspected by the Public Works Department (762-263-2268).

B. All trenches shall meet OSHA Standards.

C. The City will charge the Contractor for all labor and materials needed to correct work that has been improperly installed.

PART 2 -- PRODUCTS

2.1 TRACER WIRE

A. Tracer wire shall meet the requirements one of the following:

1. 1/8” galvanized aircraft wire clear PVC coated to 3/16”.

2. 1/8” 304 stainless steel wire clear PVC coated to 3/16”.

B. Connectors

1. Connectors shall be “wire nut” or “twist on” type connectors filled with silicone waterproofing sealant suitable for direct bury applications according to UL 486D test standard. Connectors shall be DryConn™ connectors as manufactured by King Innovation or approved equal.

2.2 SEWER PIPE AND FITTINGS

A. Under Existing or Proposed Buildings

1. All underground sewers installed through areas to be occupied by buildings shall comply with all appropriate provisions of the State of Minnesota Plumbing Code, Minnesota Rules Chapter 4715.0570.

2. Permitted pipe materials shall be: (The 6B designations are from the plumbing code.):
   (a) 6B (1), PVC Schedule 40, un-threaded, ASTM D2665, with fabricated fittings ASTM D3311.
   (b) 6B (1), PVC Schedule 80, threaded or un-threaded, cellular core, ASTM F891, with fabricated fittings ASTM D3311.
   (c) 6B (3), PVC Schedule 40 (14 - 24 inch only), ASTM D1785, with ASTM D3311 fittings.
   (d) 6B (4), PVC Schedule 40 and 80, SDR 21 and SDR 26 (6 inch and larger)

3. All pipe and fittings must be laid on a continuous granular bed. Installation must comply with ASTM D2321.

B. Solid Wall Polyvinyl Chloride (PVC) Pipe

1. 4” through 6” Diameters: Smooth-walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM D-3034 for the Standard Dimension Ratio (SDR) of 26, unless otherwise specified on the plans.

2. 8” through 15” Diameters: Smooth-walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM D-3034 for the Standard Dimension Ratio (SDR) of 35, for depths of less than 20 feet, unless otherwise specified on the plans. The SDR for depths exceeding 20 feet shall be 26, unless otherwise specified on the plans.

3. Over 15” Diameters: Smooth-walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM F679 with a minimum wall thickness for a minimum pipe stiffness of 46.

4. WYES: All wyes and tees shall be heavy duty.

5. The connection shall be push-on with elastomeric gasketed joints, which are bonded to the inner walls of the gasket recess of the bell socket.

6. The pipe grade used shall be resistant to aggressive soil and corrosive substances in accordance with the requirements of ASTM D-543.

C. Ductile Iron Pipe (DIP)

1. No exception to the referenced specification is made.

D. Reinforced Concrete Pipe (RCP)

1. No exception to the referenced specification is made.

2.3 MANHOLES

A. Precast Concrete Manholes
1. Sanitary sewer manholes shall conform to the Mn/DOT Standard Plate No. 4007C, unless otherwise shown on the plans, including integral base sections and rubber gasketed tongue and groove joints. All pipe openings shall have integral cast watertight seal.

2. Reinforced polypropylene plastic steps shall be furnished for all sanitary sewer manholes eight or more feet in depth.

B. Castings

1. All casting assemblies shall meet the certification requirements of the Minnesota Department of Transportation and be manufactured by a Mn/DOT approved source.

2. The type of casting assembly to be used shall be Neenah 1642 Type B gasketed cover with self-sealing, concealed pick hole, no lug and stamped with “sanitary sewer” unless otherwise specified on the plan.

C. Adjusting Rings

1. Only concrete adjusting rings shall be permitted.

PART 3 -- EXECUTION

3.1 INSTALLATION OF PIPE AND FITTINGS

A. Sanitary Main Installation

1. Sanitary sewer plugs shall be installed upstream of all connections to existing sanitary sewers.

2. Sewer plugs installed in sanitary sewers shall not be removed prior to approval of the City Public Works Department or City Engineer.

B. Sewer Service Installation

1. The Contractor shall install a cleanout within 2 feet of the outside wall and every 75 feet thereafter. Cleanout shall have a minimum one foot metal stake installed next to it for location purposes. The cleanout shall not be located under a deck or other structure unless the structure is a minimum of 48-inches above grade.

2. The Contractor shall install a 12-gauge copper wire along the top of the pipe for locating purposes.

3. The service line shall be placed with a minimum slope of 1/8 inch per foot.

4. A testing/sampling manhole shall be placed on all industrial services.

5. The Contractor shall install new service pipe from the property line to the building.

6. At the end of all services which are not immediately connected to working services, the Contractor shall furnish and install a wood or metal post which extends to just below the ground surface. If wood is used, there shall be attached to the top of the post a ½" x 24" steel locating rod, capable of being located by a metal detector from the ground surface. Additionally, all ends of sanitary sewer services shall be marked with a steel “T” fence post. Posts shall be painted green.

7. All commercial and industrial sanitary sewer services shall be a minimum of 6-inches in diameter.

3.2 MANHOLE STRUCTURE

A. Connect to Existing Sanitary Sewer
1. When connection to an existing sanitary sewer is made at an existing or proposed manhole, the Contractor shall expose and verify the elevation of the existing sewer prior to laying any sanitary sewer to, or from, the connection point. If the elevation of the existing sewer does not match the elevation shown on the plans, the Contractor shall notify the City Engineer, at which time the City Engineer may adjust the proposed grades.

B. Raise / Lower Existing Manhole

1. Raising and/or lowering an existing manhole to meet a proposed finished rim elevation is performed when the addition and/or deletion of 2" adjusting rings will not exceed a minimum of 2 rings or exceed a maximum of 6 rings. Typically, it will require: the removal of the manhole cone section or the concrete slab top; the addition, removal, or exchange of barrel sections; the replacement of the cone section or the concrete slab top; the installation of the proper number of adjusting rings; and the replacement of the manhole casting and frame.

C. Manhole Base

1. Pre-cast bases shall be used for all manholes.
2. Integral cast base is required unless otherwise shown on the plans or approved by the City Engineer.
3. Manholes shall be placed on a minimum of 6 inches of compacted foundation material.

D. Miscellaneous Work

1. If concrete adjusting rings are used, they shall be set with bituminous mastic cement mortar and shall be plastered inside and out with a minimum thickness of ½-inch of mortar. Taller 6" or 12" rings shall be used where adjustment requires more than three 2" rings.
2. When manhole casting is in the water table, the Contractor shall use American Infrastructure Technologies Multi-Purpose Joint Seal in rings and castings.

3.3 FIELD QUALITY CONTROL

A. The Contractor shall have all work inspected by the Public Works Department (763-682-1001).

****END OF SECTION****
SECTION 2600
STANDARD SPECIFICATIONS
FOR
TRENCH EXCAVATION
AND
BACKFILL/SURFACE RESTORATION
1999 EDITION

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2600 STANDARD SPECIFICATIONS FOR TRENCH EXCAVATION & BACKFILL/SURFACE RESTORATION

2600.1 DESCRIPTION

This work shall consist of the excavation, backfilling, and restoration of existing surface improvements for the purposes of installing new and/or relocating or adjusting existing underground utilities.

Use of the term "Plans, Specifications and Special Provisions" within this specification shall be construed to mean those documents which compliment, modify, or clarify these specifications and are accepted as an enforceable component of the Contract or Contract Documents. All references to Mn/DOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation Standard Specifications for Construction, as modified by any Mn/DOT Supplemental Specification edition published prior to the date of advertisement for bids. All reference to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

2600.2 MATERIALS

A Granular Materials

Granular materials furnished for foundation, bedding, encasement, backfill, or other purposes as may be specified shall consist of any natural or synthetic mineral aggregate such as sand, gravel, crushed rock, crushed stone, or slag, that shall be so graded as to meet the gradation requirements specified herein for each particular use by the material manufacturer or as indicated in the Plans, Specifications, or Special Provisions.

A1 Granular Material Gradation Classifications

Granular materials furnished for use in Foundation, Bedding, Encasement, or Backfill construction shall conform to the following requirements:

Foundation materials shall have 100 percent by weight passing the 1-1/2 inch sieve and a maximum of 10 percent by weight passing the No. 4 sieve.

Backfill materials shall consist of existing trench materials, except as otherwise specified in this specification or in the Special Provisions.

Bedding and encasement materials for flexible pipe, where improved pipe foundation is not required, shall meet the requirements of Mn/DOT Specification 3149.2B1, Granular Borrow, except that 100 percent by weight shall pass the one-inch sieve.

A gradation report from an approved Independent Testing laboratory of the proposed granular materials shall be furnished to the Engineer before any of the granular materials are delivered to the project.
A2 Granular Material Use Designations

Granular materials provided for Foundation, Bedding, Encasement, or Backfill use as required by the Plans, Specifications, and Special Provisions, either as part of the pipe item work unit or as a separate contract item, shall be classified as to use in accordance with the following:

Material Use Designation Zone Designation

Granular Foundation ------------- Placed below the bottom of pipe grade as replacement for unsuitable or unstable soils, to achieve better foundation support.
Granular Bedding ---------------- Placed below the pipe midpoint, prior to pipe installation, to facilitate proper shaping and to achieve uniform pipe support.
Granular Encasement ----------- Placed below an elevation one foot above the top of pipe, after pipe installation, for protection of the pipe and to assure proper filling of voids or thorough consolidation of backfill.
Granular Backfill ----------------- Placed below the surface base course, if any, as the second stage of backfill, to minimize trench settlement and provide support for surface improvements.

In each case above, unless otherwise indicated, the lower limits of any particular zone shall be the top surface of the next lower course as constructed. The upper limits of each zone are established to define variable needs for material gradation and compaction or void content, taking into consideration the sequence of construction and other conditions. The material use and zone designations described above shall only serve to fulfill the objectives and shall not be construed to restrict the use of any particular material in other zones where the gradation requirements are met.

B Piling

Piling shall be constructed in accordance with the provisions of Mn/DOT Specification 2452 and special plan details relating to piling.

C Insulation

Main Insulation shall be extruded rigid board material having a thermal conductivity of 0.23 BTU/hour/square foot/degree Fahrenheit/per inch thickness, maximum, at 40°F mean, a comprehensive strength of 35 psi minimum, and water absorption of 0.25 percent by volume minimum. Unless otherwise specified in the Plans, specifications, or Special Provisions, board dimensions shall measure 8 feet long, 2 or 4 feet wide, and 1, 1-1/2, 2, or 3 inches thick.

D Geotextile Fabric

Geotextile fabric shall meet the requirements of Mn/DOT Specification 3733 and be used as required by the Plans, Specifications, and Special Provisions.
2600.3 CONSTRUCTION REQUIREMENTS

A General Provisions

A1 Maintenance of Traffic

Whenever work interferes with the flow of traffic along a roadway, the Contractor shall provide for traffic control and signing and public safety in accordance with the provisions of the field manual of Temporary Control Zone Layouts of the Minnesota Manual of Uniform Traffic Control Devices and Mn/DOT Specifications 1404 and 1710, and the Special Provisions. Neither road closures nor detours shall be permitted unless specified in the Special Provisions or authorized by the Engineer. Where road closures or detours are permitted by the Engineer, the Engineer shall determine the appropriate agencies, boards, or departments the Contractor must notify prior to taking the action and the proper advance notice to be provided to each body.

Compliance with this requirement shall not be construed to relieve the Contractor from the responsibility of notifying agencies or institutions whose services may be predicated upon a roadway being opened to traffic or whose services would be hindered if a roadway is closed to traffic. Such agencies or institutions shall include, but not be limited to, the police department, the fire department, municipal bus service, school bus service, and ambulance service. The Contractor shall keep the required agencies informed of changing traffic patterns and detour situations.

A2 Establishing Line and Grade

The primary line and grade will be established by the Engineer. For trench installation, line and grade stakes will be set parallel to the proposed pipeline at an appropriate offset therefrom as will best serve the Contractor’s operations wherever practical. For tunnel installation, line and grade stakes will be set directly above the proposed pipeline setting. Grade and line stakes will be set at 25-foot intervals along the pipeline; at each change in line or grade; and as needed for pipeline appurtenances and service lines.

The Contractor shall arrange operations to avoid unnecessary interference with the establishment of the primary line and grade stakes; and shall render whatever assistance may be required by the Engineer in accomplishing the staking. The Contractor shall be responsible for preservation of the primary stakes and, if negligent in providing necessary protection, shall bear the full cost of any restaking.

The Contractor shall be solely responsible for the correct transfer of the primary line and grade to all working points and for construction of the work to the prescribed lines and grades as established by the Engineer. Following construction of a work shaft on tunnel installations, the line and grade shall be transferred down the shaft and be projected into and throughout the length of each tunnel heading.

Unless otherwise specified in the Plans, Specifications, and Special Provisions, the water main shall generally be placed with the minimum specified cover. However, a greater depth may be
required to clear existing storm and sanitary sewers and sewer services, and no additional compensation shall be provided for such adjustments.

In locations where sewer is in direct conflict with existing water main and water services the water main and water services shall be lowered to provide at least 18 inches of vertical distance between the top of the water main or service and the bottom of the sanitary or relocated in accordance with the Plans.

Water mains crossing above storm or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. When local conditions prevent a vertical separation as described, the following construction shall be used:

1. Sewers passing over or under Water mains shall be constructed of materials equal to water main standards of construction for a distance of at least 9 feet on either side of the water main.

2. Watermain passing under sewers shall, in addition, be protected by providing:
   - a vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;
   - adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking of the Water mains;
   - a length of water pipe shall be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

Water mains shall be laid at least 10 feet horizontally from any sanitary sewer or storm sewer, whenever possible. When local conditions prevent a horizontal separation of 10 feet, a water main may be laid closer to a storm or sanitary sewer provided that:

1. The bottom of the water main is at least 18 inches above the top of the sewer;

2. Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.

No deviation shall be made from the required line or grade except with the consent of the Engineer.

A3 Protection of Surface Structures

All surface structures and features located outside the permissible excavation limits for underground installations, together with those within the construction areas which are indicated in the Plans as being saved, shall be properly protected against damage and shall not be disturbed or removed without approval of the Engineer. Within the construction limits, as required, the removal of improvements such as paving, curbing, walks, turf, etc., shall be subject to acceptable
replacement after completion of underground work, with all expense of removal and replacement being borne by the Contractor to the extent that separate compensation is not specifically provided for in the Contract.

Obstructions such as street signs, guard posts, small culverts, mailboxes, and other items of prefabricated construction may be temporarily removed during construction provided that essential service is maintained in a relocated setting as approved by the Engineer and that nonessential items are properly stored for the duration of construction. Upon completion of the underground work, all such items shall be replaced in their proper setting at the sole expense of the Contractor.

The Contractor shall be responsible for protection of existing overhead utilities and poles. This shall include arranging with the utility and paying the utility for holding poles that will be close to the edge of any trench. Holding of poles and repair of any damage to these facilities shall be considered incidental to the project with no additional compensation allowed. If relocation or removal of these facilities is required, the Owner will contact the concerned utility and pay for the relocation or removal at no additional expense to the Contractor.

In the event of damage to any surface improvements, either privately or publicly owned, in the absence of construction necessity, the Contractor will be required to replace or repair the damaged property to the satisfaction of the Engineer and without cost to the Owner.

A4 Interference of Underground Structures

When any underground structure interferes with the planned placement of the pipeline or appurtenances to such an extent that alterations in the work are necessary to eliminate the conflict or avoid endangering effects on either the existing or proposed facilities, the Contractor shall immediately notify the Engineer and the Owner of the affected structure. When any existing facilities are endangered by the Contractor's operations, the Contractor shall cease work at the site and take such precautions as may be necessary to protect the inplace structures until a decision is made as to how the conflict will be resolved.

Without specific authorization from the Engineer, no essential utility service shall be disrupted, nor shall any change be made in either the existing structures or the planned installations to overcome the interference. Alterations in existing facilities will be allowed only to the extent that service will not be curtailed unavoidably and then only when the encroachment or relocation will satisfy all applicable regulations and conditions.

Wherever alterations are required as a result of unforeseen underground interferences not due to any fault or negligence of the Contractor, the Engineer will issue a written order covering any additional or extra work involved and specifying the revised basis of payment, if any. Any alterations made strictly for the convenience of the Contractor, shall be subject to prior approval and shall be at the Contractor's expense.

No extra compensation will be allowed for delays caused by the interference of underground structures.
A5 Removal of Surface Improvements

Removal of surface improvements in connection with trench excavation shall be limited to actual needs for installation of the pipeline and appurtenances, based on the allowable trench widths and any other controls imposed in connection with the work. Removal operations shall be coordinated effectively with the excavation and installation operations as will cause the least practical disruption of traffic or inconvenience to the public. The debris resulting from removals shall become the property of the Contractor and shall be disposed of by the Contractor in accordance with Mn/DOT Specification 2104. Removal debris shall not be deposited at locations that will block access to fire hydrants, private driveways, or other essential service areas, nor obstruct surface drainage. Removal and final disposal of debris shall be accomplished as a single operation wherever possible and, in any event, the debris shall be removed from the site before starting the excavating operations.

Removal of concrete or bituminous structures shall be by methods producing clean-cut breakage to prescored lines as will preserve the remaining structure without damage. Removal equipment shall not be operated in a manner that will cause damage to the remaining structure or adjoining property. Where not removed to an existing joint, concrete structures shall be sawed along the break lines to a minimum depth of one-third of the structure depth.

Any reusable materials generated during the work, such as aggregate, sod, topsoil, shall be segregated from other waste materials and be stockpiled so as to maintain suitability and permit proper reuse.

The use of drop weight equipment for breaking pavement will be allowed to the extent that the Contractor shall assume full responsibility for any damages caused thereby. The pavement breaking operation shall not allowed to become a nuisance to the public or a source of damage to underground or adjacent structures. The Engineer reserves the right to order discontinuance of drop weight breaking operations at any time.

A6 Temporary Service Measures

While any open excavations are maintained, the Contractor shall have available a supply of steel plates suitable for temporary bridging of open trench sections where either vehicular or pedestrian traffic must be maintained. Use of the plates shall be as directed or approved by the Engineer and where installed they shall be secured against possible displacement and be replaced with the permanent structure as soon as possible.

B Excavation and Preparation of Trench

B1 Operational Limitations and Requirements

Excavating operations shall proceed only so far in advance of pipe laying as will satisfy the needs for coordination of work and permit advance verification of unobstructed line and grade as planned. Where interference with existing structures is possible or in any way indicated, and where necessary to establish elevation or direction for connections to inplace structures, the excavating shall be done at those locations in advance of the main operation so actual conditions...
will be exposed in sufficient time to make adjustments without resorting to extra work or unnecessary delay.

Where possible, excavated materials shall be placed in areas that will not block existing vehicle and pedestrian traffic and drainage ways. The Contractor shall review proposed methods of operation with the Engineer prior to beginning the work.

All installations shall be accomplished by open trench construction except for short tunnel sections approved by the Engineer and with the exception that boring and jacking or tunnel construction methods shall be employed where so specifically required by the Plans, Specifications, or Special Provisions.

Installation of pipe through tunnel excavations will be allowed only where the surface structure can be properly supported and the backfill restored to the satisfaction of the Engineer.

The excavating operations shall be conducted so as to carefully expose all inplace underground structures without damage. Wherever the excavation extends under or approaches so close to an existing structure as to endanger it in any way, precautions and protective measures shall be taken as necessary to preserve the structure and provide temporary support. Hand methods of excavating shall be utilized to probe for and expose such critical or hazardous installations as gas pipe and power or communication cables.

The Engineer shall be notified of any need for blasting to remove materials which cannot be broken up mechanically, and there shall be no blasting operations conducted until the Engineer's approval has been secured. Blasting will be allowed only when proper precautions are taken to protect life and property, and then shall be restricted as the Engineer directs. The hours of blasting operations shall be set by the Owner. The Contractor shall assume full responsibility for any damages caused by blasting, regardless of the requirements for notification and approval. The Contractor shall secure any required permits for blasting and shall conduct blasting operations in conformance with all applicable local, state and federal laws, regulations, and ordinances.

**B2 Classification and Disposition of Materials**

Excavated materials will be classified for payment only to the extent that the removal of materials classified by the Engineer as Rock will be paid for as provided in the Special Provisions or shown in the Proposal. All other materials encountered in the excavations, with the exception of items classified for payment as structure removals, will be considered as Unclassified Excavation and unless otherwise specified in the Plans, Specifications, and Special Provisions, no additional compensation shall be provided for their removal.

Unclassified materials shall include muck, rubble, wood debris, and boulder stone, masonry or concrete fragments less than one cubic yard in volume, together with other miscellaneous matter that can be removed effectively with power operated excavators without resorting to drilling and blasting.
Rock excavation shall be defined to include all hard, solid rock in ledge formation, bedded deposits and unstratified masses; all natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; and any boulder stone, masonry or concrete fragments exceeding one cubic yard in volume. Materials such as shale, hard pan, soft or disintegrated rock which can be dislodged with a hand pick or removed with a power operated excavator will not be classified as Rock Excavation.

Excavated materials will be classified for reuse as being either Suitable or Unsuitable for backfill or other specified use, subject to selective controls. All suitable materials shall be reserved for backfill to the extent needed, and any surplus remaining shall be utilized for other construction on the project as may be specified or ordered by the Engineer. To the extent practicable, granular materials and topsoil shall be segregated from other materials during the excavating and stockpiling operations so as to permit best use of the available materials at the time of backfilling. Unless otherwise specified in the Plans, Specifications, and Special Provisions, material handling as described above shall be considered incidental with no additional compensation provided.

All excavated materials reserved for backfill or other use on the project shall be stored at locations approved by the Engineer that will cause a minimum of inconvenience to public travel, adjacent properties, and other special interests. The material shall not be deposited so close to the edges of the excavations as would create hazardous conditions, nor shall any material be placed so as to block the access to emergency services. All materials considered unsuitable by the Engineer, for any use on the project, shall be immediately removed from the project and be disposed of as arranged for by the Contractor at no extra cost to the Contract.

**B3 Excavation Limitations and Requirements**

Trench excavating shall be to a depth that will permit preparation of the foundation as specified and installation of the pipeline and appurtenances at the prescribed line and grade, except where alterations are specifically authorized. Trench widths shall be sufficient to permit the pipe to be laid and joined properly and the backfill to be placed and compacted as specified. Extra width shall be provided as necessary to permit convenient placement of sheeting and shoring and to accommodate placement of appurtenances.

Excavations shall be extended below the bottom of structure as necessary to accommodate any required Granular Foundation material. When rock or unstable foundation materials are encountered at the established grade, additional materials shall be removed as specified or ordered by the Engineer to produce an acceptable foundation. Unless otherwise indicated or directed, rock shall be removed to an elevation at least six inches below the bottom surface of the pipe barrel and below the lowest projection of joint hubs. All excavations below grade shall be to a minimum width equal to the outside pipe diameter plus two feet. Rock shall be removed to such additional horizontal dimensions as will provide a minimum clearance of six inches on all sides of appurtenant structures such as valves, housings, access structures, etc.

Where no other grade controls are indicated or established for the pipeline, the excavating and foundation preparations shall be such as to provide a minimum cover over the top of the pipe as specified. Trench widths shall allow for at least six inches of clearance on each side of the joint.
hubs. The maximum allowable width of the trench at the top of pipe level shall be the outside diameter of the pipe plus two feet, subject to the considerations for alternate pipe loading set forth below. The width of the trench at the ground surface shall be held to a minimum to prevent unnecessary destruction of the surface structures.

The maximum allowable trench width at the level of the top of pipe may be exceeded only by approval of the Engineer, after consideration of pipe strength and loading relationships. Any alternate proposals made by the Contractor shall be in writing, giving the pertinent soil weight data and proposed pipe strength alternate, at least seven days prior to the desired date of decision. Approval of alternate pipe designs shall be with the understanding that there will be no extra compensation allowed for any increase in material or construction costs.

If the trench is excavated to a greater width than that authorized, the Engineer may direct the Contractor to provide a higher class of bedding and/or a higher strength pipe than that required by the Plans, Specifications, and Special Provisions in order to satisfy design requirements, without additional compensation.

B4 Sheeting and Bracing Excavations

All excavations shall be sheeted, shored, and braced as will meet all requirements of the applicable safety codes and regulations; comply with any specific requirements of the Contract; and prevent disturbance or settlement of adjacent surfaces, foundations, structures, utilities, and other properties. Any damage to the work under contract or to adjacent structures or property caused by settlement, water or earth pressures, slides, cave-ins, or other causes due to failure or lack of sheeting, shoring, or bracing or through negligence or fault of the Contractor in any manner shall be repaired at the Contractor's expense and without delay.

Where conditions warrant extreme care, the Plans, Specifications, and Special Provisions may require special precautions to protect life or property, or the Engineer may order the installation of sheet piling of the interlocking type or direct that other safety measures be taken as deemed necessary. Failure of the Engineer to order correction of improper or inadequate sheeting, shoring, or bracing shall not relieve the Contractor's responsibilities for protection of life, property, and the work.

The Contractor shall assume full responsibility for proper and adequate placement of sheeting, shoring, and bracing, wherever and to such depths that soil stability may dictate the need for support to prevent displacement. Bracing shall be so arranged as to provide ample working space and so as not to place stress or strain on the inplace structures to any extent that may cause damage.

Sheeting, shoring and bracing materials shall be removed only when and in such manner as will assure adequate protection of the inplace structures and prevent displacement of supported grounds. Sheet ing and bracing shall be left in place only as required by the Plans, Specifications, and Special Provisions or ordered by the Engineer. Otherwise, sheeting and bracing may be removed as the backfilling reaches the level of respective support. Wherever sheeting and bracing is left in place, the upper portions shall be cut and removed to an elevation of three feet or more below the established surface grade as the Engineer may direct.
All costs of furnishing, placing and removing sheeting, shoring, and bracing materials, including the value of materials left in place as required by the Contract, shall be included in the prices bid for pipe installation and will not be compensated for separately. When any sheeting, shoring, or bracing materials are left in place by written order of the Engineer, in the absence of specific requirements of the Contract to do so, payment will be made for those materials as an Extra Work item, including waste material resulting from upper cut-off requirements.

B5 Preparation and Maintenance of Foundations

Foundation preparations shall be conducted as necessary to produce a stable foundation and provide continuous and uniform pipe bearing between bell holes. The initial excavating or backfilling operations shall produce a subgrade level slightly above finished grade as will permit hand shaping to finished grade by trimming of high spots and without the need for filling of low spots to grade. Final subgrade preparations shall be such as to produce a finished grade at the centerline of the pipe that is within 0.03 foot of a straight line between pipe joints and to provide bell hole excavation at each joint as will permit proper joining of pipe and fittings.

In excavations made below grade to remove rock or unstable materials, the backfilling to grade shall be made with available suitable materials unless placement of Granular Foundation or Bedding material is specified and provided for or is ordered by the Engineer. Placement of the backfill shall be in relatively uniform layers not exceeding 8 inches in loose thickness. Each layer of backfill shall be compacted thoroughly, by means of approved mechanical compaction equipment, as will produce uniform pipe support throughout the full pipe length and facilitate proper shaping of the pipe bed.

Where placement of foundation materials will not provide an adequate foundation for laying pipe due to the instability of the existing materials and where ordered by the Engineer, the Contractor shall place Geotextile Type I fabric on top of the unstable materials prior to placing foundation materials. Sufficient geotextile fabric shall be used to completely enclose the foundation materials and pipe.

It shall be the Contractor's responsibility to notify the Engineer of changing soil conditions which may be of poor bearing capacity and when organic soils are encountered. Where utilities are placed on unstable soils without notification of the Engineer, the Contractor shall be responsible for all repairs and correction of the installation without further compensation.

Where the foundation soil is found to consist of materials that the Engineer considers to be so unstable as to preclude removal and replacement to a reasonable depth to achieve solid support, a suitable foundation shall be constructed as the Engineer directs in the absence of special requirements in the Plans, Specifications, and Special Provisions. The Contractor may be required to furnish and drive piling and construct concrete or timber bearing supports or other work as may be ordered by the Engineer.

Care shall be taken during final subgrade shaping to prevent any over-excavation. Should any low spots develop, they shall only be filled with approved material, which shall have optimum moisture content and be compacted thoroughly without additional compensation to the Contractor. The finished subgrade shall be maintained free of water and shall not be disturbed.
during pipe lowering operations except as necessary to remove pipe slings. The discharge of
trench dewatering pumps shall be directed to natural drainage channels or storm water drains.
Draining trench water into sanitary sewers or combined sewers will not be permitted.

The Contractor shall install and operate a dewatering system of wells or points to maintain pipe
trenches free of water wherever necessary or as directed by the Engineer to meet the intent of
these specifications. Unless otherwise specified in the Plans, Specifications, and Special
Provisions, such work shall be considered incidental.

All costs of excavating below grade and placing foundation or bedding aggregates as required
shall be included in the bid prices for pipe items to the extent that the need for such work is
indicated in the Contract provisions and the Proposal does not provide for payment under
separate Contract Items. Any excavation below grade and any foundation or bedding aggregates
required by order of the Engineer in the absence of Contract requirements will be compensated
for separately.

If examination by the Engineer reveals that the need for placement of foundation aggregate was
caused by the Contractor’s manipulation of the soils in the presence of excessive moisture or lack
of proper dewatering, the cost of the corrective measures shall be borne by the Contractor.

C Non Open Cut Pipe Installation

C1 Jacking/Boring

The terms "auger", "boring", "jack", "jacking", and "tunneling" in the proposal, specifications,
and plans refers only to non-open cut construction. The Contractor shall inspect and verify soil
conditions to his own satisfaction in order to determine the type of construction to employ.
During the construction, the Contractor shall be responsible for protecting all existing utilities
above the pipe invert.

The minimum diameter of the casing pipe shall be four (4) inches greater than the outside
diameter of the bell of the carrier pipe. For any installation beneath a railroad, the top of the
casing pipe shall not be closer than the specified dimensions indicated in the permit.

If the Contractor elects to install steel casing, the minimum wall thickness shall be as specified
on the Plans, in the Special Provisions, or in the applicable Permit. Where required by the
Engineer, two 17-pound anode packs shall be attached to the casing for corrosion protection.

A 1-1/2 inch pipe shall be forced along the top of the casing pipe. The front end of this pipe shall
be 18 inches behind the front end of the casing pipe. A mixture of water and bentonite clay shall
be forced through this pipe at all times during the casing installation to fill any voids that may be
present above the casing pipe. Upon completion of the casing installation, this pipe shall be
slowly withdrawn while bentonite is forced through the pipe to fill any remaining voids.

The Contractor shall prevent excavated materials from flowing back into the excavation during
the non-open cut construction. This shall include the use of a shield conforming to the size and

shape of the casing that will prevent materials from flowing into the leading edge of the casing. The machine used shall be capable of controlling line and grade and shall conform to the size and shape of the casing pipe.

No jacking/augering of pipe will be allowed below the water table unless the water table has been lowered sufficiently to keep the water below the pipe being installed. The use of water under pressure (jetting) or puddling will not be permitted to facilitate jacking/augering operations.

If any installation is augered, the head shall be approved by the Engineer and the auger shall be located six (6) inches behind the lead edge of the casing or carrier pipe.

If a void develops, the jacking/augering shall be stopped immediately and the void shall be filled by pressure grouting. The grout material shall consist of a sand-cement slurry of at least two sacks of cement per cubic yard and a minimum of water to assure satisfactory placement.

Skids and blocking shall be used as necessary to install the carrier pipe to the proper line and grade inside the casing pipe. Voids between carrier and casing pipes shall be filled with sand and the casing pipe sealed at both ends with a suitable material to prevent water or debris from entering the casing pipe.

C2 Directional Boring

Direction boring/drilling installation shall be accomplished where required on the Plans or in the Special Provisions to minimize disturbance of existing surface improvements. The installer shall have a minimum of three years of experience in this method of construction and have installed at least 1,000 feet of 8-inch or larger diameter pipe to specified grades. The field supervisor employed by the Contractor shall have at least three years of experience and shall be at the site at all times during the boring/drilling installation, and be responsible for all of the work.

The Contractor shall submit boring/drilling pit locations to the Engineer before beginning construction.

The drilling equipment shall be capable of placing the pipe as shown on the plans. The installation shall be by a steerable drilling tool capable of installing continuous runs of pipe, without intermediate pits, a minimum distance of 200 feet. The guidance system shall be capable of installing pipe within 1-1/2 inch of the plan vertical dimensions and 2 inches of the plan horizontal dimensions. The Contractor shall be required to remove and reinstall pipes which vary in depth and alignment from these tolerances.

Pull back forces shall not exceed the allowable pulling forces for the pipe being installed. Drilling fluid shall be a mixture of water and bentonite clay. Disposal of excess fluid and spoils shall be the responsibility of the Contractor.

D Placement of Insulation
Rigid insulation board shall be placed within the pipe encasement zone, 6 inches above the pipe. Prior to placement of the insulation, Granular Borrow (MnDOT 3149) shall be leveled and compacted until there is no further visual evidence of increased consolidation or the density of the compacted layer conforms to the density requirements specified in the Special Provisions, then leveled and lightly scarified to a depth of 1/2 inch. Borrow material placed above and below the insulation shall be free of rock or stone fragments measuring 1-1/2 inches or greater.

Insulation boards shall be placed on the scarified material with the long dimension parallel to the centerline of the pipe. Boards shall be placed in a single layer with tight joints. No continuous joints or seams shall be placed directly over the pipe. If two or more layers of insulation boards are used, each layer shall be placed to cover the joints of the layer immediately below.

The Contractor shall exercise precaution to insure that all joints between boards are tight during placement and backfilling with only extruded ends placed end to end or edge to edge.

The first layer of material placed over the insulation shall be 6 inches in depth, free of rock or stone fragments measuring 1-1/2 inches or greater. The material shall be placed in such a manner that construction equipment does not operate directly on the insulation and shall be compacted with equipment which exerts a contract pressure of less than 80 psi. The first layer shall be compacted to conform to the density requirements specified in the Special Provisions.

E Pipeline Backfilling Operations

All pipeline excavations shall be backfilled to restore preexisting conditions as the minimum requirement, and fulfill all supplementary requirements indicated in the Plans, Specifications, and Special Provisions. The backfilling operations shall be started as soon as conditions will permit on each section of pipeline, so as to provide continuity in subsequent operations and restore normal public service as soon as practicable on a section-by-section basis. All operations shall be pursued diligently, with proper and adequate equipment, as will assure acceptable results.

The backfilling shall be accomplished with the use of Suitable Materials selected from the excavated materials to the extent available and practical. Should the materials available within the trench section be unsuitable or insufficient, without loading and hauling or the employment of unreasonable measures, the required additional materials shall be furnished from outside sources as an Extra Work item in the absence of any Special Provision requirements.

Suitable Material shall be defined as a mineral soil free of foreign materials (rubbish, debris, etc.), frozen clumps, oversize stone, rock, concrete or bituminous chunks, and other unsuitable materials, that may damage the pipe installation, prevent thorough compaction, or increase the risks of after settlement unnecessarily. Material selection shall be such as to make the best and fullest utilization of what is available, taking into consideration particular needs of different backfill zones. Material containing stone, rock, or chunks of any sort shall only be utilized where and to the extent there will be no detrimental effects.

Within the pipe bedding and encasement zones described as that portion of the trench which is below an elevation one foot above the top of the pipe, the materials placed shall be limited in...
particle size to 1-1/2 inches maximum in the case of pipe of 12 inches in diameter or less and to 2 inches maximum in the case of larger pipe. Above these zones, the placement of material containing stones, boulders, chunks, etc. greater than 8 inches in any dimension shall not be allowed.

All flexible pipe shall be bedded in accordance with ASTM Specification D2321, "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe". This shall include placement of granular bedding and encasement materials from a point six inches below the bottom of pipe to a point twelve inches above the top of the pipe. Placement and compaction of bedding and encasement materials around the pipe shall be considered incidental to the installation of the pipe. Where existing soils do not meet the requirements of bedding and encasement materials, the Contractor shall furnish the required granular materials.

Compaction of materials placed within the pipe bedding and encasement zones shall be accomplished with portable or hand equipment methods, so as to achieve thorough consolidation under and around the pipe and avoid damage to the pipe. Above the cover zone material, the use of heavy roller type compaction equipment shall be limited to safe pipe loading.

Backfill materials shall be carefully placed in uniform loose thickness layers up to 12 inches thick spread over the full width and length of the trench section to provide simultaneous support on both sides of the pipeline. Granular backfill may be placed in 12 inch layers above an elevation one foot above the top of the pipe, and with the provision that, by authority and at the discretion of the Engineer in consideration of the demonstrated capability of special type vibrating compactors, the stated maximums may be increased.

Each layer of backfill material shall be compacted effectively, by approved mechanical or hand methods, until there is no further visual evidence of increased consolidation or the density of the compacted layer conforms to the density requirements specified in the Special Provisions. Compaction of the inplace layer shall be completed acceptably before placing material for a succeeding layer thereon. The manner of placement, compaction equipment, or procedure effectiveness shall be subject to approval of the Engineer.

All surplus or waste materials remaining after completion of the backfilling operations shall be disposed of in an acceptable manner within 24 hours after completing the backfill work on each particular pipeline section. Disposal at any location within the project limits shall be as specified, or as approved by the Engineer; otherwise, disposal shall be accomplished outside the project limits at the Contractor's discretion. The backfilling and surplus or waste disposal operations shall be a part of the work required under the pipeline installation items, not as work that may be delayed until final cleanup.

Compaction of backfill within Roadbed areas shall meet the density requirements of Mn/DOT Specification 2105. Compaction of backfill in all other areas shall be as required in the Special Provisions.

Until expiration of the guarantee period, the Contractor shall assume full responsibility and expense for all backfill settlement and shall refill and restore the work as directed to maintain an
acceptable surface condition, regardless of location. All additional materials required shall be furnished without additional cost to the Owner.

Any settlement of road surfaces that are either placed under this Contract or by others under either public or private contract; that are in excess of one inch, as measured by a ten foot straight edge; and that are within the guarantee period shall be considered failure of the mechanical compaction. The Contractor shall be required to repair such settlement including all items placed by others.

**F Restoration of Surface Improvements**

Wherever any surface improvements such as pavement, curbing, pedestrian walks, fencing, or turf have been removed, damaged or otherwise disturbed by the Contractor's operations, they shall be repaired or replaced to the Engineer's satisfaction, as will restore the improvement in kind and structure to the preexisting condition. Each item of restoration work shall be done as soon as practicable after completion of installation and backfilling operations on each section of pipeline.

In the absence of specific payment provisions, as separate Contract Items, the restoration work shall be compensated for as part of the work required under those Contract Items which necessitated the destruction and replacement or repair, and there will be no separate payment. If separate pay items are provided for restoration work, only that portion of the repair or reconstruction which was necessitated by the Contract work will be measured for payment. Any improvements removed or damaged unnecessarily or undermined shall be replaced or repaired at the Contractor's expense.

**F1 Turf Restoration**

Turf restoration shall be accomplished by sod placement except where seeding is specifically allowed or required.

Topsoil shall be placed to a minimum depth of four inches under all sod and in all areas seeded. The topsoil material used shall be light friable loam containing a liberal amount of humus and shall be free of heavy clay, coarse sand, stones, plants, roots, sticks and other foreign matter. Topsoil meeting these requirements shall be selected from the excavated materials to the extent available and needed.

All turf establishment work shall be done in substantial compliance with the provisions of Mn/DOT Specification 2575 using seed mixtures as specified in the Special Provisions or Proposal.

**F2 Pavement Restoration**

The inplace pavement structure (including base aggregates) shall be restored in kind and depth as previously existed, using base aggregates salvaged from the excavated materials to the extent
available and needed, and with new materials being provided for reconstruction of the concrete or bituminous surface courses.

If, through no fault of the Contractor in failing to reserve sufficient aggregate materials from the excavations, there should be insufficient quantity of suitable aggregate to reconstruct the pavement base courses, the additional materials required will be furnished by the Owner at its expense, or the Contractor will be ordered to furnish the additional materials from outside sources. Placement of any additional aggregate materials delivered to the site by the Owner or of any additional materials furnished by the Contractor shall be an incidental expense, as will also be the disposal of any excess materials resulting therefrom, unless special payment provisions are otherwise agreed upon.

Reconstruction of aggregate base courses and concrete or bituminous surface courses shall be in substantial compliance with all applicable Mn/DOT Specifications pertaining to the item being restored. The materials used shall be comparable to those used in the inplace structure, and the workmanship and finished quality shall be equal to that of new construction to the fullest extent obtainable in consideration of operational restrictions.

Existing concrete and bituminous surfaces at the trench wall shall be sawed or cut with a cutting wheel to form a neat edge in a straight line before surfaces are to be restored. Sawing or cutting may be accomplished as a part of the removal or prior to restoration at the option of the Contractor. However, all surface edges will be inspected prior to restoration.

F3 Restoration of Miscellaneous Items

Wherever any curbing, curb and gutter sections, pedestrian walks, fencing, driveway surfacing, or other improvements are removed or in any way damaged or undermined, they shall be restored to original condition by repair or replacement as the Engineer considers necessary. Replacement of old materials will be acceptable only to the extent that existing quality can be fully achieved, such as in the case of fencing. Otherwise new materials shall be provided and placed as the Engineer directs. Workmanship and finished quality shall be equal to that of new construction, where new materials are used, to the extent obtainable in consideration of operational restrictions.

A proper foundation shall be prepared before reconstructing concrete or bituminous improvements. Unless otherwise directed, granular material shall be placed to a depth of at least four inches under all concrete and bituminous items. No direct compensation will be made for furnishing and placing this material even though such course was not part of the original construction.
G Maintenance and Final Cleanup

All subgrade surfaces shall be maintained acceptably until the start of surfacing construction or restoration work, and until the work has been finally accepted. Additional materials shall be provided and placed as needed to compensate for trench settlement and to serve as temporary construction pending completion of the final surface improvements.

Final disposal of debris, waste materials, and other remains or consequences of construction, shall be accomplished intermittently as new construction items are completed and shall not be left to await final completion of all work. Cleanup operations shall be considered as being a part of the work covered under the Contract Items involved and only that work which cannot be accomplished at any early time shall be considered as final cleanup work not attributable to a specific Contract Item.

If disposal operations and other cleanup work are not conducted properly as the construction progresses, the Engineer may withhold partial payments until such work is satisfactorily pursued or he may deduct the estimated cost of its performance from the partial estimate value.

Maintenance of sodded and seeded areas shall include adequate watering for plant growth and the replacement of any dead or damaged sod as may be required for acceptance of the work.

2600.4 METHOD OF MEASUREMENT

All items will be measured separately according to design designation as indicated in the Pay Item name and as may be detailed and defined in the Plans, Specifications, or Special Provisions. Complete-in-Place items shall include all component parts thereof as described or required to complete the unit, but excluding any excesses covered by separate Pay Items

A Rock Excavation

Rock Excavation shall be measured by volume in cubic yards. Depth shall be measured from the top of the rock to a point six inches below the outside barrel of the pipe and width shall be the inside diameter of the pipe plus twenty-four inches (12” from each side). The minimum width of measurement shall be four feet.

B Granular Materials

Granular materials furnished and placed as special foundation, bedding, encasement, or backfill construction will be measured by weight or volume of material furnished by the Contractor from outside sources and placed within the limits defined. Unless otherwise specified, volume will be determined by vehicular measure (loose volume) at the point of delivery. Measurements will not include any materials required to be placed as a component part of other Contract Items as may be specified.
C Geotextile Fabric

Where geotextile fabric is used for improving pipe foundation, it shall be measured by the square foot of material installed.

D Piling

Piling shall be measured according to the provisions of Mn/DOT Specification 2452.

D1 Pile Bents

Pile bents shall be measured as a unit and shall include all materials and labor required, except the pile.

E Insulation

Rigid board insulation shall be measured on a square foot basis installed to the specified thickness noted on the Plans, Specifications, and Special Provisions and shall include all materials, equipment, and labor required for placement.

2600.5 BASIS OF PAYMENT

All costs of excavating to foundation grade, preparing the foundation, placing and compacting backfill materials, restoring surface improvements, and other work necessary for prosecution and completion of the work as specified, shall be included for payment as part of the pipe and pipe appurtenance items without any direct compensation being made.

When special aggregate backfill materials are required to be furnished and placed to comply with the indicated Laying Conditions, the costs shall be included for payment as part of the pipe items without any direct compensation. Otherwise, the furnishing of aggregate materials for backfill by order of the Engineer in the absence of such requirements will be compensated for as an Extra Work item.

In the absence of special payment provisions, all costs of restoring surface improvements as required, disposal of surplus or waste materials, maintenance and repair of completed work, and final cleanup operations shall be incidental to the Contract Items under which the costs are incurred.

Granular materials furnished for foundation, bedding, cover, or backfill placement as specified in connection with pipe or structure items will only be paid for as separate Contract Items to the extent that the Proposal contains specific Pay Items. Otherwise the furnishing and placing of granular materials as specified shall be incidental to the pipe or structure item without any direct compensation being made.

****END OF SECTION****
SECTION 02610 - PIPE CULVERTS

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary to construct pipe culverts as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Reference Section 02320 of these Specifications for trench excavation, bedding and backfill, except as modified herein.

B. Mn/DOT Specification Section 2501 shall apply to the construction of pipe culvert and appurtenance items, except as modified herein.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 CULVERT PIPE AND FITTINGS

A. Reinforced Concrete Pipe (MnDOT 3236)

1. No exception to the referenced specification is made.

B. Corrugated Steel Pipe

1. No exception to the referenced specification is made.

C. Corrugated Polyethylene Pipe

1. HDPE aprons will not be accepted. Galvanized metal or approved equal only.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. The Contractor shall install a clay (or an approved impermeable equal) collar around all culverts at a point approximately 4 feet from each apron. The collar shall fill the breadth and height of the trench for a minimum length of 3 feet.

3.2 FIELD QUALITY CONTROL

A. Deflection test - No exception to the referenced specification is made.

B. Televising - No exception to the referenced specification is made.

****END OF SECTION****
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**STANDARD SPECIFICATIONS FOR**  
**WATER MAIN AND SERVICE LINE INSTALLATION**  
**1999 EDITION**

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2611 STANDARD SPECIFICATIONS FOR WATER MAIN AND SERVICE LINE INSTALLATION

2611.1 DESCRIPTION

This work shall consist of the construction of water main and building service pipelines utilizing plant fabricated pipe and other appurtenant materials, installed for conveyance of potable water. The work includes the relocation or adjustment of existing facilities as may be specified in the Plans, Specifications and Special Provisions.

Use of the term "Plans, Specifications and Special Provisions" within this specification shall be construed to mean those documents which compliment, modify, or clarify these specifications and are accepted as an enforceable component of the Contract or Contract Documents. All references to Mn/DOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation Standard Specifications for Construction, as modified by any Mn/DOT Supplemental Specification edition published prior to the date of advertisement for bids. All reference to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

The following American Water Works Association (AWWA) Specifications have been referenced in this Specification:

C104 American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

C105 American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems

C110 American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (75 mm Through 1200 mm), for Water and Other Liquids

C111 American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

C115 American National Standard for Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges

C150 American National Standard for Thickness Design of Ductile-Iron Pipe

C151 American National Standard for Ductile-Iron Pipe, Centrifugally Case, for Water or Other Liquids

C153 American National Standard for Ductile-Iron Compact Fittings, 3 In. Through 24 In. (76 mm Through 610 mm) and 54 In. Through 64 In. (1,400 mm Through 1,600 mm), for Water Service
C301 AWWA Standard for Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids

C304 AWWA Standard for Design of Prestressed Concrete Cylinder Pipe

C500 AWWA Standard for Metal-Seated Gate Valves for Water Supply Service (Includes addendum C500a-95.)

C502 AWWA Standard for Dry-Barrel Fire Hydrants (Includes addendum C502a-95.)

C504 AWWA Standard for Rubber-Seated Butterfly Valves

C509 AWWA Standard for Resilient-Seated Gate Valves for Water Supply Service (Includes addendum C509a-95.)

C600 AWWA Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances

C605 AWWA Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water

C651 AWWA Standard for Disinfecting Water Mains

C800 AWWA Standard for Underground Service Line Valves and Fittings

C900 AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution (Includes addendum C900a-92.)

C901 AWWA Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. Through 3 In., for Water Service

C905 AWWA Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In., (350mm Through 1,200mm), for Water Transmission and Distribution

C906 AWWA Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 63 In., for Water Distribution

C907 AWWA Standard for Polyvinyl Chloride (PVC) Pressure Fittings for Water - 4 In. Through 8 In. (100mm Through 200mm)

Service installations shall include either Branch Service Lines or Tapped Service Lines in accordance with the standards set forth herein.

Tapped Service installations shall include all water service lines less than three inches nominal inside diameter pipe. The component parts of a tap service installation shall include a corporation
stop coupling complete with water main tap and saddle where required; a curb stop coupling complete with service box; and copper piping extending from the corporation stop to the curb stop coupling and beyond to the property line or to the limits as established by the Engineer. Tapped Service lines shall be installed at the size specified in the Plans, Specifications, and Special Provisions.

Branch Service installations shall include all water service lines of three inches nominal inside diameter pipe and larger. The component parts of a branch service installation shall include a tapping sleeve and valve or a tee connection and valve complete with valve box, and piping extending from the water main connection, to the property line or to the limits as specified by the Engineer.

All references to Gray Iron material shall be construed to include both Gray Iron and Ductile Iron products, except where one or the other is specified, and all references to Polyvinyl Chloride pipe shall be construed to include only pressure pipe complying with AWWA C-900 or C-905. All references to "structure" shall include any man-made object that is not otherwise exempted by special terminology or definition.

2611.2 MATERIALS

All materials required for this work shall be new material conforming to requirements of the reference specifications for the class, kind, type, size, grade, and other details indicated in the Contract. Unless otherwise indicated, all required materials shall be furnished by the Contractor. If any options are provided for, as to type, grade, or design of the material, the choice shall be limited as may be stipulated in the Plans, Specifications, or Special Provisions.

All manufactured products shall conform in detail to such standard design drawings as may be referenced or furnished in the Plans. Otherwise, the Owner may require advance approval of material suppliers, product design, or other unspecified details as it deems desirable for maintaining adopted standards.

At the request of the Engineer, the Contractor shall submit, in writing, a list of materials and suppliers for approval.

A Certificate of Compliance shall be furnished stating that the materials furnished have been tested and are in compliance with the specification requirements.

A Water Pipe Materials

All pipe furnished for water main and branch line installations shall be of the type, kind, size, and class indicated for each particular line segment as shown in the Plan and designated in the Contract Items. Wherever connection of dissimilar materials or designs is required, the method of joining and any special fittings employed shall be subject to approval of the Engineer.
Al Ductile Iron Pipe and Ductile Iron and Gray Iron Fittings

The pipe furnished shall be Ductile Iron pipe fittings furnished shall be of the Ductile Iron or Gray Iron type as specified for each particular use of installation. When Gray Iron is specified, either type may be furnished. Gray Iron may not be substituted for Ductile Iron unless specifically authorized in the Special Provisions.

Ductile iron pipe shall conform to the requirements of AWWA C115 or C151 for water and thickness design shall conform to AWWA C 150. In addition, the pipe shall comply with the following supplementary provisions:

(1) Fittings shall conform to the requirements of AWWA C110 OR 153 (Gray Iron and Ductile Iron Fittings) (Ductile Iron Compact Fittings) for the joint type specified.

(2) Unless otherwise specified all pipe and fittings shall be furnished with cement mortar lining meeting the requirements of AWWA C104 for standard thickness lining. All exterior surfaces of the pipe and fittings shall have an asphaltic coating at least one mil thick. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection.

(3) Rubber gasket joints for Ductile Iron Pressure Pipe and fittings shall conform to AWWA C111.

A2 Prestressed Concrete Cylinder Pipe and Fittings

Prestressed Concrete Cylinder pipe, fittings and specials shall conform to the requirements of AWWA C-301 and C-304 (Prestressed Concrete Pressure Pipe, Steel Cylinder Type) for the size, working pressure, external loading, laying condition, and other design considerations indicated in the Plans, Specifications, and Special Provisions.

The Contractor shall furnish plans and specifications to the pipe manufacturer giving such special details and other information as are necessary for manufacture of the pipe, fittings, and specials in accordance with the specific requirements of the project.

A3 Polyvinyl Chloride (PVC) Pressure Pipe and Fittings

Polyvinyl chloride (PVC) pressure pipe, produced by a continuous extrusion process employing a prime grade of unplasticized polyvinyl chloride, shall conform to the requirements of AWWA C-900 for the size, grade, and pressure class indicated on the Plans, Specifications, and Special Provisions. Fittings shall conform to AWWA C907 and C908. The grade used shall be resistant to aggressive soils or corrosive substances in accordance with the requirements of ASTM D-543. Unless otherwise specified, the dimensions and tolerances of the pipe barrel should conform to ductile iron or cast iron pipe equivalent outside diameters.
A4 Polyethylene (PE) Pressure Pipe and Fittings

Polyethylene pressure pipe and fittings shall conform to the requirements of AWWA C906 for the size and pressure class indicated on the Plans, Specifications and Special Provisions. Unless otherwise specified, the dimensions and tolerances of the pipe barrel should conform to Ductile Iron pipe equivalent outside diameters. The method of joining material shall be by the Thermal Butt- Fusion Method.

The standard HDPE fittings shall be standard commercial products manufactured by injection molding or by extrusion and machining, or, shall be fabricated from PE pipe conforming to this specification. The fittings shall be fully pressure rated by the manufacturer to provide a working pressure equal to the pipe, for 50 years service at 73.4 degrees Fahrenheit with an included 2:1 safety factor. The fittings shall be manufactured from the same resin type, grade, and cell classification as the pipe itself. The manufacture of the fittings shall be in accordance with good commercial practice to provide fittings homogeneous throughout and free from crack, holes, foreign inclusions, voids, or other injurious defects. The fittings shall be as uniform as commercially practicable in color, opacity, density and other physical properties. The minimum "quick-burst" strength of the fittings shall not be less than that of the pipe with which the fitting is to be used.

B Fire Hydrants

Fire hydrants shall be of the type, size, and construction specified in the Plans and shall conform to the applicable requirements of AWWA C-502.

Unless otherwise specified in the Plans, Specifications, and Special Provisions, hydrants shall be furnished in conformance with the following supplementary requirements:

(1) Hydrants shall have a five-inch (nominal diameter) main valve opening of the type that opens against water pressure.

(2) Hydrant barrels shall be two piece, non-jacket type, with flanged joint above finished grade line and with mechanical joint connection at the hub end for joining a six-inch ductile iron branch pipe.

(3) Hydrant bury length, measured from the bottom of the branch pipe connection to the finished ground line at the hydrant, shall be 7'-6".

(4) Hydrants shall have two outlet nozzles for 2-1/2 inch (I.D.) hose connection and one outlet nozzle for 4 inch (I.D.) steamer connection. All outlet nozzle threads shall be National Standard Fire-Hose Coupling Screw Threads (NFPA 1963).

(5) Hydrant operating mechanisms shall be provided with "O" ring seals preventing entrance of moisture and shall be lubricated through an opening in the operating nut or bonnet.
(6) Hydrants shall be provided with outlets for drainage in the base or barrel, or between the base and barrel, unless the Special Provisions require that drain outlets be omitted or plugged.

(7) The hydrant operating nut shall be rotated counterclockwise to open.

(8) Detailed drawings, catalog information, and maintenance data shall be furnished as requested by the Engineer.

C Valves and Valve Housing

Cl Valve Housings

Valve housings shall be of ductile or cast iron, High Density Polyethylene or masonry construction as specified in the Plans, Specifications, and Special Provisions for the particular valve size or installation. Masonry manhole or vault type units shall be constructed in accordance with the provisions of Mn/DOT Specification 2506. Precast Concrete Manholes shall conform to ASTM Specification C-478 suitable for HS 20 traffic loading for all units located in driving areas. Ductile or cast iron valve boxes and all castings for manhole or vault type units shall conform to the requirements of Mn/DOT Specification 3321.

C2 Gate Valves

Gate Valves shall be manufactured and furnished in accordance with an approved pattern and shall conform to all applicable requirements of AWWA C-500 or AWWA C-509, together with such supplementary requirements as may be covered in the Plans, Specifications, and Special Provisions or the provisions hereof. Unless otherwise specified, the gate valves furnished shall comply with the following supplementary requirements:

(1) Gate valves meeting the requirements of AWWA C-500 shall be two-faced, double disc type, with parallel seats. Gate valves meeting the requirements of AWWA C-509 shall be single disc type with resilient seat bonded or mechanically attached to either the gate or valve body. All valves shall be provided with a two-inch square operating nut opening counterclockwise and mechanical joint ends.

(2) All gate valves shall be non-rising stem type furnished with O-Ring stem seals.

(3) All gate valves 16 inches or larger in size shall be arranged for operation in the horizontal position and shall be equipped with bypass valves.

(4) All gate valves 12 inches or larger in size shall be equipped with approved barrel type rugged gate position.

(5) All gears on gate valves shall be cut tooth steel gears, housed in heavy ductile or cast iron extended type grease cases of approved design.
(6) All gate valves shall have an open indicating arrow, the manufacturer’s name, pressure rating and year of manufacture cast on the valve bodies.

**C3 Butterfly Valves**

Butterfly valves shall be manufactured in conformance with all applicable requirements of AWWA C-504 for 150 p.s.i. working pressure minimum, together with such supplementary requirements as may be covered in the Plans, Specifications, and Special Provision or the provisions hereof. Unless otherwise specified, the butterfly valves furnished shall comply with the following supplementary requirements.

1. The butterfly valves shall be short body of ductile or cast iron with mechanical joint ends.

2. The butterfly valves shall be rubber seated with ductile or cast disc, non-rising stem type furnished with O-ring stem seals.

3. The butterfly valves shall be equipped with a two-inch square operating nut opening counterclockwise.

4. The butterfly valves shall be designed for direct burial installation.

5. All butterfly valves shall have an open indicating arrow, the manufacturer's name, pressure rating and year of manufacture on the valve bodies.

**D Water Service Pipe and Fittings**

Water service pipe of 3 inches or larger inside diameter shall conform to the requirements for Ductile Iron Pipe and Ductile Iron and Gray Iron Fittings as set forth under the provisions of 2611.2A1, and Polyvinyl Chloride Pressure Pipe as set forth under the provisions of 2611.2A3, and Polyethylene pipe as set forth under the provision of 2611.2A4.

Water service pipe of less than 3 inches in inside diameter shall conform to the requirements of ASTM B 88 for Seamless Copper Water Tube, Type K, Soft Annealed temper, Polyethylene Pipe as per AWWA C901 or Polyvinyl Chloride Pipe and fittings as per a ASTM D1785, D2241, D2466, D2467 and D2740 as specified on the Proposal or in the Special Provisions.

Corporation stops, saddles, curb stops, and curb stop service boxes shall conform to the requirements of AWWA C800 be as detailed in the Plans, Specifications, and Special Provisions or approved designations. All fittings for copper tubing shall be cast brass, having uniformity in wall thickness and strength, and shall be free of defects affecting serviceability. All copper pipe fittings shall be flared or compression type. All threads for underground service line fittings shall conform to the requirements of AWWA C-800. Each fitting shall be permanently and plainly marked with the name or trademark of the manufacturer.
Curb stop service boxes shall be gray iron castings conforming to the requirements of ASTM A 48 for Class 20 or higher tensile strength and shall have 18 inches of vertical adjustment for the cover depth specified in the Plans, Specifications, and Special Provisions.

E Polyethylene Encasement Material

Polyethylene encasement material shall conform to the requirements of AWWA C-105 for tube type installation and 8 mil nominal film thickness.

F Restrained Joint Retainer Glands

Where water main joint restraint is required by the use of retainer glands, the retainer glands shall be American, US Pipe or Mega-Lug type, ductile iron, and be designed to withstand the design pressures indicated in the Plans, Specifications, and Special Provisions.

All nuts, bolts, and tie rod type restraints shall be stainless steel or coated with an approved rustproofing material.

G Mortar

Mortar for use in masonry construction shall be an air-entrained mixture of one part Masonry Cement (Type I) and two parts mortar sand, with sufficient water added to produce proper consistency, and with sufficient air-entraining agent added to maintain an air content within the range of 7 to 10 percent. Mortar shall meet the requirements of ASTM C270.

H Concrete

Concrete for cast-in-place masonry construction shall be produced and furnished in accordance with the provisions of Mn/DOT Specification 2461 for the mix design indicated in the Plans, Specifications, or Special Provisions. The requirements for Grade B concrete shall be met where a higher grade is not specified. Type 3, air-entrained, concrete shall be furnished and used in all structures having weather exposure.

2611.3 CONSTRUCTION REQUIREMENTS

A Installation of Pipe and Fittings

Installation of ductile iron water mains and their appurtenances shall conform to the requirements of AWWA C-600 Specifications, the Plans, Specifications and Special Provisions.

Prestressed concrete cylinder pipe and their appurtenances shall conform to the requirements of AWWA C301 and C304. The installation shall be to the bedding and backfill conditions specified in the Plans, Specifications, or Special Provisions.
Installation of Polyvinyl Chloride (PVC) pipe and their appurtenances shall conform to the requirements of AWWA C900. The installation shall be to the bedding and backfill conditions specified by the Manufacturer, Plans, Specifications, or Special Provisions.

Installation of Polyethylene Pipe and their appurtenances shall conform to the requirements of AWWA C906. The installation shall be to the bedding and backfill conditions specified by the Manufacturer, Plans, Specifications, or Special Provisions.

Installation of pipe and fittings shall also conform to the following general guidelines:

**A1 Inspection and Handling**

Proper and adequate implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. During the process of unloading, all pipe and accessories shall be inspected by the Contractor for damage. The Contractor shall notify the Engineer of all material found to have cracks, flaws or other defects. The Engineer shall inspect the damaged material and have the right to reject any materials found to be unsatisfactory. The Contractor shall promptly remove all rejected material from the site.

All materials shall be handled carefully, as will prevent damage to protective coatings, linings, and joint fittings; preclude contamination of interior areas; and avoid jolting contact, dropping, or dumping.

While suspended and before being lowered into laying position, each pipe section and appurtenant unit shall be inspected by the Contractor to detect damage or unsound conditions that may need corrective action or be cause for rejection. The Contractor shall inform the Engineer of any defects discovered and the Engineer will prescribe the required corrective actions or order rejection.

Immediately before placement, the joint surfaces of each pipe section and fitting shall be inspected for the presence of foreign matter, coating blisters, rough edges or projections, and any imperfections so detected shall be corrected by cleaning, trimming, or repair as needed.

**A2 Pipe Laying Operations**

Trench excavation and bedding preparations shall proceed ahead of pipe placement as will permit proper placement and joining of the pipe and fittings at the prescribed grade and alignment without unnecessary hindrance. All foreign matter or dirt shall be removed from the inside of the pipe and fittings before they are lowered into position in the trench, and they shall be kept clean by approved means during and after laying. The water main materials shall be carefully lowered into laying position by the use of suitable restraining devices. Under no circumstances shall the pipe be dropped or dumped into the trench.
At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes. Bell holes shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate to support the pipe throughout its length. No pipe material shall be laid in water nor when the trench or bedding conditions are otherwise unsuitable or improper.

When placement or handling precautions prove inadequate, in the Engineer’s opinion, the Contractor shall provide and install suitable plugs or caps effectively closing the open ends of each pipe section before it is lowered into laying position, and they shall remain so covered until removal is necessary for connection of an adjoining unit.

As each length of bell and spigot pipe is placed in laying position, 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 approved backfill material, which shall be thoroughly compacted by tamping around the pipe to a height of at least 12 inches above its top. Acceptable tamping techniques include hand tamping and use of hand operated mechanical tamping devices.

At all times when pipe laying is not in progress, including noon hour and overnight periods, all open ends of the pipe line shall be closed by watertight plugs or other means approved by the Engineer. If water is present in the trench, the seals shall remain inplace until the trench is pumped completely dry.

When connecting to existing stubs, the Contractor shall take every precaution necessary to prevent dirt or debris from entering the existing lines. All necessary work to make the connection shall be done at no additional compensation, except where noted otherwise.

A3 Aligning and Fitting of Pipe

The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe and so as to leave a smooth square-cut end. Pipe shall be cut with approved mechanical cutters. The electric-arc cutting method, using carbon or steel rod, will be approved for use on larger size ductile or gray pipe where mechanical cutters are not available. Flame cutting will not be allowed under any conditions. All rough edges shall be removed from the cut ends of pipe and, where rubber gasket joints are used, the outer edge shall be rounded or beveled by grinding or filing to produce a smooth fit.

Wherever it is necessary to deflect ductile iron pipe from a straight line either in the vertical or horizontal plane, to avoid obstructions, plumb stems, or produce a long radius curve when permitted, the amount of deflection allowed at each joint shall not exceed the allowable limits for maintaining a satisfactory joint seal as given in AWWA C-600 for mechanical joints and push-on joints. The maximum angular deflection at any joint for other pipe materials and joints shall not exceed the manufacturer's recommendations. If the specified alignment requires angular deflections greater than recommended or allowed, the Contractor shall provide appropriate bends or shorter pipes such that the maximum angular deflection is not exceeded.
Connection and assembly of joints shall be accomplished during the setting, aligning, and fitting operations, in accordance with the provisions of Section 2611.2D, to the extent that the jointing requirements will permit.

**A4 Blocking and Anchoring of Pipe**

All plugs, caps, tees, bends, and other thrust points shall be provided with reaction backing, or movement shall be prevented by attachment of suitable restraining devices or tie rods, in accordance with the requirements of the Plans, Specifications, and Special Provisions.

In the absence of other specified requirements for reaction backing or restraining devices, the following provisions shall apply:

(1) All horizontal bends exceeding 20 degrees deflection, and all caps, plugs, and branch tees shall be provided with concrete buttress blocking.

(2) All vertical bends exceeding 20 degrees deflection shall be provided with concrete buttress blocking at the low points and with metal tie rod or strapping restraints at the high points.

(3) Offset bends made with standard offset fittings need not be strapped or buttressed.

Hardwood blocking shall only be used as temporary reaction backing until acceptable permanent reaction blocking or restraining devices have been installed. Blocking shall be nominal 2-inch timber having an area equivalent to at least four times the area of the surface of the cap or plug it restrains.

Concrete buttresses shall be poured against firm, undisturbed ground and shall be formed in such a way that the joints will be kept free of concrete and remain accessible for repairs. The concrete mix used in buttress construction shall meet the requirements for Grade B concrete in conformance with Mn/DOT Specification Section 2461. Buttress dimensions shall be a minimum of 12 inches in thickness, and the minimum area, in square feet shall be as follows.

<table>
<thead>
<tr>
<th>PIPE SIZE</th>
<th>TEE OR PLUG</th>
<th>1/4 BEND</th>
<th>1/8 BEND</th>
<th>1/32 BEND</th>
</tr>
</thead>
<tbody>
<tr>
<td>6”</td>
<td>2.9</td>
<td>3.1</td>
<td>1.6</td>
<td>0.8</td>
</tr>
<tr>
<td>8”</td>
<td>3.7</td>
<td>5.3</td>
<td>2.9</td>
<td>1.4</td>
</tr>
<tr>
<td>10”</td>
<td>5.7</td>
<td>8.1</td>
<td>4.4</td>
<td>2.2</td>
</tr>
<tr>
<td>12”</td>
<td>8.1</td>
<td>13.4</td>
<td>6.6</td>
<td>3.2</td>
</tr>
<tr>
<td>16”</td>
<td>15.1</td>
<td>21.4</td>
<td>11.6</td>
<td>5.9</td>
</tr>
<tr>
<td>20”</td>
<td>23.2</td>
<td>30.2</td>
<td>18.1</td>
<td>9.3</td>
</tr>
<tr>
<td>24”</td>
<td>33.6</td>
<td>48.5</td>
<td>26.1</td>
<td>13.3</td>
</tr>
</tbody>
</table>
Contractors are instructed to size concrete buttress blocking on fittings and dead ends where the blocking must withstand the pressure of larger main line fittings equipped with reducers, for the larger sized main line thrust and not for smaller fitting size only. This is of particular importance on tees and crosses where the main size is reduced on the run from large to small size by use of reducers.

All metal parts of tie rod or strap type restraints shall be galvanized or coated with other approved asphaltic type rustproofing.

All necessary fittings, bands, tie rods, nuts, and washers, and all labor and excavation required for installation of reaction restraints shall be furnished at the Contractor's expense with no direct compensation provided therefore.

**A5 Polyethylene Encasement of Pipeline**

Wherever so required by the Plans, Specifications, or Special Provisions, the pipeline, including valves, fittings, and appurtenances, shall be fully encased in polyethylene film meeting the requirements of these Specifications. The film shall be furnished in tube form for installation on pipe and all pipe-shaped appurtenances such as bends, reducers, offset sets, etc. Sheet film shall be provided and used for encasing all odd-shaped appurtenances such as valves, tees, crosses, etc.

The polyethylene tubing shall be installed on the pipe prior to being lowered into the trench. Tubing length shall be sufficient to provide a minimum overlap at all joints of one foot or more. Overlap may be accomplished with a separate sleeve tube placed over one end of the pipe prior to connecting another section of pipe, or by bunching extra overlap material at the pipe ends in accordion fashion. After completing the pipe jointing and positioning the overlap material, the overlap shall be secured in place with plastic adhesive tape wrapped circumferentially around the pipe not less than three turns.

After encasement, the circumferential slack in the tubing film shall be folded over at the top of the pipe to provide a snug fit along the barrel of the pipe. The fold shall be held in place with plastic adhesive tape applied at intervals of approximately three feet along the pipe length. Also, any rips, punctures, or other damage to the tubing shall be repaired as they are detected. These repairs shall be made with adhesive tape and overlapping patches cut from sheet or tubing material.

At odd-shaped appurtenances such as gate valves, the tubing shall overlap the joint and be secured with tape, after which the appurtenant piece shall be wrapped with a flat film sheet or split length of tubing by passing the sheet under the appurtenance and bringing it up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Wherever encasement is terminated, it shall extend for at least two feet beyond the joint area.

Openings in the tubing for branches, service taps, air valves and similar appurtenances shall be made by cutting an X-shaped slit and temporarily folding back the film. After installing the appurtenance, the cut tabs shall be secured with tape and the encasement shall be completed as necessary for an odd-shaped appurtenance.
Unless otherwise specified in the Plans, Specifications, and Special Provisions, hydrants encased in polyethylene tubing shall have plugged drain outlets.

**B Connection and Assembly of Joints**

Where rubber gasketed joints are specified, care shall be taken during the laying and setting of piping materials to insure that the units being joined have the same nominal dimension of the spigot outside diameter and the socket inside diameter. A special adaptor shall be provided to make the connection when variations in nominal dimension might cause unsatisfactory joint sealing.

Immediately before making the connection, the inside of the bell or socket and the outer surface of the spigot ends shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter. Insertion of spigot ends into the socket or bell ends shall be accomplished in a manner that will assure proper centering and insertion to full depth. The joint seal and securing requirements shall be as prescribed below for the applicable pipe and joint type.

**B1 Ductile Iron Pressure Pipe and Fitting Joints**

Ductile iron pressure pipe and fitting joints shall conform to AWWA C-111.

**B1a Push-On Joints**

The circular rubber gasket shall be kept in a warm, flexible condition at all times, and for purposes of placement shall be flexed inward and inserted in the gasket recess of the bell socket. A thin film of approved gasket lubricant shall be applied to either the inside surface of the gasket or the outside surface of the spigot end, or to both. Care shall be taken while inserting the spigot end to prevent introduction of contaminants. The joint shall be completed by forcing the spigot end to the bottom of the socket by the use of suitable pry-bar or jack type equipment. Spigot ends which do not have depth marks shall be marked before assembly to insure full insertion. Field cut pipe shall be filed or ground at the spigot edge to resemble the manufacturer's fabricated detailing. The use of the bucket on the excavation equipment to force the pipe into the socket shall not be permitted.

**B1b Mechanical Joints**

The last eight inches of the outside spigot surface and the inside bell surface of each pipe and appurtenance joint shall be painted with a soap solution, after being thoroughly cleaned. The gland shall then be slipped on the spigot end with the lip extension toward the socket or bell end. The rubber gasket shall be kept in a warm, flexible condition at all times, and for purposes of placement shall be painted with soap solution and be placed on the spigot end with the thick edge toward the gland. An approved lubricant provided by the pipe manufacturer may be used in lieu of the soap solution.
After the spigot end is inserted into the socket to full depth and centered, the gasket shall be pressed into place within the bell evenly around the entire joint. After the gland is positioned behind the gasket, all bolts shall be installed and the nuts tightened alternately to the specified torque, such as to produce equal pressure on all parts of the gland.

Unless otherwise specified, the bolts shall be tightened by means of a suitable torque-limiting wrench to within a foot-pound range of: 45 to 60 for 5/8 inch bolts; 75 to 90 for 3/4 inch bolts; 85 to 100 for 1 inch bolts; and 105 to 120 for 1-1/4 inch bolts. After tightening, all exposed parts of the bolts and nuts shall be completely coated with an approved asphaltic type rust preventive material.

**B1c Flanged Joints**

Flanged joints shall be installed only in above grade or exposed locations and shall conform to the requirements of AWWA C115 Specifications, the Plans, Specifications and Special Provisions. Flanged joints shall have full face gaskets.

**B2 Prestressed Concrete Cylinder Pipe Joints**

Unless otherwise indicated, all pipe and appurtenances shall be joined by means of the rubber gasketed bell and spigot connection in accordance with AWWA C301 or C304 and with the recommendations of the pipe manufacturer and the provisions hereof. All contact surfaces of the steel bell and spigot assembly shall be thoroughly lubricated with approved material before the connection is made.

After the joint has been set in the home position, the outside joint recess shall be filled with cement grout, poured into place by means of a paper or cloth diaper. The grout shall contain at least one part Portland cement for each two parts of sand. Care shall be taken in pouring the grout to assure complete filling of the recess around the entire pipe circumference.

**B3 Polyvinyl Chloride Pipe Joints**

**B3a Push-On Joints**

The circular rubber gasket shall be bonded to the inner wall of the gasket recess of the bell socket. Installation of pipe spigot into the bell socket shall conform to the requirements for Ductile Iron Push-On Joints as set forth under the provisions of 2611.3B1a

**B4 Polyethylene Pipe Joints**

Polyethylene pipe joints shall conform to the requirements of AWWA C-906, and shall be made by the Thermal Butt-Fusion Method.
**C Water Service Installations**

Water service facilities consisting of Tap Service Lines and Branch Service Lines, complete with all required appurtenances, shall be installed as required by in the Plans, Specifications, and Special Provisions, in accordance with all pertinent requirements for main line installations together with the provisions hereof.

It shall be the responsibility of the Contractor to keep an accurate record of the location, depth and size of each service connection and other pertinent data such as the location of curb stops and pipe endings. Tap locations shall be recorded in reference to survey line stationing. Curb stops shall be tied to definable land marks such as building corners, lot corner markers, etc. Pipe terminals at the property line shall be marked to the ground surface with a suitable wood timber 4 by 4 inch, 8 feet long set vertically into the ground with the top 2 feet painted blue. Approved record keeping forms will be furnished by the Engineer and the completed records shall be submitted by the Contractor upon completion of the work.

Water service lines shall normally be installed by trenching and be subject to the same requirements as prescribed for the main pipeline installation, except for those which may not be pertinent or applicable. Where water service lines are installed alongside of sanitary service lines, installation shall be such as to maintain the minimum specified clearances between pipelines and provide proper and adequate bearing for all pipes and appurtenances. For separate installation, the trench width shall be not less than two feet. Subject to minimum clearances, the water lines may be laid in a common trench excavated principally for sewer installation, either by widening the trench as necessary or by providing a shelf in the trench wall where ground stability will permit. When water service pipe is placed in a common trench with sewer service pipe, the sewer service pipe shall be constructed of materials and with joints equivalent to water main standards.

Water service lines shall be installed to provide for the specified cover over the top of the pipe and with not less than 18 inches of clearance between pipelines. A minimum 3 inches of clearance shall be maintained in crossing over or under other structures. Where the service pipe may be exposed to freezing due to insufficient cover or exposure from other underground structures, the water pipe shall be insulated as directed by the Engineer.

**C1 Tee Branch Service Lines**

Tee branch service piping shall be of the type, size, and wall thickness specified. The pipe and appurtenances shall have rubber gasketed push-on or mechanical joints. Tee branch service lines shall be provided as required by the Plans.

Installation of tee branch service facilities shall be in accordance with all applicable requirements of these specifications as pertain to the mainline installations.
C2 Tapped Service Lines

Service piping shall be of the size and type specified. Unless otherwise specified, minimum pipe size for tap service installations shall be one inch nominal inside diameter. Larger size pipe may be specified for commercial and industrial uses or for some domestic service as specifically identified.

Installation of service facilities shall be in accordance with all applicable requirements of these specifications as pertain to the mainline installations, subject to the exceptions and supplementary provisions set forth hereinafter.

Unless otherwise indicated, service piping may be laid directly on any solid foundation soil that is free of stones and hard lumps. However, when specified or ordered, aggregate materials shall be furnished and placed as necessary to secure proper foundation drainage, pipe covering, or backfill support.

Tapped service piping of 3/4 inch to and including 1-1/4 inches in diameter shall be installed in one piece without intermediate joint couplings between the corporation stop and the curb stop. Service pipe of 1-1/2 inches in diameter and larger shall be furnished in standard roll lengths to eliminate any intermediate joints. When full roll lengths are less than the service length the rolls may be joined with approved couplings.

Unless otherwise specified, connection of tapped service lines to the water main shall be made at an angle of not more than 22 degrees from the horizontal. A double wrap of Teflon tape shall be placed on the corporation stop threads prior to installation in the main. Expansion loops shall be directed downward or horizontal from the tap.

Unless otherwise indicated, tap service lines shall be installed on a straight line at right angles to the water main or property line as directed by the Engineer. In the absence of specific requirements, the service line shall be terminated at the property line, where it shall be connected to an existing line or, in the case of undeveloped property, it shall be capped, plugged, or peened as approved by the Engineer.

The flaring of copper tubing ends shall be accomplished only with the use of the proper size and type of tools as designed for the purpose. Tubing shall be cut squarely and all edge roughness shall be removed prior to flaring. All couplings shall be tightened securely, so the flared end fits snugly against the bevel of the fitting without leakage. The flared joint couplings shall be made up without the use of jointing compounds.

The service pipe and curb stop coupling depth shall be such as to maintain not less than the specified minimum cover. The service box shall be connected to or centered over the curb stop and be firmly supported on concrete blocking as required by the Plans, Specifications, and Special Provisions. Clearance shall be provided so the service box does not rest on the water pipe. Service boxes shall be installed plumb. The service boxes shall be brought to proper surface grade when the final ground surface has been established.
D Setting Valves, Hydrants, Fittings and Specials

Valves, hydrants, fittings, and specials shall be provided and installed as required by the Plans, Specifications, and Special Provisions, with the exact locations and setting as directed by the Engineer, and with each installation accomplished in accordance with the requirements for installation of mainline pipe to the extent applicable. Support blocking, reaction backing, and anchorage devices shall be provided as required by the Plans, Specifications, and Special Provisions, or as otherwise ordered by the Engineer.

Hydrants shall be installed plumb, with the height and orientation of nozzles as shown in the Plans or as directed by the Engineer. Unless otherwise specified, the hydrants shall be connected to the mainline pipe with 6-inch diameter ductile iron pipe, controlled by an independent valve.

When a hydrant with an open drain outlet is set in clay or other impervious soil, a drainage pit of at least one cubic yard shall be excavated below and around the hydrant base and the pit shall be filled with Foundation Material to a level six inches above the drain outlet. Two layers of tar paper, or other material approved by the Engineer, shall be carefully placed over the rock to prevent backfill material from entering voids in the rock drain. Hydrants located where the groundwater table is above the drain outlet shall have the outlet drain hole plugged or the drain tube cut off to prevent draining, and shall be equipped with a tag stating, "Pump After Use".

Valve boxes shall be centered over the valve wrench nut and be installed plumb, with the box cover flush with the surface of the finished pavement or at such other level as may be directed.

Masonry valve pit structures, for valves with exposed gearing or operating mechanisms, shall be constructed in accordance with the details shown in the Plans and with the applicable provisions of these Specifications.

Drainage blow-offs, air vents, and other special appurtenances shall be provided and installed as required by the Plans, Specifications, and Special Provisions.

All dead ends shall be closed with approved plugs or caps and shall be equipped with suitable blow-off facilities.

E Disinfection of Water Mains

Before being placed in service, the completed water main shall be disinfected. Disinfection materials and procedures, and the collection and testing of water samples, shall be in accordance with the provisions of AWWA C-651. After the final flushing the water shall be tested for bacteriologic quality and found to meet the standards prescribed by the Minnesota Department of Health.

Where an existing water main is cut for the installation of any fitting, the pipe and fittings proposed to be installed shall be disinfected prior to installation as follows:
(1) The interior of the pipe and fittings shall be cleaned of all dirt and foreign material.

(2) The interior of the pipe and fittings shall be thoroughly swabbed or sprayed with a 1 percent minimum hypochlorite solution.

Unless otherwise indicated in the Plans, Specifications, and Special Provisions, the Contractor shall furnish all materials and perform the disinfecting, flushing, and testing as necessary for meeting the water quality requirements. The flushing operations and the form of chlorine and method of application to be used shall be subject to approval by the Engineer.

**F Electrical Conductivity Test**

The Contractor shall perform a conductivity test within one week after completion of pressure testing of the main on all iron pipe water mains to establish that electrical thawing may be carried out in the future. The system (pipeline, valves, fittings, and hydrants) shall be tested for electrical continuity and current capacity. The electrical test shall be made after the hydrostatic pressure test and while the line is at normal operating pressure. Backfilling shall have been completed. The line may be tested in sections of convenient length as approved by the Engineer.

Direct current of 350 amperes + 10%, shall be passed through the pipeline for 5 minutes. Current flow through the pipe shall be measured continuously on a suitable ammeter and shall remain steady without interruption or excessive fluctuation throughout the 5-minute test period.

Insufficient current or intermittent current or arcing, indicated by large fluctuation of the ammeter needle, shall be evidence of defective contact in the pipeline. The cause shall be isolated and corrected. Thereafter, the section in which the defective test occurred shall be retested as a unit and shall meet the requirements.

Sources of Direct Current for these tests may be motor generators, batteries, arc welding machines, etc. Direct Current arc welding machines will probably be the usual source. These machines are available in adequate capacity for these tests and are equipped with controls for regulating the current output. All such equipment shall be furnished by the Contractor, subject to the approval of the Engineer.

Cables from the power source to the section of system under test should be of sufficient size to carry the test current without overheating or excessive voltage drop. Usable sizes will probably be in the range of 2/0 to 4/0 A.W.G.

Connections for the test shall be made at hydrants. The hydrants shall be in the open position with the caps on during the test. The cable shall be clamped to the body of the hydrant.

Note: After the test the hydrant shall be shut off and a cap loosened to allow hydrant drainage or the hydrant shall be pumped dry. Tighten cap after drainage.
In using arc welding machines, the current control should be set at minimum before starting. After starting the machines, advance the control until the current indicated on the ammeter is at the desired test value. Caution: In case of open circuits at joints or connections, the voltage across the defective joint or connection will be in order of 50-100 volts.

G Hydrostatic Testing of Water Mains

After the pipe has been laid, including fittings and valves and blocking, all newly-laid pipe or any valved section thereof, unless directed otherwise by the Engineer, shall be subject to hydrostatic pressure of 150 pounds per square inch. The duration of each such test shall be at least two hours.

Each section of pipe to be tested shall be filled with water and all air expelled at the highest point. The required taps to expel air or to fill the water main shall be supplied and installed by the Contractor and shall be 3/4 inch and shall include an approved service saddle when required.

The test apparatus shall be applied at the lowest elevation on the section to be tested. The apparatus shall be connected to the main at a service tap or special tap location.

The pressure gauge shall be a standard pressure gauge. The dial shall register from 0 - 200 psi and have a dial size of 4 1/2 inches with 1 psi increments.

The hydrostatic test, pressure requirement for an acceptable test shall be a maximum pressure drop of 2 psi during the last hour of the two hour pressure test.

If this test requirement cannot be met, the Contractor shall investigate the cause, make corrections, and retest until the pressure drop requirement can be met.

Only if several consecutive tests indicate a consistent pressure drop and only after the Contractor has made numerous attempts to resolve the problem, acceptable to the Engineer, may the Contractor request in writing and the Engineer consider the use of the leakage test. The leakage test may be performed by the Contractor to determine the magnitude of the leak, however, meeting the leakage allowance shall not automatically be considered acceptance, in lieu of the pressure test, for the section being tested. Final acceptance shall be at the discretion of the Engineer.

When allowed, the leakage test shall be performed in accordance with AWWA C-600, Section 4.1.5, 4.1.6 and the line will be accepted as per Section 4.1.7.

H Operational Inspection

At the completion of the project and in the presence of the Engineer and the Contractor, representatives of the Owner shall operate all valves, hydrants, and water services to ascertain that the entire facility is in good working order; that all valve boxes are centered and valves are opened; that all hydrants operate and drain properly; that all curb boxes are plumb and centered; and that water is available at all curb stops.
2611.4 METHOD OF MEASUREMENT

All items will be measured separately according to design designation as indicated in the Pay Item name and as may be detailed and defined in the Plans, Specifications, or Special Provisions. Pipe will generally be designated by size (inside diameter or span), strength class, kind or type, and laying condition. Payment shall include all component parts thereof as described or required to complete the unit, but excluding any item covered by a separate pay item. Lineal measurement of piping will include the running length of any special fittings (tees, wyes, bends, gates, etc.) installed within the line of measure between specified terminal points.

A Water Pipe

Mainline pipe and service pipe of each kind and size will be measured separately by the overall length along the axis of the pipeline, from beginning to end of each installation and without regard to intervening valves or specials. Terminal points of measure will be the spigot or cut end, base of hub or bell end, center of valves or hydrants, intersecting centers of tee or wye branch service connections, and center of corporation stop or curb stop couplings.

B Valves

Valves of each size and type will be measured separately as complete units, including the required manhole or valve box setting.

C Corporation Stops

Corporation stops of each size and type will be measured separately by the number of units installed, including the water main tap and saddle.

D Curb Stops

Curb stops of each size and type will be measured separately by the number of units installed, including the required curb box.

E Hydrants

Hydrants will be measured by the number of units installed.

F Air Vents

Air vents of each type and size will be measured separately by the number of complete units installed, including the required manhole or valve box setting.
G Rearrangement of Inplace Facilities

The removal, relocation, extension, or adjustment of existing inplace facilities will be measured, as indicated in the Proposal.

H Polyethylene Encasement

Polyethylene encasement of pipe will be measured by the linear foot of pipe encased of each specified size.

I Ductile and Gray Iron Fittings

Ductile Iron and Gray Iron fittings shall be measured by the pound without joint accessories or on an each basis as specified on the Proposal or in the Special Provisions.

The standard weight of Ductile Iron and Gray Iron fittings, for payment basis, shall be as published in AWWA C-110.

J Polyvinyl Chloride or Polyethylene

Polyvinyl Chloride or Polyethylene fittings shall be measured on an each basis as specified and shown on the Proposal or in the Special Provisions.

K Access Structures

Access structures, such as valve boxes, service boxes, manholes and vaults, will be measured for payment only when and to the extent that the Proposal contains specific items therefore. Otherwise, the required structures are included for payment as part of the pipe appurtenance (Gate Valve, Curb Stop, Air Vent, etc.) item which is served. When applicable, measurement will be by the number of individual units installed of each type and design.

2611.5 BASIS OF PAYMENT

Payment for construction of water distribution facilities will be made as detailed in the method of measurement and as shown on the Bid Proposal or detailed in the Special Provisions. Payment shall include all costs of furnishing and installing the complete facility as required by the Plans, Specifications, and Special Provisions.

Payment shall be made for Water Main Pipe, Service Pipe, and Tapped Service Pipe, of each size and kind at the appropriate Contract prices per linear foot installed. All costs of pipeline disinfection, leakage testing, pipe jointing materials, dead end plugs and caps, making connections to existing facilities, blocking and anchorage materials, and other work necessary for proper installation of pipe as specified shall be included for payment as part of the pipe item, without any direct compensation being made therefore unless specific pay items are included on the Proposal.
Payment shall be made for Valves, Corporation Stops, Curb Stops, Hydrants, Air Vents, Polyethylene Encasement, Insulation, and other specially identified appurtenant items, at the appropriate Contract prices per unit of measure for each size and type or kind installed. Access structures such as Valve Boxes, Service Boxes, Manholes, and Vaults will be paid for as separate items only when separate pay items are included on the Proposal.

Payment for rearrangement of inplace facilities or vertical offset of proposed facilities shall be made under specially named items at the appropriate Contract prices per unit of measure and shall be compensation in full for all costs of performing the work as specified.

All costs of excavating to foundation grade, preparing the foundation, placing and compacting backfill materials, restoring surface improvements, and other work necessary for prosecution and completion of the work as specified, shall be included for payment as part of the pipe and pipe appurtenance items without any direct compensation being made therefore, unless specific pay items are included on the Proposal.

When special aggregate backfill materials are required to be furnished and placed to comply with the indicated Laying Conditions, the costs thereof shall be included for payment as part of the pipe items without any direct compensation therefore.

In the absence of special payment provisions, all costs of repairing, replacing, or otherwise restoring surface improvements as required by the Contract shall be included for payment as part of other Contract items without any direct compensation being made therefore.

****END OF SECTION****
SECTION 02620 - SUBSURFACE DRAINS

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary to construct subsurface drains as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification No. 2502 shall apply to the subsurface drains, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 SUBSURFACE PIPE AND FITTINGS

A. Perforated PVC drain pipe, SDR35 (ASTM D3034)

B. Perforated PVC drain pipe, A-2000 (ASTM D2412)

C. Perforated corrugated polyethylene drainage tubing, PE (ASTM D3350)

D. Cleanout caps on inspection tees shall be cast iron screw in type.

2.2 GRANULAR MATERIALS

A. The filter aggregate shall conform to the requirements of Mn/DOT 3149-H for coarse filter aggregate.

2.3 GEOTEXTILE SOCK

A. The geo-textile sock shall conform to the requirements of MnDOT 3733, Type I.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. If an existing utility is shown on the plans and there is no bid item for removing and restoring, or working around the utility, the Contractor shall be required to remove and restore, or protect the utility.

B. The Contractor shall install and operate a dewatering system to maintain all trenches free of water wherever necessary. The Contractor shall be responsible for any damage to adjacent structures or buildings caused by the dewatering operations. The Contractor shall make his own subsurface investigations and determine what dewatering methods to utilize to prevent such damage.

C. Existing inverts shall be protected during construction. If debris enters culverts or sewers, it shall be the responsibility of the Contractor to clean.

D. Inspection tees shall be installed flush with the finished boulevard grade.
E. Where subdrains are connected to catch basins or manholes, rodent protection shall be installed.

****END OF SECTION****
SECTION 2621
STANDARD SPECIFICATIONS
FOR
SANITARY SEWER
AND
STORM SEWER INSTALLATION
1999 EDITION

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2621 STANDARD SPECIFICATIONS FOR SANITARY SEWER AND STORM SEWER INSTALLATION

2621.1 DESCRIPTION

This work shall consist of the construction of pipe sewers utilizing plant fabricated pipe and other appurtenant materials, installed for conveyance of sewage, industrial wastes, or storm water. The work includes construction of manhole and catch basin structures and other related items as specified.

Use of the term "Plans, Specifications, and Special Provisions" within this specification shall be construed to mean those documents which compliment, modify, or clarify these specifications and are accepted as an enforceable component of the Contract or Contract Documents. All references to Mn/DOT Specifications shall mean the latest published edition of the Minnesota Department of Transportation Standard Specifications for Construction as modified by any Mn/DOT Supplemental Specifications issued before the date of advertisement for bids. All references to other Specifications of AASHTO, ASTM, ANSI, AWWA, etc. shall mean the latest published edition available on the date of advertisement for bids.

The following specifications have been referenced in this Specification:

AASHTO M198 Specification for Joints for Circular Concrete Sewer and Culvert Pipe Using Flexible Watertight Gaskets

AASHTO M294 Specification for Corrugated Polyethylene Pipe, 300-to 1200-mm Diameter

ASTM A48 Specification for Gray Iron Castings

ASTM A74 Specification for Cast Iron Soil Pipe and Fittings

ASTM C76 Specification for Reinforced Concrete Pipe

ASTM C270 Mortar for Unit Masonry

ASTM C361 Specification for Reinforced Concrete Low Head Pressure Pipe

ASTM C425 Specification for Compression Joints for VCP and Fittings

ASTM C443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets

ASTM C478 Specification for Precast Reinforced Concrete Manhole

ASTM D543 Test Method for Resistance of Plastic to Chemicals
2621.2 MATERIALS

All materials required for this work shall be new material conforming to requirements of the referenced specifications for the class, kind, type, size, grade, and other details indicated in the Contract. Unless otherwise indicated, all required materials shall be furnished by the Contractor. If
any options are provided for, as to type, grade, or design of the material, the choice shall be limited as may be stipulated in the Plans, Specifications, or Special Provisions.

All manufactured products shall conform in detail to such standard design drawings as may be referenced or furnished in the Plans. Otherwise, the Owner may require advance approval of material suppliers, product design, or other unspecified details as it deems desirable for maintaining adopted standards.

At the request of the Engineer, the Contractor shall submit in writing a list of materials and suppliers for approval. Suppliers shall submit a Certificate of Compliance that the materials furnished have been tested and are in compliance with the specifications.

**A Sewer Pipe and Service Line Materials**

All pipe furnished for main sewer and service line installations shall be of the type, kind, size, and class indicated for each particular line segment as shown in the Plans and designated in the Contract Items. Wherever connection of dissimilar materials or designs is required, the method of joining and any special fittings employed shall be products specifically manufactured for this purpose and subject to approval by the Engineer.

**A1 Vitrified Clay Pipe and Fittings**

Vitrified clay extra strength pipe and fittings shall conform to the requirements of ASTM M-65 for the size and type and class specified, subject to the following supplementary provisions:

1. Unless otherwise specified, the pipe and fittings shall be non-perforated, full circular type, either glazed or unglazed.

2. All pipe and fittings manufactured with bell-and-spigot ends shall be furnished with factory fabricated compression joints conforming to the requirements of ASTM C-425.

3. In lieu of the bell-and-spigot jointing requirements, the pipe and fittings may be furnished with plain ends, in which case the jointing shall be by means of compression couplings conforming to the requirements of ASTM C-425, Type B.

4. All clay pipe fittings (wyes, tees, bends, plugs, etc.) shall be of the same pipe class and joint design as the pipe to which they are to be attached.

5. Pipe and fittings manufactured to the standards of AASHTO 52; 65 may be accepted by prior approval of the Engineer.

**A2 Ductile Iron Pipe and Ductile Iron and Gray Iron and Fittings**

The pipe furnished shall be Ductile Iron pipe and fittings furnished shall be of the Ductile Iron or Gray Iron type as specified for each particular use of installation. When Gray Iron is specified,
either type may be furnished. Gray Iron may not be substituted for Ductile Iron unless specifically authorized in the Special Provisions.

Ductile iron pipe shall conform to the requirements of AWWA C115 or C151 for water and thickness design shall conform to AWWA C150. In addition, the pipe shall comply with the following supplementary provisions:

(1) Fittings shall conform to the requirements of AWWA C110 OR 153 (Gray Iron and Ductile Iron Fittings or Ductile Iron Compact Fittings) for the joint type specified.

(2) Unless otherwise specified, all pipe and fittings shall be furnished with cement mortar lining meeting the requirements of AWWA C104 for standard thickness lining. All exterior surfaces of the pipe and fittings shall have an asphaltic coating at least one mil thick. Spotty or thin seal coating, or poor coating adhesion, shall be cause for rejection.

(3) Rubber gasket joints for Ductile Iron Pressure Pipe and fittings shall conform to AWWA C111.

A3 Reinforced Concrete Pipe and Fittings

Reinforced concrete pipe, fittings and specials shall conform with the requirements of ASTM C-76 (Reinforced Concrete Pipe) with rubber O-ring or profile joints for the type, size, and strength class specified, subject to the following supplementary provisions:

(1) All branch fittings such as tees, wyes, etc. shall be cast as integral parts of the pipe. All fittings and specials shall be of the same strength class as the pipe to which they are attached.

(2) Joints shall meet the requirements of ASTM C-361.

(3) Lift holes will not be permitted unless specifically authorized in the Plans, Specifications, and Special Provisions.

A4 Corrugated Steel Pipe and Fittings

Corrugated steel pipe and fittings shall conform to the requirements of Mn/DOT Specification 3226 (Corrugated Steel Pipe) for the type, size and sheet thickness specified. When specifically provided for in the Plans, Specifications, and Special Provisions, the galvanized steel pipe and fittings shall be furnished with special aramid fiber bonded, bituminous, or plastic coating or concrete lining as required.

A5 Polyvinyl Chloride Pipe and Fittings

Smooth walled polyvinyl chloride pipe and fittings shall conform with the requirements of ASTM D-3034 and ASTM F-679 for the size, standard dimension ratio (SDR), and strength requirements indicated on the Plans, Specifications, and Special Provisions. The grade used shall be resistant to
aggressive soils or corrosive substances in accordance with the requirements of ASTM D-543. Unless otherwise specified, all pipe and fittings shall be SDR 35 and connections shall be push-on with elastomeric gasketed joints which are bonded to the inner wall of the gasket recess of the bell socket.

Corrugated polyvinyl chloride pipe and fittings with smooth interior shall conform with the requirements of ASTM F-949 for the size and wall thickness indicated on the Plans, Specifications, and Special Provisions. Unless otherwise specified, all pipe and fittings shall be push-on with snug fit elastomeric joints meeting tightness requirements of ASTM D-3212.

A6 Cast Iron Soil Pipe

Unless otherwise specified in the Plans, Specifications, and Special Provisions, cast iron soil pipe shall be service weight pipe meeting the requirements of ASTM A-74 and the Plans, Specifications, and Special Provisions. Unless otherwise specified, pipe joints shall be push-on, sealed with elastomeric gaskets, meeting the requirements of ASTM C-564.

A7 Acrylonitrile-Butadiene-Styrene Pipe

Acrylonitrile-Butadiene-Styrene (ABS) solid wall pipe and fittings shall conform to the requirements of ASTM D-2751 for 4 inch and 6 inch diameter and shall be gasket seal joints, assembled as recommended by the pipe manufacturer. Solvent cemented joints, assembled as recommended by the pipe manufacturer, shall be provided only where specifically indicated in the Plans, Specifications, and Special Provisions.

A8 Dual-Wall Corrugated Polyethylene Pipe

Dual-Wall Corrugated Polyethylene Pipe shall conform to the requirements of AASHTO M-294 and Design 18 of the AASHTO Standard Specifications for Highway Bridges for storm sewer pipe sizes 12-inch through 36-inch. Joints shall be water-tight unless the engineer approves a soil-tight joint. Pipe manufacture, water-tight joint testing, and installation shall conform to current Mn/DOT requirements and/or as indicated in the Plans, Specifications, and Special Provisions.

B Metal Sewer Castings

Metal castings for sewer structures such as manhole frames and covers, catch basin frames, grates and curb boxes, shall conform to the requirements of ASTM A-48 (Gray Iron Castings), subject to the following supplementary provisions:

(1) Casting assemblies or dimensions, details, weights, and class shall be as indicated in the detailed drawings for the design designation specified. Unless otherwise specified, the castings shall be Class 30 or better.

(2) Lid-to-frame surfaces on round casting assemblies shall be machine milled to provide true bearing around the entire circumference.
(3) Casting weight shall be not less than 95 percent of theoretical weight for a unit cast to exact dimensions, based on 442 pounds per cubic foot.

(4) A Certificate of Compliance shall be furnished with each shipment of castings stating that the materials furnished have been tested and are in compliance with the specification requirements.

(5) Unless otherwise specified, sanitary sewer manholes in areas subject to flooding by surface water shall have self-sealing lids and recessed pick holes.

(6) Unless otherwise specified, sanitary sewer manhole lids shall have recessed pick holes.

C Precast Concrete Manhole and Catch Basin Sections

Precast concrete riser sections and appurtenant units (grade rings, top and base slabs, special sections, etc.) used in the construction of manhole and catch basin structures shall conform with the requirements of ASTM C-478, Mn/DOT 2506 and the following supplementary provisions:

(1) The precast sections and appurtenant units shall conform to all requirements as shown on the detailed drawings.

(2) Joints of manhole riser sections shall be tongue and groove with rubber "O" ring or profile joints provided on sanitary sewer manholes. Sanitary sewer inlet and outlet pipes shall be joined to the manhole with a gasketed, flexible, watertight connection or any watertight connection arrangement that allows differential settlement of the pipe and manhole wall to take place.

(3) Air-entrained concrete shall be used in the production of all units. Air content shall be maintained within the range of 5 to 7 percent.

(4) A Certificate of Compliance shall be furnished with each shipment of precast manhole and catch basin sections stating that the materials furnished have been tested and are in compliance with the specification requirements.

(5) Lift holes will not be permitted in precast manholes.

D Concrete

Concrete for cast-in-place masonry construction shall be produced and furnished in accordance with the requirements of Mn/DOT Specification 2461 for the mix designation indicated in the Plans. The requirements for Grade B concrete shall be met where a higher grade is not specified. Type 3 (air-entrained) concrete shall be furnished and used in all structures having weather exposure.
E Mortar

Mortar for use in masonry construction shall be an air-entrained mixture of one part Masonry cement, Type S, and two parts mortar sand, with sufficient water to produce proper consistency, and with sufficient air-entraining agent added to maintain an air content within the range of 7 to 10 percent. Mortar shall meet the requirements of ASTM C-270.

2621.3 CONSTRUCTION REQUIREMENTS

A Installation of Pipe and Fittings

A1 Inspection and Handling

Proper and adequate implements, tools, and facilities satisfactory to the Engineer shall be provided and used by the Contractor for the safe and convenient prosecution of the work. During the process of unloading, all pipe and accessories shall be inspected by the Contractor for damage. The Contractor shall notify the Engineer of all material found to have cracks, flaws or other defects. The Engineer shall inspect the damaged materials and have the right to reject any materials found to be unsatisfactory. The Contractor shall promptly remove all rejected material from the site. All materials shall be handled carefully, as will prevent damage to protective coatings, linings, and joint fillings; preclude contamination of interior areas; and avoid jolting contact, dropping, or dumping.

All work and materials are subject to tests by the Owner at such frequency as may be determined by the Engineer.

While suspended and before being lowered into laying position, each pipe section and appurtenant unit shall be inspected by the Contractor to detect damage or unsound conditions that may need corrective action or be cause for rejection. The Contractor shall inform the Engineer of any defects discovered and the Engineer will prescribe the required corrective actions or order rejection.

Immediately before placement, the joint surfaces of each pipe section and fitting shall be inspected for the presence of foreign matter, coating blisters, rough edges or projections, and any imperfections so detected shall be corrected by cleaning, trimming, or repair as needed.

A2 Pipe Laying Operations

Trench excavation and bedding preparations shall proceed ahead of pipe placement as will permit proper laying and joining of the units at the prescribed grade and alignment without unnecessary deviation or hindrance.

All foreign matter or dirt shall be removed from the inside of the pipe and fittings before they are lowered into position in the trench and they shall be kept clean by approved means during and after laying. The sewer materials shall be carefully lowered into laying position by the use of suitable restraining devices. Under no circumstances shall the pipe be dropped into the trench.
At the time of pipe placement, the bedding conditions shall be such as to provide uniform and continuous support for the pipe between bell holes. Bell holes shall be excavated as necessary to make the joint connections, but they shall be no larger than would be adequate to support the pipe throughout its length. No pipe material shall be laid in water nor when the trench or bedding conditions are otherwise unsuitable or improper.

When placement or handling precautions prove inadequate, in the Engineer’s opinion, the Contractor shall provide and install suitable plugs or caps effectively closing the open ends of each pipe section before it is lowered into laying position, and they shall remain so covered until removal is necessary for connection of an adjoining unit.

Unless otherwise permitted by the Engineer, bell and spigot pipe shall be laid with the bell ends facing upgrade and the laying shall start on the downgrade end and proceed upgrade. As each length of bell and spigot pipe is placed in laying position, 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 approved backfill material, which shall be thoroughly compacted by tamping around the pipe to a height of at least 12 inches above the top with hand operated mechanical tamping devices or by hand. The joint areas shall remain exposed and precautions shall be taken to prevent the soil from entering the joint space, until the joint seal is effected. Backfill in the bell area shall be left loose.

Connection of pipe to existing lines or previously constructed manholes or catch basins shall be accomplished as shown in the Plans or as otherwise approved by the Engineer. Where necessary to make satisfactory closure or produce the required curvature, grade or alignment deflections at joints shall not exceed that which will assure tight joints and comply with any limitations recommended by the pipe manufacturer.

Entrance of foreign matter into pipeline openings shall be prevented at all times to the extent that suitable plugs or covering can be kept in place over the openings without interfering with the installation operations.

Installation of thermoplastic pipe shall conform to ASTM D-2321.

A3 Connection and Assembly of Joints

All pipe and fitting joints shall fit tightly and be fully closed. Spigot ends shall be marked as necessary to indicate the point of complete closure. All joints shall be soil tight, as the minimum requirement, and shall be watertight in all sanitary sewer pipe lines and in all storm sewer pipe lines installed within the limits of a paved street or highway traffic lanes. Where specified, the joints in certain assemblies shall be made structurally integral by being completely encased in concrete to form a rigid watertight unit as indicated in the standard drawings.

All joints shall be sealed as follows, subject to such other approved method as the Engineer may authorize as being an acceptable alternative:
(1) Concrete pipe and fitting joints - compression type rubber gasket seals conforming to the requirements of ASTM C-443, ASTM C-361 or AASHTO M-198 for circular pipe, or as otherwise approved by the Engineer in the case of non-circular pipe sections.

(2) PVC pipe, and ABS solid wall pipe and fittings assembled gasket seal joints.

(3) Corrugated smooth wall PVC and corrugated-double wall HDPE pipe and fittings - assembled push-on gasketed joints shall pass performance tests as listed in ASTM D-3212. Solvent welds shall not be permitted.

(4) Vitrified clay pipe and fittings - factory fabricated compression seals or compression type couplings.

(5) Corrugated steel pipe and fittings - sealed with approved type compression seals.

**A4 Bulkheading Open Pipe Ends**

All pipe and fitting ends left open for future connection shall be bulkheaded by approved methods prior to backfilling. Unless otherwise specified or approved, all openings of 24 inches in diameter or less shall be closed off with prefabricated plugs or caps and all openings larger than 24 inches in diameter shall be closed off with masonry bulkheads.

Prefabricated plugs and caps shall be of the same material as the pipe material, or an approved alternate material, and they shall be installed with watertight seal as required for the pipeline joints. Masonry bulkheads shall be constructed with clay or concrete brick to a wall thickness of eight inches.

Bulkheads installed for temporary service during construction may be constructed with two-inch timber planking securely fastened together and adequately braced, as an alternate to the masonry construction.

**B Appurtenance Installations**

Appurtenance items such as aprons, trash guards, gates and castings shall be installed where and as required by the Plans and in accordance with such standard detail drawings or supplementary requirements as may be specified.

Casting assemblies installed on manhole or catch basin structures shall be set in a full mortar bed and be adjusted to the specified elevation without the use of shims or blocking.

Sewer aprons shall be subject to all applicable requirements for installation of pipe. All aprons and outfall end sections shall have the last three sections tied. Two tie bolt fasteners shall be placed in each of the last three joints, one on each side of top center at the 60 degree point (from vertical). Tie bolt diameter shall be: 1/2 inch for 12” to and including 21” pipe; 5/8 inch for 24” to and
including 36" pipe; 3/4 inch for 42" to and including 54" pipe; and 1" for 60" and larger pipe. The tie bolts shall be of a design approved by the Engineer.

C Sewer Service Installations

Main sewer service connections and building service sewer pipe shall be installed as provided for in the Contract and as may be directed by the Engineer. The sewer service connections and pipe lines shall be installed in conformance with all applicable requirements of the main sewer installation and as more specifically provided for herein.

The Engineer, with the assistance of the Contractor, shall keep accurate records of all service installations as to type, location, elevation, point of connection and termination, etc. This service record shall be maintained jointly by the Contractor and Engineer on forms provided by the Engineer. The service installations shall not be backfilled until all required information has been obtained and recorded.

The main sewer service connection shall consist of installing a Branch Tee or Wye section in the main sewer line at designated locations or providing an insert type Saddle Tee in a pipe cutout where and as permitted or required in lieu of the built-in fitting. Orientation of service connection fitting shall be as shown in the standard drawings unless otherwise directed by the Engineer.

Where the depth of cover over the main sewer invert is greater than 15 feet (or such other maximum as may be indicated), the service connection shall be extended upward by means of a Service Riser Section in accordance with the details shown in the standard drawings.

Unless otherwise specified, service pipe shall be installed at right angles to the main sewer and at a straight line grade to the property line. The standard and minimum grades shall be a uniform rise of one inch in four feet for sanitary service lines and one inch in eight feet for storm sewer service lines. These minimum grades may be reduced (by not more than one-half pitch) where the Engineer so approves in the case of restrictive elevation differences.

Building service pipe lines shall generally be kept as deep as required to serve the building elevation and maintain the specified minimum pipe grades. Pipe bends shall be provided as necessary to bring the service lines to proper location and grade. Pipe bends shall not exceed 22-1/2 degrees without approval of the Engineer.

Unless otherwise indicated, service pipe installation shall terminate at property line or as designated on the Plans, with a gasketed plug placed in the end, at which point the Contractor shall furnish and set a 4 x 4 inch wooden timber 6 feet to 8 feet in length embedded 4 feet below grade, or approved steel post to mark the exact end of pipe. The timber or post shall be set vertically, with the top 2 feet painted green.

Wherever service line connections to the main sewer are permitted or required to be made by the open cut-out method in the absence of a built-in Tee or Wye fitting, the connection shall be made by using an approved type of Saddle Tee fitting. The pipe cut-out shall be made with an approved type coring machine or by other approved methods producing a uniform, smooth circular cut-out
as required for proper fit. The cut-out discs shall be retrieved and shall not be allowed to remain within the main sewer pipe. The Saddle Tee shall be securely fastened to the main sewer pipe by means of epoxy resin or other approved adhesive. The entire connection fitting shall be encased in concrete to a minimum thickness of six inches and as may be shown in the standard drawings.

Wherever service line connections to the main sewer are required to be made by means of built-in Branch Tee or Wye fittings, the Contractor shall, in the absence of such fitting, remove a section of the main sewer pipe and replace it with the required Branch Tee or Wye section connected by means of an approved sleeve coupling.

Sanitary sewer service lines shall not be connected to a manhole at an elevation more than 24 inches above the crown of the outgoing sewer. Where the elevation difference is greater than 24 inches, the connection shall be made by means of an Outside Drop Connection in accordance with the details shown in the standard drawings.

All pipe and fitting openings at temporary terminal points shall be fitted with suitable plugs or shall be bulkheaded as required for the main sewer pipe.

**D Manhole and Catch Basin Structures**

Manholes, catch basins, and other special access structures shall be constructed at designated locations as required by the Plans and in accordance with any standard detail drawings or special design requirements given therefor.

Unless otherwise specified or approved, manholes and catch basins shall be constructed on a precast or cast-in-place concrete base and the barrel riser sections, cone section and top adjusting rings shall all be of precast concrete. All units shall be properly fitted and sealed to form a completely watertight structure. Barrel and cone height shall be such as to permit placement of at least two and not more than six standard two-inch precast concrete adjusting rings or as shown on the plan immediately below the casting assembly.

Unless otherwise specified or approved, manholes and catch basins shall have an inside barrel diameter at the bottom of 48 inches minimum and the inside diameter at the top of the cone section and all adjusting rings shall be of the same size and shape as the casting frame. Casting assemblies shall be as specified in the Plans. Catch basin grate elevation shall be adjusted as necessary to maintain the required dip below normal gutter grade, as shown on the plans.

Concrete cast-in-place base shall be poured on undisturbed or firmly compacted foundation material which shall be trimmed to proper elevation. The bottom riser section shall be set in fresh concrete or mortar and all other riser section joints of the tongue and groove design shall be sealed with rubber gaskets. The concrete base under an outside drop connection shall be monolithic with the manhole base.

Wherever special designs so require or permit, and as otherwise may be approved by the Engineer, a precast concrete base may be used or the structure may be constructed with solid sewer brick or block units or with cast-in-place concrete. Any combination of cast-in-place concrete and brick or
block mortar construction will be allowed and may be required where it is impossible to complete the construction with standard precast manhole sections.

All annular wall space surrounding the inplace storm sewer pipes shall be completely filled with mortar or concrete, and the inside bottom of each manhole and catch basin shall be shaped with fresh concrete to form free flow through invert troughs as directed.

E Reconnecting Existing Facilities

Disposition of abandoned facilities and reconnection of existing facilities shall be as provided for in the Plans, Specifications, and Special Provisions.

F Sanitary Sewer Leakage Testing

All sanitary sewer lines, including service connections, shall be substantially watertight and shall be tested for excessive leakage upon completion and before connections are made to the service by Others. Each test section of the sewer shall be subjected to exfiltration testing, either by hydrostatic or air test method as described below and at the Contractor's option. The requirements set forth for maximum leakage shall be met as a condition for acceptance of the sewer section represented by the test.

If the ground water level is greater than three feet above the invert elevation of the upper manhole and the Engineer so approves, infiltration testing may be allowed in lieu of the exfiltration testing, in which case the allowable leakage shall be the same as would be allowed for the Hydrostatic Test.

All testing shall be performed by the Contractor without any direct compensation being made therefor, and the Contractor shall furnish all necessary equipment and materials, including plugs and standpipes as required.

F1 Air Test Method

The pipeline shall be sealed with plug whose sealing length is greater than the diameter of the pipe and constructed in such a nature that it will not require external blocking or bracing and maintain a seal against the line's test pressure.

All wyes, tees, outlets or ends of lateral streets shall be suitably capped and braced to withstand the internal pressures. Such caps or plugs shall be easily removable.

One plug shall be tapped for the air supply hose and the return air pressure hose. The air supply hose, connected from the compressor to the plug shall be a throttling valve, bleeding valve and shut off valve for control. The air pressure tap shall have a sensitive pressure gauge, 0 to 10 psi range, protected by a gauge cock and a pressure relief valve set at 10 psi.
In performing the test, air is added slowly to the pipeline until pressure inside the pipeline reaches 4.0 psi. If air is added too rapidly, the test accuracy will decrease because a change in temperature also has an effect on the change in pressure. When the air pressure inside the pipeline reaches 4.0 psig above external hydrostatic pressure, the supply air is stopped. A minimum two-minute time interval is allowed for the temperature difference to stabilize before the actual test is performed. If the air pressure drops below 3.5 psig during this time interval, more air will be supplied to the pipeline and throttled to maintain a pressure between 3.5 psig and 4.0 psig for a minimum of two minutes after which time the supply air will be shut off.

The portion of line being tested shall be accepted if the portion under test does not lose air at a rate greater than 0.0015 cfm per square foot (for PVC) or 0.003 cfm per square foot (for RCP) per internal pipe end area at an average pressure of 3.0 psig greater than any back pressure exerted by groundwater that may be over the pipe at the time of test.

The test shall be accomplished by determining the time in minutes for the pressure to decrease from 3.5 psig to 3.0 psig greater than the average groundwater that may be over the pipe. That time shall not be less than the time shown on the given diameter in the following table:

Pipe Diameter in Inches Minutes for PVC Minutes for RCP

<table>
<thead>
<tr>
<th>PIPE DIAMETER IN INCHES</th>
<th>PVC</th>
<th>RCP</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1.9</td>
<td>1.0</td>
</tr>
<tr>
<td>6</td>
<td>2.8</td>
<td>1.4</td>
</tr>
<tr>
<td>8</td>
<td>3.8</td>
<td>1.9</td>
</tr>
<tr>
<td>10</td>
<td>4.7</td>
<td>2.4</td>
</tr>
<tr>
<td>12</td>
<td>5.7</td>
<td>2.9</td>
</tr>
<tr>
<td>15</td>
<td>7.1</td>
<td>3.4</td>
</tr>
<tr>
<td>18</td>
<td>8.5</td>
<td>4.3</td>
</tr>
<tr>
<td>21</td>
<td>9.9</td>
<td>5.0</td>
</tr>
<tr>
<td>24</td>
<td>11.3</td>
<td>5.7</td>
</tr>
</tbody>
</table>

If the pipeline fails to meet the requirements of the test, the Contractor shall, at their own expense, determine the source of leakage and then repair or replace all defective material and/or workmanship.

In determining the pressure greater than the average groundwater, the groundwater height in feet above the pipeline must be measured.
When the water elevation has been established, the height in feet above the pipeline shall be divided by 2.31 and that pressure added to gauge pressure of test.

A table for converting water height to gauge pressure is as follows:

<table>
<thead>
<tr>
<th>Groundwater Level over Top of Pipeline</th>
<th>Added Pressure to be Applied to Gauge Pressure Readings (PSIG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 foot</td>
<td>0.43 psig</td>
</tr>
<tr>
<td>2 feet</td>
<td>0.86 psig</td>
</tr>
<tr>
<td>3 feet</td>
<td>1.29 psig</td>
</tr>
<tr>
<td>4 feet</td>
<td>1.72 psig</td>
</tr>
<tr>
<td>5 feet</td>
<td>2.16 psig</td>
</tr>
<tr>
<td>6 feet</td>
<td>2.59 psig</td>
</tr>
<tr>
<td>7 feet</td>
<td>3.01 psig</td>
</tr>
<tr>
<td>8 feet</td>
<td>3.44 psig</td>
</tr>
<tr>
<td>9 feet</td>
<td>3.87 psig</td>
</tr>
<tr>
<td>10 feet</td>
<td>4.30 psig</td>
</tr>
</tbody>
</table>

**F2 Hydrostatic Test Method**

After bulkheading the test section, the pipe shall be subjected to a hydrostatic pressure produced by a head of water at a depth of three feet above the invert elevation of the sewer at the manhole of the test section. In areas where ground water exists, this head of water shall be three feet above the existing water table.

The water head shall be maintained for a period of one hour during which time it will be presumed that full absorption of the pipe body has taken place, and thereafter for an extended period of one hour the water head shall be maintained as the test period. During the one hour test period, the measured water loss within the test section, including service stubs, shall not exceed the Maximum Allowable Loss (in Gallons Per Hour per 100 Feet of Pipe) given below for the applicable Main Sewer Diameter.
<table>
<thead>
<tr>
<th>Main Sewer Diameter (In Inches)</th>
<th>Maximum Allowable Loss* (In Gallons Per Hour Per 100 Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.5</td>
</tr>
<tr>
<td>8</td>
<td>0.6</td>
</tr>
<tr>
<td>10</td>
<td>0.8</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>15</td>
<td>1.2</td>
</tr>
<tr>
<td>18</td>
<td>1.4</td>
</tr>
<tr>
<td>21</td>
<td>1.7</td>
</tr>
<tr>
<td>24 &amp; Larger</td>
<td>1.9</td>
</tr>
</tbody>
</table>

* Based on 100 Gallons Per Day Per Pipe Diameter Inch Per Mile

If measurements indicate exfiltration within a test action section is not greater than the allowable maximum, the section will be accepted as passing the test.

**F3 Test Failure and Remedy**

In the event of test failure on any test section, testing shall be continued until all leakage has been detected and corrected to meet the requirements. All repair work shall be subject to approval of the Engineer. Introduction of sealant substances by means of the test water will not be permitted.

Unsatisfactory repairs or test results may result in an order to remove and replace pipe as the Engineer considers necessary for test conformance. All repair and replacement work shall be at the Contractor's expense.

**G Deflection Test**

Deflection tests shall be performed on all plastic gravity sewer pipes. The test shall be conducted after the sewer trench has been backfilled to the desired finished grade and has been in place for 30 days.

The deflection test shall be performed by pulling a rigid ball or nine-point mandrel (Mn/DOT Technical Memorandum 98-24-B-01 or latest revision) through the pipe without the aid of mechanical pulling devices. The ball or mandrel shall have a minimum diameter equal to 95% of the actual inside diameter of the pipe. The maximum allowable deflection shall not exceed five percent of the pipe's internal diameter. The line will be considered acceptable if the mandrel can progress through the line without binding. The time of the test, method of testing, and the equipment to be used for the test shall be subject to the approval of the Engineer.

All testing shall be performed by the Contractor at his expense without any direct compensation being made therefor, and he shall furnish all necessary equipment and materials required.
G1 Test Failure and Remedy

In the event of test failure on any test section, the section shall be replaced, with all repair work subject to approval of the Engineer. The replaced section shall be retested for leakage and deflection in conformance with the specifications contained herein. All repairs, replacement, and retesting shall be at the Contractor's expense.

H Televising

Sewer line televising may be required by the Engineer, at the cost of the Contractor, if visual inspection, leakage testing, or deflection testing indicate the sewer has not been constructed in accordance with these specifications and the requirements of the Plans, Specifications, and Special Provisions.

2621.4 METHOD OF MEASUREMENT

All items will be measured separately according to design designation as indicated in the Pay Item name and as may be detailed and defined in the Plans, Specifications, or Special Provisions. Pipe will generally be designated by size (inside diameter or span), strength class, kind or type, and laying condition. Complete-in-place items shall include all component parts thereof as described or required to complete the unit, but excluding any excesses covered by separate Pay Items. Linear measurement of piping will include the running length of any special fittings (tees, wyes, elbows, gates, etc.) installed within the line of measure between specified terminal points.

A Sewer Pipe

Sewer pipe of each design designation will be measured by length in linear feet along the line of pipe. Terminal points of measurement will be the pipe end at free outlets; the point of connection with inplace pipe; the center of manholes or catch basins; the point of centerline intersections at branch fittings; or the point of juncture with other appurtenances or units as defined.

Separation of quantities according to "depth zone classification", when so designated in the Pay Item, will be determined by depth of pipe invert below the ground surface profile.

B Manholes

Manholes of each design designation will be measured by number of each constructed complete-in-place, including the base and castings as required, but excluding any excess depth greater than 8.0 feet measured from top of manhole cover to invert elevation of lowest pipe.

Excess manhole depth of each design designation will be measured by the linear foot difference in depth between the 8.0 feet allowed as standard and the actual increased depth as constructed.
C Catch Basins

Catch basins of each design designation will be measured by number of each constructed complete-in-place, including the base and castings as required, but excluding any excess depth greater than 5.0 feet measured from top of grate (low point) to invert elevation of lowest outlet pipe.

Excess catch basin depth of each design designation will be measured by the linear foot difference in depth between the 5.0 feet allowed as standard and the actual increased depth as constructed.

D Outside Drop Connection

Outside drop connections of each design will be measured by number of each constructed complete-in-place, including granular encasement, fittings, and any special piping details as required, including two holes into existing manholes for the drop connection, but excluding any excess vertical drop greater than 2.0 feet measured between invert of high pipe inlet and invert of low pipe outlet.

Excess drop connection depth will be measured by the linear foot difference in vertical drop between the 2.0 feet allowed as standard and the actual increased vertical drop as constructed.

E Service Connection

Service Connections of each design will be measured by number of each constructed complete-in-place as specified.

F Service Pipe

Service pipe of each design will be measured separately by length in linear feet, horizontally along the line of installation, between the service end and the point of juncture with the main pipe connection fitting.

G Special Pipe Fittings

Special pipe fittings (wyes, tees, bends, etc.) of each design designation will be measured by number of each installed complete-in-place as specified, but excluding any such fittings required to be installed as a component part of any other Work Unit.

H Appurtenant Items

Appurtenant items such as aprons, trash guards, gates and other prefabricated units or assemblies as identified by Pay Item name will be measured separately by number of each installed complete-in-place as specified.
2621.5 BASIS OF PAYMENT

Payment for sewer pipe and service pipe items at the Contract prices per linear foot of pipe of each design shall be compensation in full for all costs of providing a complete-in-place pipeline, including excavation, foundation preparation, backfilling, leakage testing, restoration of surface improvements, disposal of surplus or waste materials, final cleanup, and such other work as may be specified, but excluding the construction of other structures or special sections and the placement of special fittings, appurtenances or materials specifically designated for payment under other Contract Items.

Payment for manhole, catch basin, outside drop connection, service connection, and other structures as specified, at the Contract prices per structure, shall be compensation in full for all costs of constructing each unit complete-in-place as specified, including all required castings, special fittings, base or encasement, and appurtenant materials as specified for the complete structure or section, but excluding such additional work as may be designated for payment under other Contract Items.

Where the specified standard manhole, catch basin, or outside drop connection depths are exceeded, the excess depth of each design will be paid for separately as linear footage items and payment at the Contract prices therefor shall be compensation in full for all costs of providing the extra depth.

Special pipe fittings such as wyes, tees and bends will be paid for as separate Contract Items to the extent they are required to be installed in the sewer pipe and service pipe lines and not as a component part of a complete-in-place structure (outside drop connections, service connections, etc.)

Appurtenant items such as aprons, trash guards, drainage gates, and other prefabricated units or assemblies and specials as designated will be paid for as separate Contract Items to the extent they are not included as a component part of any complete-in-place structure.

****END OF SECTION****
SECTION 02630 - PIPE SEWERS – STORM

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to storm sewer construction as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification No. 2506 shall apply to manholes, catch basins and castings, except as modified herein.

B. Reference Section 02320 of these Specifications for trench excavation, bedding and backfill, except as modified herein.

C. CEAM Specification No. 2621 shall apply to construction of pipe sewers, except as modified herein.

D. Mn/DOT Specification No. 2503 shall apply to measurement and payment of pipe sewers, except as modified herein.


F. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 SEWER PIPE AND FITTINGS

A. Under Existing or Proposed Buildings

   1. All underground sewers installed through areas to be occupied by buildings shall comply with all appropriate provisions of the State of Minnesota Plumbing Code, Minnesota Rules Chapter 4715.0550.

   2. Permitted pipe materials shall be: (The 6B, 5M, etc. designations are from the plumbing code.):

      (a) 6B (1), PVC Schedule 40, un-threaded, ASTM D2665, with fabricated fittings ASTM D3311.

      (b) 6B (1), PVC Schedule 80, threaded or un-threaded, cellular core, ASTM F891, with fabricated fittings ASTM D3311.

      (c) 6B (3), PVC Schedule 40 (14 - 24 inch only), ASTM D1785, with ASTM D3311 fittings.

      (d) 6B (4), PVC Schedule 40 and 80, SDR 21 and SDR 26 (6 inch and larger)

      (e) 5M, Reinforced concrete pipe, C-76.

      (f) 5N, Reinforced and pre-stressed concrete pipe, pressure type and fittings.

   3. All pipe and fittings must be laid on a continuous granular bed. Installation must comply with ASTM D2321.

B. Reinforced Concrete Pipe (MnDOT 3236)
1. No exception to the referenced specification is made.

C. Corrugated Polyethylene Pipe and Fittings (MnDOT 3247)

1. Smooth interior and corrugated exterior polyethylene pipe and fittings (diameters through 36-inches) shall conform to the requirements of AASHTO M294 and MnDOT Specification 3247. All joints shall be installed using an approved watertight sleeve with gaskets meeting the requirements of ASTM-F477. Shall be used only when outside of roadway.

2. HDPE aprons will not be accepted. Galvanized metal or approved equal only.

D. Corrugated Steel Pipe (MnDOT 3226)

1. No exception to the referenced specification is made.

2.2 MANHOLES & CATCH BASINS

A. Precast Concrete Manholes and Catch Basin Section

1. Storm sewer manholes shall conform to the Mn/DOT Standard for the design type shown on the plans.

2. Reinforced polypropylene plastic steps shall be furnished for all storm sewer manholes eight feet or more in depth.

B. Castings

1. All casting assemblies shall meet the certification requirements of the Minnesota Department of Transportation and be manufactured by a Mn/DOT approved source.

2. The type of casting assembly to be used shall be Neenah R-1733-C stamped with “storm sewer”, unless otherwise specified on the plan.

3. The type of curb and gutter catch basin casting assembly to be used shall be Neenah R-3250-1, R-3250-CL or R-3067-DL, unless otherwise specified on the plan.

4. When manhole or catch basin castings are located in water table or in “Green Space”, the Contractor shall use American Infrastructure Technologies Multi-Purpose Joint Seal.

C. Adjusting Rings

1. Only concrete adjusting rings shall be permitted.

2.3 GEOTEXTILE FABRIC

A. Mn/DOT 3733, Type II, non-woven for use in wrapping joints in storm sewer.

PART 3 -- EXECUTION

3.1 MANHOLE STRUCTURE

A. Raise / Lower Existing Manhole

1. Raising and/or lowering an existing manhole to meet a proposed finished rim elevation is performed when the addition and/or deletion of 2" adjusting rings will not reach a minimum of 2 rings or exceed a maximum of 6 rings. Typically, it will require: the removal of the manhole cone section or the concrete slab top; the addition, removal, or exchange of barrel sections; the replacement of the cone section or the concrete slab top; the installation of the proper number of adjusting rings; and the replacement of the manhole casting and frame.
B. Miscellaneous Work

1. If concrete adjusting rings are used, they shall be set with bituminous mastic or cement mortar and shall be plastered inside and out with a minimum thickness of ½-inch or mortar. Taller 6" or 12" rings shall be used where adjustment requires more than three 2" rings.

2. When manhole casting is in the water table, the Contractor shall use American Infrastructure Technologies Multi-Purpose Joint Seal in rings and castings.

3.2 Field Quality Control

A. Deflection test - No exception to the referenced specification is made.

B. Television – No exception to the referenced specification is made.

***End of Section***
SECTION 02660 - DETENTION POND EXCAVATION & EMBANKMENT

PART 1 -- GENERAL

1.1 GENERAL

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of storm water detention ponds as indicated on the drawings or as specified herein.

B. The Contractor shall review and comply with the recommendations contained in the soils report found in the Appendix hereto, unless otherwise directed by the City Engineer.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2105.1 through 2105.3 shall apply to all excavation and embankment, except as modified in these Special Provisions.

B. Reference to "roadway" and "roadbed" in the MN/DOT Specifications shall be used interchangeably with "dike" and/or "embankment."

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. All suitable excess excavated material shall remain the property of the Owner.

B. Unsuitable excess excavated material shall become the property of the Contractor and shall be removed from the pond site and disposed of at a site secured by the Contractor.

C. Excavated material unsuitable for embankment and backfill construction shall become the property of the Contractor and shall be removed from the site and disposed of at a site secured by the Contractor.

D. Frozen material will not be allowed for pond construction.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. EXCAVATION/EMBANKMENT CONSTRUCTION

1. At the end of each day the Contractor shall eliminate surface indentations, including those caused by sheep foot rollers and tractor cleats, and roll the surface with a steel wheel or rubber tired roller.

2. Design contours representing the finished surface are shown on the grading plan at this site. The Contractor shall excavate, haul, place and compact the material as needed to be within +/- 0.5' of the finished subgrade of the site.

3. Embankments shall be constructed in eight-inch (loose thickness) lifts.
4. All embankments and subcuts shall be compacted using the Specified Density Method. Testing shall be by the Contractor. Compacted density shall be at least 95% of ASTM:D698-78, Standard Proctor Density. Certified copies of all density test reports shall be provided to the City Engineer.

5. Topsoil unsuitable for protection layer construction can be used as embankment material beyond the four to one pond slopes.

6. All rock six-inches and larger encountered during any embankment construction shall be removed and disposed of as directed by City Engineer.

7. All embankment shall be compacted using the Specified Density Method:

8. Under areas with proposed paved or structural improvements:
   (a) 100% Standard Proctor from the proposed pavement subgrade elevation down 3 feet.
   (b) 95% Standard Proctor from the bottom of excavation up to 3 feet below the subgrade elevation

9. Under areas with no proposed paved or structural improvements:
   (a) 95% Standard Proctor

3.2 SOURCE QUALITY CONTROL

A. The Contractor shall arrange for having the following testing performed:
   1. One (1) gradation test per each 500 tons or 275 cubic yards (CV) of granular borrow.
   2. One (1) Standard Proctor test per each 500 cubic yards of clay borrow.

B. All testing shall be performed by an independent testing laboratory approved by the City Engineer.

C. Samples for testing shall be taken from material at locations approved by the City Engineer. All sampling methods shall be approved by the City Engineer.

3.3 FIELD QUALITY CONTROL

A. The Contractor shall arrange for the following testing performed:
   1. At least two Standard Proctor Density tests shall be conducted in accordance with ASTM D-698 on each type of soil used in the construction of the pond to establish the moisture density relationship.
   2. Field density tests shall be conducted at the rate of one test per 1500 cubic yards of placed material (compacted volume).

B. The Contractor shall furnish the services of an independent testing laboratory approved by the City Engineer on a full-time basis to conduct continuous density tests whenever subgrade, embankment, or structure and trench backfill compaction operations are being conducted.

C. Field density tests shall be conducted in accordance with ASTM D-1556 (Sand Cone Method) or ASTM D-2922 or D-3017 (Nuclear Methods). Continuous field density tests shall be performed on each lift during the compaction operation to insure that minimum density requirements are met. Moisture contents shall be tested with each field density test in order to insure that the moisture content is at or above the optimum required water content.

D. The Contractor shall cooperate fully with the individuals performing the tests.
E. Samples for testing shall be taken from material in place at locations approved by the City Engineer. All sampling methods shall be approved by the City Engineer.

F. Should any of the specified tests fail, the Contractor may arrange and pay for additional tests as may be necessary to satisfy the City Engineer that the specified density requirements have been met.

G. Copies of all test results with maps of testing locations shall be submitted as determined at the pre-construction meeting.

H. All required soils tests and pond bottom surveys must be approved by the City Engineer prior to pond prefill.

I. At conclusion of the pond construction and prior to pond prefill, the Contractor, the independent engineering firm providing the onsite construction observation, and the soils testing laboratory involved with the liner testing shall provide the City, in writing, the acceptance that the pond subgrade and embankment meet the requirements of the specifications.

**** END OF SECTION ****
PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to adjusting a casting assembly frame and ring or valve box as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2506 shall apply to adjusting frame and ring, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 ADJUSTING RINGS

1. Only concrete adjusting rings shall be permitted.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. The manhole casting and rings shall be placed on a full mortar bed or bituminous mastic upon final setting. The inside and outside of adjusted area shall be plastered with a minimum thickness of ½-inch cement. If structure is in the water table, the Contractor shall use American Infrastructure Technologies multipurpose joint seal on rings and castings.

B. The Contractor shall bring manhole castings and valve boxes to grade.

   1. If manhole castings or valve boxes are bituminous and/or concrete to be raised after bituminous base placement, the Contractor shall saw-cut the adjacent bituminous and/or concrete surface to obtain a clean, vertical solid edge.

C. All inverts of manholes and valves boxes shall be cleaned of debris and gravel, which may have fallen into the structures as a result of construction.

D. Finished grade of the casting or valve box in paved areas shall be according to the following, unless otherwise specified on the plans:

<table>
<thead>
<tr>
<th></th>
<th>Distance Below Adjacent Concrete Pavement</th>
<th>Distance Below Adjacent Bituminous Pavement</th>
<th>Distance Below Adjacent Gravel Pavement</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Streets</td>
<td>1/8” to 1/4”</td>
<td>1/4” to 3/8”</td>
<td>1”</td>
</tr>
<tr>
<td>County Highways</td>
<td>1/8” to 1/4”</td>
<td>1/4” to 3/8”</td>
<td>1”</td>
</tr>
<tr>
<td>Location</td>
<td>Adjustment Range 1</td>
<td>Adjustment Range 2</td>
<td>Adjustment Range 3</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------</td>
<td>--------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>State Highways</td>
<td>1/8&quot; to 1/4&quot;</td>
<td>1/4&quot; to 3/8&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>1/8&quot; to 1/4&quot;</td>
<td>1/8&quot; to 1/4&quot;</td>
<td>1&quot;</td>
</tr>
<tr>
<td>Parking Areas</td>
<td>1/8&quot; to 1/4&quot;</td>
<td>1/4&quot; to 3/8&quot;</td>
<td>1&quot;</td>
</tr>
</tbody>
</table>

E. In no case shall the casting or valve box extend above the finished surface.

F. Raising and/or lowering an existing manhole to meet a proposed finished rim elevation is performed when the addition and/or deletion of 2" adjusting rings will not reach a minimum of 2 rings or exceed a maximum of 6 rings. Typically, it will require the removal of the manhole cone section or concrete slab top; the addition, removal or exchange of barrel sections; replacement of the cone section or the flat slab top; installation of the proper number of adjusting rings; and replacement of the manhole frame and casting. In some cases, the existing structure may require saw cutting.

****END OF SECTION****
SECTION 02720 - AGGREGATE BASE

PART 1 -- GENERAL

1.1 SUMMARY

   A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to construct the aggregate base course as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

   A. Mn/DOT Specification Section 2211 shall apply to the construction of aggregate base, except as modified herein.

   B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

   A. The material to be used shall conform to the Specifications for Aggregate Base Class 5 (crushed limestone or natural mineral aggregate) modified so that the percent passing the No. 200 sieve shall be 5 to 10 percent.

   B. Materials included here consist of new aggregate surfacing, Class 5 aggregate base, aggregate bedding (rock), bedding and encasement material. If additional rock is used to provide a coarser Class 5 gradation, the added materials must pass the Los Angeles Rattler (L.A.R.) test. The percent crushed shall also be tested on the aggregate surfacing or aggregate base Class 5 samples.

2.2 SOURCE QUALITY CONTROL

   A. The Contractor shall arrange for having the following testing performed:

      1. One (1) gradation test for each 500 tons or 275 cubic yards (CV) of each class of aggregate base.
      2. One (1) percent crushing test.
      3. One (1) aggregate quality test.

   B. All testing shall be performed by an independent testing laboratory approved by the City Engineer.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

   A. At the end of each day the Contractor shall eliminate surface indentations, including those caused by sheeps foot rollers and tractor cleats, and roll the surface with a steel wheel or rubber tired roller.

   B. The depth and class of aggregate base to be constructed shall be as shown on the plans. Aggregate base construction shall take place only after the street subgrade condition and grade has been examined by the City Engineer.

   C. All aggregate base shall be compacted using the Specified Density Method:
1. Under areas with proposed paved or structural improvements:
   (a) 100% Standard Proctor from the proposed pavement subgrade elevation down 3 feet.
   (b) 95% Standard Proctor from the bottom of excavation up to 3 feet below the subgrade elevation.

2. Under areas with no proposed paved or structural improvements:
   (a) 95% Standard Proctor.

3.2 FIELD QUALITY CONTROL

A. "Blue top" stakes shall be provided by the Contractor at 100 foot intervals to confirm that the subgrade is constructed to the required grades and elevations. Methods other than "blue top" staking may be allowed, if approved by the City Engineer.

B. The Contractor shall arrange for and pay all costs associated with having the following testing performed:
   1. One (1) compaction test (including Standard Proctor) for each 500 SY of each class of aggregate base.

C. All testing shall be performed by an independent testing laboratory approved by the City Engineer.

D. Samples for testing shall be taken from material in place, in the roadway at locations approved by the City Engineer. All sampling methods shall be approved by the City Engineer.

E. Should any of the specified tests fail, the Contractor may arrange and pay for additional tests as may be necessary to satisfy the City Engineer that the specified density requirements have been met.

****END OF SECTION****
SECTION 02730 - AGGREGATE SURFACING

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to construct the aggregate surfacing / shouldering as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2118 shall apply to the construction of aggregate surfacing, except as modified herein.

B. Mn/DOT Specification Section 2221 shall apply to the construction of aggregate shouldering, except as modified herein.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Materials included here consists of new aggregate surfacing, Class 5 aggregate base, aggregate bedding (rock), bedding and encasement material. If additional rock is used to provide a coarser Class 5 gradation, the added materials must pass the Los Angeles Rattler (L.A.R.) test. The percent crushed shall also be tested on the aggregate surfacing or aggregate base class 5 samples.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. At the end of each day the Contractor shall eliminate surface indentations, including those caused by sheep foot rollers and tractor cleats, and roll the surface with a steel wheel or rubber tired roller.

B. The depth and class of aggregate surfacing to be constructed shall be as shown on the plans. Aggregate surfacing construction shall take place only after the subgrade or aggregate base condition and grade has been examined by the City Engineer.

C. Existing aggregate surfacing shall be salvaged prior to commencing trenching activities, and shall be restored after underground construction is completed.

D. All aggregate surfacing shall be compacted using the Specified Density Method:

1. Under areas with proposed paved or structural improvements:
   (a) 100% Standard Proctor from the proposed pavement subgrade elevation down 3 feet.
   (b) 95% Standard Proctor from the bottom of excavation up to 3 feet below the subgrade elevation

2. Under areas with no proposed paved or structural improvements:
   (a) 95% Standard Proctor
3.2 SOURCE QUALITY CONTROL

A. The Contractor shall arrange for and pay all costs associated with having the following testing performed:

1. One (1) gradation test for each 500 tons or 275 cubic yards (CV) of each class of aggregate.
2. One (1) percent crushing test (if required by the City Engineer).
3. One (1) aggregate quality test (if required by the City Engineer).

B. Samples for testing shall be taken from material in stock at locations approved by the City Engineer. All sampling methods shall be approved by the City Engineer.

C. The Contractor shall cooperate fully with the individuals performing the tests.

3.3 FIELD QUALITY CONTROL

A. The Contractor shall arrange for and pay all costs associated with having the following testing performed:

1. One (1) compaction test (including Standard Proctor) on subgrade per each 500 SY of each class of aggregate surfacing and/or shouldering.

B. All testing shall be performed by an independent testing laboratory approved by the City Engineer.

C. The Contractor shall cooperate fully with the individuals performing the tests.

D. Samples for testing shall be taken from material in place, in the roadway at locations approved by the City Engineer.

E. Should any of the specified tests fail, the Contractor may arrange and pay for additional tests as may be necessary to satisfy the City Engineer that the requirements have been met.

****END OF SECTION****
SECTION 02740 - PLANT-MIXED BITUMINOUS SURFACING

PART 1 -- GENERAL

1.1 SUMMARY
A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of plant-mixed bituminous surfacing as indicated on the plans or as specified herein.

B. This is a Certified Plant Project. The supplier shall have sufficient testing facilities and qualified personnel including Certified Technicians. If requested by the City Engineer, the required tests shall be performed in a timely manner and with a good quality control program.

1.2 SPECIFICATION REFERENCE
A. Plant mixed asphalt pavement shall conform to the current Mn/DOT Specification 02350/2360 Plant Mixed Asphal tic Pavement Combined 2350/2360 (Gyratory/Marshall Design Specifications), dated December 12, 2006. Copies of Mn/DOT’s current specifications may be downloaded and printed from Mn/DOT’s web site at:

    http://www.dot.state.mn.us/tecsup/prov/order/2360-2350-combined.pdf

1. Mn/DOT Specification Section 2357 shall apply to the construction of bituminous tack coat, except as modified herein.

2. Mn/DOT Section 02360.6B4: The maximum payment factor for density is 100%.

3. Mn/DOT Section 02360.7C (Pavement Smoothness Specification – IRI (International Roughness Index)) is hereby DELETED.

B. Unless noted otherwise, the provisions in this Section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS
A. The bituminous material for tack coat shall be CSS-1H.

B. Bituminous material and aggregate shall be as shown on the typical sections in the plans.

1. Mn/DOT 2360 Superpave mix design is acceptable for substitution in place of Mn/DOT 2350, as approved by the City Engineer.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS
A. Bituminous Tack Coat

1. The material shall be applied at the rate of 0.05 gallons per square yard.

2. The contact surfaces of all fixed structures, the edge of the in-place mixture in all courses at transverse joints, and the wearing course at longitudinal joints shall be given a uniform coating of Liquid Asphalt or Emulsified Asphalt before placing the adjoining mixture. The bituminous material shall be applied by methods that will ensure uniform coating and in no case shall the application be excessive.

B. The bituminous wearing course shall be constructed after two freeze/thaw cycles following the season in which the underground utilities, aggregate base and bituminous base course have been constructed or in accordance with City Policy #44 in Appendix.
C. The Contractor is required to use the self-propelled pneumatic tire roller as an intermediate roller on the wearing courses.

D. The bituminous surfacing shall be constructed with maximum deviation of plus or minus 1/4-inch from the planned compacted thickness.

E. Cut the adjacent asphalt surface prior to construction of the bituminous surface course to obtain a clean, vertical, solid edge.

F. Compaction of all bituminous mixtures shall be by the Maximum Density Method.

G. The base bituminous course shall be ramped at all cross drains, curb inlets, and pedestrian ramps during placement. Storm sewer catch basins located in concrete curb and gutter shall be ramped. Bituminous ramp shall be installed integral with the bituminous base course. All ramping shall be milled prior to placement of bituminous wear course.

3.2 SOURCE QUALITY CONTROL

A. The bituminous mix shall be designed using Contractor Trial Mix Designs. A current Mn/DOT mix design may be accepted provided it represents the aggregate source and bituminous plant being used for the project, and is approved by the City Engineer. No bituminous mixture shall be placed without an approved mix design.

B. Testing of the material bituminous tack coat may be required, if determined by the City Engineer, that the material appears suspect.

3.3 FIELD QUALITY CONTROL

A. Three (3) inch diameter core samples shall be taken by the Contractor to verify the thickness of the compacted finished bituminous structure. Sample locations shall be designated by the City Engineer and made with a drilling device that produces clean sharp, vertical edges.

B. If any cores prove deficient, the Contractor may, at its own cost and expense, take additional core samples to further define the extent of the deficiency.

C. The City Engineer shall calculate deficient pavement areas using the locations and thickness results of all core samples and prorating the thickness profile.

D. A $0.50 deduction per square yard will be made for each 1/8-inch deficiency of thickness beyond the specified tolerances.

Reduction in payment for bituminous courses constructed to more than the a maximum permissible thickness shall be in accordance with Mn/DOT Section 2360.7, except that the thickness tolerances specified herein apply.

E. Testing:

<table>
<thead>
<tr>
<th>Quantity Mixture Type</th>
<th>REQUIRED CONTRACTOR TESTING</th>
<th>OWNER ARRANGED INDEPENDENT ASSURANCE TESTING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VMA &amp; Air Voids</td>
<td>Gradation</td>
</tr>
<tr>
<td>0-500 Ton</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>500-1000 Ton</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>1000+ Ton</td>
<td>4 First Day 1/1000 Ton</td>
<td>2/Day</td>
</tr>
<tr>
<td>Mixture Type</td>
<td>REQUIRED CONTRACTOR TESTING</td>
<td>OWNER ARRANGED INDEPENDENT ASSURANCE TESTING</td>
</tr>
<tr>
<td>--------------</td>
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<td>---------------------------------------------</td>
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<tr>
<td></td>
<td>VMA &amp; Air Voids</td>
<td>VMA &amp; Air Voids</td>
</tr>
<tr>
<td></td>
<td>Gradation</td>
<td>Gradation</td>
</tr>
<tr>
<td></td>
<td>Spot Check</td>
<td>Spot Check</td>
</tr>
<tr>
<td></td>
<td>Thereafter with Min. 2/day</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Extraction</td>
</tr>
</tbody>
</table>

1. Contractor shall send a copy of the testing results to the City Engineer.

2. Should any of the specified tests fail, the Contractor shall notify the City Engineer immediately and shall arrange and pay for additional test as may be necessary to satisfy the City Engineer that the requirements have been met.

****END OF SECTION****
PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of plant-mixed bituminous surfacing as indicated on the plans or as specified herein.

1.2 SPECIFICATION REFERENCE

A. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

B. Subgrade Preparation

1. Mn/DOT Specification Section 2112 shall apply to the subgrade preparation, except as modified herein.

C. Aggregate Base Course

1. Mn/DOT Specification Section 2211 shall apply to the construction of aggregate base, except as modified herein.

D. Bituminous Tack Coat

1. Mn/DOT Specification Section 2357 shall apply to the construction of bituminous tack coat, except as modified herein.

E. Bituminous Paving Materials

1. Mn/DOT Specification Section 2350, Bituminous Quality Assurance, shall apply to the construction of plant-mixed bituminous surfacing, except as modified herein.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Subgrade Preparation

1. No exception to the referenced specification is made.

B. Aggregate Base Course

1. The material to be used shall conform to the Specifications for Aggregate Base, Class 5.

C. Bituminous Tack Coat

1. The bituminous material for tack coat shall be CRS-1 or CRS-2.

D. Bituminous Paving Materials

1. Bituminous material for the mixture shall be PG 58-28 asphaltic cement.
2. No recycled materials will be allowed in the bituminous wearing course.
3. The wear mix shall be produced with gradation 3 aggregate for lifts of 1-1/2" and more, and shall be produced with gradation 4 aggregate for lifts of less that 1-1/2".
PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. The depth and class of aggregate base and bituminous surface to be constructed shall be:

1. Bituminous Patch - 5 Ton
   (a) 2" Type MV Bituminous Wearing Course
   (b) 12” 2211 Aggregate Base, Class 5

2. Bituminous Patch - 7 Ton
   (a) 1" Type MV Bituminous Wearing Course
   (b) 3" Type MV Bituminous Base Course
   (c) 10“ 2211 Aggregate Base, Class 5

3. Bituminous Patch - 9 Ton
   (a) 1" Type MV Bituminous Wearing Course
   (b) 4" Type MV Bituminous Base Course
   (c) 12” 2211 Aggregate Base, Class 5

unless otherwise shown on the plans.

B. The subgrade, aggregate and bituminous base courses of patches whose smallest dimension is less than the width of the compaction equipment shall be hand tamped.

C. The subgrade shall be compacted using Quality Compaction Method.

D. When the Contractor believes subgrade preparation is complete, he shall notify the City Engineer for a final examination. If the City Engineer requests it, the subgrade shall be test rolled with a fully loaded tandem truck to verify subgrade stability.

E. Aggregate base construction shall take place only after the street subgrade condition and grade has been examined by the City Engineer.

F. Cut the adjacent asphalt surface prior to the Construction of the bituminous surface course to obtain a clean, vertical, solid edge.

G. Compaction of the aggregate base courses shall be by the Quality Compaction Method.

H. The bituminous tack coat shall be applied at the rate of 0.05 gallons per square yard.

I. The contact surfaces of all fixed structures, the edge of the in-place mixture in all courses at transverse joints, and the wearing course at longitudinal joints shall be given a uniform coating of Liquid Asphalt or Emulsified Asphalt before placing the adjoining mixture. The bituminous material shall be applied by methods that will ensure uniform coating and in no case shall the application be excessive.

J. The bituminous surfacing shall be constructed with maximum deviation of plus or minus 1/4-inch from the planned compacted thickness.

K. Compaction of all bituminous mixtures shall be by the Ordinary Method of Compaction. A nuclear density meter and operator shall be provided by the Contractor, if requested by the City Engineer.
3.2 FIELD QUALITY CONTROL

A. The bituminous mix shall be designed using Contractor Trial Mix Designs. A current Mn/DOT mix design may be accepted provided it represents the aggregate source and bituminous plant being used for the project, and is approved by the City Engineer. No bituminous mixture shall be placed without an approved mix design.

B. Final line and grade of the wearing surface shall not exceed the following tolerances from the adjacent pavement surfaces:

<table>
<thead>
<tr>
<th></th>
<th>Distance Below Adjacent Bituminous Pavement</th>
</tr>
</thead>
<tbody>
<tr>
<td>City Streets</td>
<td>1/8”</td>
</tr>
<tr>
<td>County Highways</td>
<td>1/8”</td>
</tr>
<tr>
<td>State Highways</td>
<td>1/8”</td>
</tr>
<tr>
<td>Sidewalks</td>
<td>1/8”</td>
</tr>
<tr>
<td>Parking Areas</td>
<td>1/4”</td>
</tr>
</tbody>
</table>

****END OF SECTION****
SECTION 02745 - BITUMINOUS TACK COAT

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of the bituminous tack coat as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2357 shall apply to the construction of bituminous tack coat, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. The bituminous material for tack coat shall be CRS-1 or CRS-2.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. The material shall be applied at the rate of 0.05 gallons per square yard.

B. The contact surfaces of all fixed structures, the edge of the in-place mixture in all courses at transverse joints, and the wearing course at longitudinal joints shall be given a uniform coating of Liquid Asphalt or Emulsified Asphalt before placing the adjoining mixture. The bituminous material shall be applied by methods that will ensure uniform coating and in no case shall the application be excessive.

****END OF SECTION***
PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of concrete paving as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2301 shall apply to the construction of concrete pavement including any additional requirements listed in the Technical Memorandum (2301) Concrete Pavement contained in the Appendix, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

C. Mn/DOT Standard Plan Sheets.

1.3 SUBMITTALS

A. The mix proportions shall be determined by an independent certified testing laboratory secured by the Contractor. A current mix design may be submitted and accepted, provided the aggregate source is the same as that being used for this project. Two copies of the certified mix design shall be submitted to the City Engineer for review prior to the construction of the project.

B. Test reports and certification by an approved testing laboratory that the following meet all of the requirements of these Specifications.

1. Fine Aggregate for Portland Cement Concrete (Mn/DOT 3126)
2. Coarse Aggregate for Portland Cement Concrete (Mn/DOT 3137)
3. Fine aggregate and cementitious material (ASTM C-1260).

C. In the event ready-mix concrete is used, the Contractor shall furnish the City Engineer with numbered delivery tickets showing the date, time, place of delivery, number of cubic yards, the weight of cement, fine aggregate and coarse aggregates, and amount of mixing water in each load. At the end of each paving day, the Contractor shall obtain from the supplier a summary showing the average component amounts that day.

PART 2 -- PRODUCTS

2.1 MATERIAL

A. The concrete mix to be used shall conform to Mn/DOT Mix. No. 3A26 for vibratory machine placement, Mix. No. 3A36 for non-vibratory machine placed concrete and Mix No. 3A46 for manual placed concrete.

B. 50% of the coarse aggregate shall be Class A material as specified in Mn/DOT Specification 3137.

C. High early strength concrete, when used and/or specified, shall be accomplished by increasing normal cement content by approximately 30 percent without use of calcium chloride, except as directed by the City.
D. The source of fine and coarse aggregates shall be one currently approved by the Minnesota Department of Transportation.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. The concrete pavement with integral curb shall be constructed using the slip form method of construction. The Contractor’s equipment must be mechanically and physically capable of placing the concrete and integral curb in accordance with the Specifications and to the plan widths, cross-sections, grades and thicknesses, including all irregularities and/or special sections affecting project geometry.

B. The provisions of Section 2301.3L for transverse metal tine finish shall be deleted.

C. Control contraction joints shall be sawed at 60 to 75 foot intervals within 24 hours of placing the concrete. Contraction joints shall be sawed at approximately 15 foot intervals in accordance with the Plans.

D. Longitudinal, contraction and expansion joints shall be constructed as specified in Mn/DOT 2301 and as shown on the attached Mn/DOT Standard Plan Sheet 5-297.221 (2 sheets).

E. All joint walls shall be lightly sand blasted and then cleaned with a jet of compressed air under a pressure not less than 85 pounds per square inch immediately prior to sealing. Any joints filled above the permissible level (1/8 inch below the concrete surface) shall be corrected by removing and replacing the sealer at the Contractor's expense.

F. Concrete paving equipment shall be operated so that smooth, continuous movement in the direction of the paving operation is maintained. Starting and stopping the paver for other than safety reasons or for lack of fresh concrete will not be permitted. The City Engineer may require paving operations to be halted if the paver is not being operated to produce pavement conforming to plan elevation, grade or cross-section; if the concrete is not being supplied at an acceptable rate; or if the mechanical operation of the paving equipment is causing unacceptable surface variations not correctable by finishing operations.

3.2 FIELD QUALITY CONTROL

A. The Contractor shall conduct various material tests throughout the construction to determine conformance with these specifications, including but not limited to:

1. Air and slump cone tests.
2. Beam and cylinder testing.

B. The Contractor's shall cooperate with the individuals conducting the testing operations and furnish a daily testing report including all daily field test results, sample locations and time of tests.

C. A 10-foot straight edge with the capability of checking the deviation in any direction over the entire width of the fresh concrete shall be supplied by the Contractor during all concrete pavement installation. The Contractor shall verify the compliance of the concrete surface with deviation requirements during the concrete finishing operation and make corrections as required.

D. If any random or uncontrolled crack occurs in undoweled or doweled jointed pavement, the pavement shall be repaired in a manner consistent with dowel load-transfer techniques using the latest Mn/DOT’s Rehabilitation Standards/Details in use at the time of the construction. The City Engineer may require replacement of the pavement or portions, thereof, or allow repairs. The City Engineer will review specific repair techniques and also determine if a reduced payment is appropriate. The
replacement or repair work shall be performed at the Contractor’s expense. Failed repairs shall be replaced at the Contractor’s expense. Acceptance of the repairs will be consistent with the acceptance of the pavement portion of the Project.

E. PAVEMENT THICKNESS & CORE SAMPLES

1. It is intended that the finished pavement thickness conform substantially to the thickness shown in the Plans or as modified and staked by the City Engineer. Any modifications will be considered as being the planned thickness.

2. Prior to final acceptance of the work, the City Engineer will take cores from the pavement for use as test specimens.

3. Coring will not begin until the new pavement has attained an age of 7 days or until control beams have attained a flexural strength of 500 pounds per square inch. The Contractor will be responsible for filling the core holes with 3U18 concrete or another concrete mix approved by the City Engineer. The Contractor will be responsible for all traffic control related to coring. All unacceptable cores and cores taken to delineate deficient pavement as outlined in 2301.3P2 or 2301.3P3 will be at the Contractor's expense.

4. Wherever any core shows a deficiency of more than 0.50 inch from the planned thickness, additional exploratory cores will be taken. The first exploratory cores at any location will be taken 10-feet on each side of the deficient core location and at the same distance from the pavement centerline, and one will be taken in the adjacent traffic lane if it was placed in the same operation. If the length of each one of the first exploratory cores is equal to or greater than the plan thickness of the pavement minus 0.50 inch, no additional cores will be taken in that location. If any or all of these cores are not within such limitations, additional exploratory cores will be taken at intervals of 10 to 25 feet, as directed by the City Engineer, at the same distance from the pavement centerline in the same lane as the original core. The coring will proceed in the direction of the deficiency until cores of satisfactory length are obtained. Any exploratory cores are also the responsibility of the Contractor.

5. Wherever the cores show a thickness deficiency greater than 0.50 inch, the pavement will be considered to be defective and shall be removed and replaced. The defective pavement area will be considered as the entire area surrounding the deficient core (or cores) within a traffic lane and between acceptable cores. The remaining areas in an increment where the cores show a thickness deficiency no greater than 0.50 inch will be considered as acceptable pavement.

6. Where the cores are deficient in length by less than 0.50 inch, or less, and the concrete also has an air content less than 4.0 percent, the Contractor shall remove and replace the defective pavement.

7. Whenever the average thickness of the acceptable pavement in a particular section or fractional section of the mainline pavement is found to be less than the Plan thickness by more than 0.10 inch, the acceptable pavement in that section or fractional section (excluding any areas of defective pavement whether or not they have been removed and replaced acceptably).

****END OF SECTION****
PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performance of all work and services necessary or incidental to the application of pavement markings as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. The following Mn/DOT Specification Section 3354 shall apply to the pavement markings, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Paint shall be a non-bleeding, quick drying, alkyd petroleum base paint suitable for application of traffic bearing surfaces.

B. Paint shall meet FS TIP-85E.

C. Paint shall be mixed in accordance with manufactures instructions before application.

D. Polymer preformed markings shall conform to the provisions of MnDOT Specification 3354.

2.2 EQUIPMENT

A. Application equipment shall consist of a machine of the spray type capable of applying the material under pressure at a controlled temperature through nozzles equipped with remotely controlled cutoff mechanisms and suitable line guides that will produce clean cut lines and prevent excessive material drift.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. At the time of applying the marking material, the application area shall be free of contamination. The Contractor shall clean the surface prior to the line application in a manner and to the extent required by the City Engineer.

B. Pavement markings shall not be applied in seasonable weather when the air temperature is 50 degrees F or higher, and shall not be applied when the wind or other conditions cause a film of dust to be deposited on the pavement surface after cleaning and before the marking material can be applied.

C. The filling of tanks, pouring of materials or cleaning of equipment shall not be performed on unprotected pavement surfaces unless adequate provisions are made to prevent spillage of the material.
D. No striping operations will be permitted between sundown and sunrise without written permission from the City Engineer.

E. All material shall be placed in a workmanlike manner, which shall result in a clearly defined line.

F. All pavement striping shall be 4-inches wide, unless noted otherwise on the plans. All pavement striping shall be a minimum of 15 mils thick (wet thickness) at a rate of 100 square feet per gallon.

G. Application for the marking material shall be such as to provide uniform film thickness throughout the coverage area. Stripe ends shall be clean cut and square, with a minimum of material beyond the cutoff.

H. Polymer preformed markings shall be installed per the manufacturer’s recommendations.

I. All pavement markings not conforming to the requirements of the Contract shall be removed and replaced or otherwise repaired to the satisfaction of the City Engineer. Removal of unacceptable work shall be accomplished with suitable blasting or grinding equipment unless other means are approved by the City Engineer.

****END OF SECTION****
SECTION 02770 - CONCRETE CURBING AND DRIVEWAY PAVEMENT

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of concrete curbing and driveway paving as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2531 shall apply to the construction of concrete curbing and driveway placement, except as modified herein.

B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

C. Mn/DOT Standard Plates

1.3 SUBMITTALS

A. The mix proportions shall be determined by an independent certified testing laboratory secured by the Contractor. A current mix design may be submitted and accepted, provided the aggregate source is the same as that being used for this project. Two copies of the certified mix design shall be submitted to the City Engineer for review prior to the construction of the project.

PART 2 -- PRODUCTS

2.1 MATERIAL

A. The concrete mix to be used shall conform to Mn/DOT Mix No. 3A32 for manually placed concrete or Mix No. 3A22 for machine placed concrete.

B. 50% of the coarse aggregate shall be Class A material as specified in Mn/DOT Specification 3137.

C. Joint sealer shall be a silicone based product.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Excavate to the elevation shown on the design detail plate. Salvage material suitable for backfill.

B. The width of all driveways shall be established in the field by the Project Engineer or City Engineer.

C. The joints in the driveway pavement shall match with the sidewalk and curb control joints. The Contractor shall be fully responsible for proper jointing patterns. Mismatched jointing will require removal and replacement of components in order to achieve the desired results. All removal and replacement of rejected construction shall be at the Contractor's expense.

D. The tooling tolerances as outlined in specification 2531 for surface uniformity, alignment and jointing shall be reviewed by the Contractor prior to the construction. Defects found during examinations will require the Contractor to remove and replace those areas.
E. Backfill along exposed edges of slabs and/or behind the curb with selected salvage material from the excavation to the elevation shown on the design detail plate.

F. When the pavement is placed directly on natural subgrade, earth check dams shall be constructed immediately after passage of the slip forms or removal of the forms to prevent water from flowing along the edge of the pavement and undermining the concrete. They shall not be spaced or be of a width to provide an approach over which a vehicle may be driven onto the pavement.

G. High early strength concrete shall be used for all driveway pavement.

H. No warranty is expressed or implied that all concrete work will be accessible for machine construction.

3.2 FIELD QUALITY CONTROL

A. Testing

1. The Contractor shall conduct various material tests throughout the construction to determine conformance with these specifications, including but not limited to:
   (a) Air and slump cone tests.
   (b) Beam and cylinder testing.

2. The Contractor's shall cooperate with the individuals conducting the testing operations.

B. Warranty Period

1. During the warranty period indicated in the Supplementary Conditions, necessary repairs shall include but not be limited to defects in concrete and workmanship such as cracking, pop-outs, spalling, improper joint placement and settlement.

***END OF SECTION***
SECTION 02775 - WALKS – CONCRETE

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of concrete walks as indicated on the drawings or as specified herein.

1.2 SPECIFICATIONS REFERENCES

A. Mn/DOT Specification Section 2521 shall apply to the construction of concrete walks, except as modified herein.

B. Mn/DOT Technical Memorandum No. 03-19-TS-02 shall apply to the construction of pedestrian curb ramps.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

D. Mn/DOT Standard Plates, including modifications from the Technical Memorandum listed above.

1.3 SUBMITTALS

A. Two copies of the certified mix design shall be submitted to the City Engineer for review prior to the construction of the project. The mix proportions shall be determined by an independent certified testing laboratory secured by the Contractor. A current Mn/DOT Design Mix may be accepted provided the aggregate sources are the same as that being used for this project.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. CONCRETE

1. The concrete mix to be used shall conform to Mn/DOT Mix No. 3A32 for manually placed concrete or Mix No. 3A22 for machine placed concrete.

2. Fifty percent (50%) of the coarse aggregate shall be Class A material as specified in Mn/DOT Specification 3137.

B. The foundation materials shall be Class 5, Aggregate Base.

C. TRUNCATED DOME SYSTEMS for pedestrian curb ramps.

1. The approved products are those listed on the Mn/DOT web site http://www.mrr.dot.state.mn.us/materials/apprprod.asp.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Excavate the walk alignment to 3-inches below finished walk sub-grade or the bottom of the topsoil layer, whichever is deeper. If excavation beyond the 3 inch layer is required, the Contractor shall fill the excess excavation with suitable compacted material. Salvage all topsoil for re-use.
B. A minimum depth of 3-inches of Class 5 aggregate shall be furnished, placed and compacted by the "Ordinary Compaction Method" upon the prepared subgrade.

C. Backfill along the walk with salvaged topsoil, to an elevation so the sod will match the walk surface and adjacent undisturbed lawn.

D. When the pavement is placed directly on natural subgrade, earth check dams shall be constructed immediately after passage of the slip forms or removal of the forms to prevent water from flowing along the edge of the pavement and undermining the concrete. They shall not be constructed to provide an approach over which a vehicle may be driven onto the pavement.

E. Concrete walk thickness shall be a minimum of 5 inches.

3.2 FIELD QUALITY CONTROL

A. Compression Strength Testing

1. The Contractor shall furnish the necessary 6" x 12" concrete cylinder forms and make one triplicate set of concrete test cylinders each working day that concrete is poured. The Contractor shall deliver the test cylinders to an independent testing laboratory, approved by the City Engineer, for seven day and twenty-eight day compressive strength tests.

2. The independent testing labs shall send copies of the test results to the Owner and the City Engineer.

3. The Contractors shall cooperate with the individuals conducting the testing operations.

B. Warranty Period

1. During the warranty period indicated in the Supplementary Conditions, necessary repairs shall include but not be limited to defects in concrete and workmanship such as cracking, pop-outs, spalling, improper joint placement and settlement.

****END OF SECTION****
NOTES:
The curb and curb transition on the ramp will be paid for as linear feet of concrete curb or concrete curb and gutter. The ramp area will be paid for as concrete walk. The truncated dome area shall be considered incidental.

1/2 inch preformed joint filler material, AASHTO M 213.

2. When possible, provide a path of travel 4'0" wide behind the pedestrian ramp. A relatively flat 4'0" x 4'0" landing will allow wheelchairs to navigate around the pedestrian ramp.

3. When a median is not wide enough for two pedestrian ramps and a 48" landing between them, the pedestrian crossing shall be cut through the median at street level.

4. 6" to 8" is the required offset of the detectable warnings. Truncated dome area from the front face of curb, or place the detectable warnings at the back of curb. The ADA required truncated dome area shall be 2'0" in direction of travel and shall extend the full width (3'0" or 4'0" Typ) of the curb ramp. This 2'0" by 3'0" or 4'0" width (Typ) truncated dome area shall contrast visually with the adjacent walking surface. The entire truncated dome area shall be a light color (light gray, white, or yellow) when the adjacent sidewalk is a dark color. The entire truncated dome area shall be a dark color (red, black, dark gray, or bright yellow) when the adjacent sidewalk is a "white" or light gray cement color.

4'0" for new construction. 3'0" allowed for retrofits or preservation projects.
SECTION 02780 - BRICK PAVERS

PART 1 -- GENERAL

1.1 SUMMARY
A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to installation of all brick pavers, as shown on the drawings, as specified herein.

1.2 SPECIFICATION REFERENCES
A. All masonry work shall be done according to practices set forth in the Concrete Masonry Handbook.
B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.3 SUBMITTALS
A. The Contractor shall submit 6 sample pavers to the Engineer for approval prior to actually placing the order together with the name of the manufacturer, the model or style of the particular paver, and the technical specification for the paver.
B. Once the order is placed, the Contractor shall submit to the City the lot number(s) of the pavers to be shipped so the City can order a quantity for repair and replacement.

PART 2 -- PRODUCTS

2.1 MATERIALS
A. New brick pavers in concrete walks shall comply with the following:
   1. Modular size, exterior grade brick pavers nominal 8” x 4” x 1-1/4” thick to match streetscape pavers.
   2. Approved manufacturer/product: Pacific Clay, color “Desert Brown” as distributed by Mankato Brick or equal as approved by City Engineer and City.
   3. The pavers shall be an “open stock” item as produced by the manufacturer.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS
A. The paver installer shall examine areas and conditions under which brick pavers are to be installed. The Contractor shall notify the Engineer and City, in writing, of conditions detrimental to proper and timely completion of the work. The Contractor shall not proceed with the work until unsatisfactory conditions have been corrected in manner acceptable to paver installer, unless otherwise directed by the City Engineer.
B. Installation shall be accomplished as follows:
   1. Joints shall be uniform, not less than 1/4 inch nor more than 3/8 inch wide.
   2. Lay out all pavers in patterns shown on drawings.
3. Cut masonry units with motor-driven saw designed to cut masonry with clean, sharp, unchipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full units without cutting wherever possible.

C. The Contractor shall protect all brick paved areas from damage until work is turned over to City. Remove and replace pavers which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units, pointed to eliminate evidence of replacement.

D. In the event cold weather delays brick installation or if the walk must be opened to pedestrian traffic prior to completion of the installation of the brick pavers, the depressed area in the sidewalk shall be filled with a non-slip surface plywood or other approved method through the winter.

****END OF SECTION****
PART 1 -- GENERAL

1.1 SUMMARY
A. This section covers the furnishing of all labor, materials, tools equipment and performances of all work and services necessary or incidental to project signing as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES
A. Mn/DOT Specification Section 2564 shall apply to the construction of project signing, except as modified herein.
C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS
A. All signing materials shall conform to the requirements of Mn/DOT Specification 3352 and all Supplemental Specifications thereto.

B. Street Name Signs
   1. Plates shall be single faced, 9” flat .080 aluminum with 3M high-intensity reflective sheeting. Plates shall be a minimum of 24” and a maximum of 48” in length. Plates must fit E 450 brackets.
   2. Letters shall be 6” series C, uppercased, white on green background.
   3. Brackets shall be E 450 style brackets with 5/8” square center rod extending approximately 7/8” into post cap, welded. Brackets shall have 16 gauge plate holders with star hole and ornamental top nut. Bracket color shall match the street name sign background color.
   4. Posts shall be galvanized tubular steel with a 2 3/8” outside diameter, 0.065” wall thickness, 1.61 lbs/ft, 12’ in length.
   5. Sign post shall be embedded in a 12” diameter concrete footing to a depth of 4 feet. Earth shall be tamped around concrete encasement.

C. Stop Signs
   1. Plates shall be R1-1, .080 aluminum with 3M High Intensity reflective sheeting, 30” X 30”.
   2. Posts shall be U-channel, RIB-BAK high carbon, grade SP-80 steel. Posts shall have 3/8 inch diameter mounting holes, 1” on center running the entire length of the post.
      a. Face plates shall be mounted to a 7'-0” x 2 lbs./ft U-channel RIB-BAK top post.
      b. Base posts shall be a minimum of 8’-0” in length, 3 lbs./ft and shall be driven into the ground a minimum of 4’.
PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. The lower portion of the post shall be air-driven into the ground. Where posts must be placed in concrete or bituminous, the Contractor shall core the area without damaging the remainder of the surface. At core location, a PVC tube at least four inches in diameter shall be inserted and the post air driven from that point. The area shall then be patched.

B. The Contractor shall construct the posts and signs at the locations indicated on the drawings and shall verify all sign locations with the City Engineer prior to installation.

****END OF SECTION****
SECTION 02920 - TURF RESTORATION

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to turf restoration as indicated on the drawings or as specified herein.

B. A goal of the project during construction is to get the cleanest water possible into the storm drainage systems as quickly as possible and protect critical and unique areas. Every effort shall be required by the Contractor to achieve these goals.

C. A variety of different seeding mixtures may be utilized on this project. The Contractor shall refer to the plan for the locations of the different turf establishment areas.

D. Temporary seeding may be necessary during construction in erosion sensitive areas. The Contractor shall do temporary seeding work as specified herein or as directed by the City Engineer.

E. Rapid Stabilization - This stabilization process is directed at areas of a critical or unique characteristic to prevent the separation of soil particles from the soil surface. This work may be required at any time during the contract on small areas that may or may not be accessible with normal equipment.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Sections 2575, 3876, and 3878, Controlling Erosion, Establishing Vegetation and Seed shall apply to the establishment of grass and sod as shown on the plans.

B. BWSR Specification Restoring & Managing Native Wetland & Upland Vegetation shall apply to the establishment of wetland vegetation as shown on the plans. This manual is available at web site: http://www.bwsr.state.mn.us/wetlands/publications/nativewetveg.pdf

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Seeding Items

1. The seed mixtures to be used are shown on the plans. In general, all application rates for mixes, except oats, are 150% the rate in Mn/DOT 2575.3 Table 2575-2 and 3876.2 Table 3876-5.

2. Seeding with the various seed mixture designations shall utilize the following combinations of seed, fertilizer and mulch:

(a) Type 1 mulch shall consist of clean straw with no pasture hay.

(b) Temporary seeding, if required, shall use Seed Mixture – 110B Oats.

(c) Fertilizer shall be 22-5-10. (Phosphorous use in fertilizer for first establishment and the first year is allowed unless limited or prohibited by local ordinances.)

<table>
<thead>
<tr>
<th>APPLICATION RATES</th>
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<tr>
<td>FERTILIZER</td>
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City of Buffalo
March 31, 2007

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<table>
<thead>
<tr>
<th>Seed Mix</th>
<th>Rate lb/AC</th>
<th>Type Rate</th>
<th>Rate lb/AC</th>
<th>Type Rate</th>
<th>Typical Use</th>
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<tbody>
<tr>
<td>240SR (Sandy Roadside)</td>
<td>112.5</td>
<td>22-5-10</td>
<td>200</td>
<td>1</td>
<td>Sand, loamy sand, sandy loam, sandy clay loam.</td>
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<tr>
<td>250GR (General Roadside)</td>
<td>105</td>
<td>22-5-10</td>
<td>200</td>
<td>1</td>
<td>All.</td>
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<tr>
<td>260CT (Commercial Turf)</td>
<td>150</td>
<td>22-5-10</td>
<td>200</td>
<td>1</td>
<td>Good topsoils, loams.</td>
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<tr>
<td>270RT (Residential Turf)</td>
<td>180</td>
<td>22-5-10</td>
<td>200</td>
<td>1</td>
<td>Good topsoils, loams.</td>
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<tr>
<td>280AG (Agricultural Areas)</td>
<td>75</td>
<td>22-5-10</td>
<td>200</td>
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<td>Clay, clay loam, loam, silty clay, silty clay loam.</td>
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<tr>
<td>310NWT (Native Wet Tall)</td>
<td>123</td>
<td>22-5-10</td>
<td>200</td>
<td>1</td>
<td>Clay, clay loam, loam, silty clay, silty clay loam.</td>
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<tr>
<td>325 (Prairie Sedge Meadow)</td>
<td>126</td>
<td>22-5-10</td>
<td>400</td>
<td>1</td>
<td>Native sedge/prairie meadow mix.</td>
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<td>Reaches a height of 36 to 48 inches.</td>
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<td>Developed for use on hydric soils and</td>
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<td>for wetland restoration.</td>
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<td>Sedges, meadow grasses, and meadow forbs</td>
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<td>are best installed by broadcast method,</td>
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<td>separate from main grass mix, in early spring</td>
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<td>or fall if possible.</td>
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<td>Many of thes species require pre-germination</td>
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<td></td>
<td>treatments.</td>
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<tr>
<td>110B (Oats)</td>
<td>100</td>
<td>22-5-10</td>
<td>200</td>
<td>1</td>
<td>All, temporary seeding</td>
</tr>
</tbody>
</table>

B. Seed Mixtures:

1. The application rates for Mn/DOT seed mixes shall be at 1.5 times that specified in the referenced specification.
2. The application rates for BWSR seed mixes shall be at 1.5 times that specified in the referenced specification.

C. Sodding Items

1. The sod to be used shall be Type A - Lawn Sod.

D. Rapid Stabilization

1. **Method 1** – Type 1 mulch @ 2 tons/acre and disc anchoring.
2. **Method 2** – Applying type 1 mulch and tacking it with type1 hydraulic soil stabilizer @ 200 pounds/acre.
3. **Method 3** – Seed mixture 190RS @ 20 pounds/1,000 gallons.
   (a) Fertilizer 10-5-20 @ 100 pounds/1,000 gallons.
   (b) Type 6 Hydraulic Soil Stabilizer 625 pounds/1,000 gallons.
   (c) Water ratio 1,000 gallons.
4. **Method 4** – Erosion Control Blanket, Category III.
   (a) Seed Mixture 190RS @ 2 pounds/100 square yards.
   (b) Fertilizer 10-5-20 @ 8 pounds/100 square yards.
5. **Method 5** – Rip Rap Class 1
   (a) Geotextile Type III.
PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. GENERAL

1. Prior to construction, the Owner, City Engineer and Contractor shall observe the existing storm water outfall system and discharge area and shall document the existing conditions. Upon completion of surface restoration (i.e., paving and turf establishment), the storm water outfall system and discharge area shall be observed and all increased sediment deposits shall be removed and disposed of by the Contractor. All increases in sediment deposits shall be considered to have originated from the project site.

2. Prior to construction, the Owner, Engineer and Contractor shall review the project to identify critical areas that could require rapid stabilization during the construction process, and develop a plan to either mitigate disturbance to those areas or identify the methods of rapid stabilization most appropriate.

3. If Contractor fails to install and/or perform the appropriate rapid stabilization practices, as determined by the City Engineer, the City Engineer may issue a written order to the Contractor. The Contractor shall respond within 24 hours with sufficient personnel, equipment and/or materials and conduct the required work or be subject to a $ 500 per calendar day deduction for non-completion.

4. When the City Engineer determines that the rapid stabilization practices installed by the Contractor have failed, the Contractor shall correct the cause and alleviate all damage, to the fullest extent possible. If the corrective action is not taken in a timely manner, the City Engineer may issue a written order to the Contractor. The Contractor shall respond within 24 hours with sufficient personnel, equipment and/or materials and conduct the required work or be subject to a $ 500 per calendar day deduction for non-completion.

5. The subgrade shall be shaped to approximate contour of the finished surface. All construction debris shall be removed from the area prior to the placement of the topsoil. The subgrade shall be loosened with a disc or harrow to a depth of six-inches prior to application of the topsoil.

6. The topsoil shall be shaped to the approximate contour of the finished surface, with a minimum depth of 4-inches, unless otherwise shown on the plans. All construction debris shall be removed from the area prior to seeding or sodding. The topsoil shall be loosened with a disc or harrow to its full depth prior to seeding or sodding.

7. The Contractor shall be responsible for providing water and maintenance until final acceptance by the City Engineer, to firmly establish the seed or sod. The term maintenance shall include mowing, weed control and watering, as necessary. **Failure to perform the work required within the 24 hours of the notification of non-compliance, will result in a contract deduction of $ 100 for each 24 hour period that the work is incomplete, as observed by the City Engineer.**

8. The Contractor shall remove all rocks and debris from the surface prior to seeding and mulching.

B. SEEDING REQUIREMENTS

1. Turf establishment by seeding shall be done utilizing the various combinations of seed mixtures (including aquatic plants), fertilizing and mulching at disturbed areas as shown on the plans.

2. Areas prepared for seeding shall be free of rocks, debris and clumps of soil. The areas shall be graded uniformly and lawned areas shall be raked free of chunks exceeding ¾ inches diameter.

3. Seed, except for mix 25B, shall be applied with a drill seeder, unless otherwise approved in writing by the City Engineer.

4. The Contractor shall furnish weight tickets documenting pounds of hydraulic soil stabilizer placed, pounds of fertilizer placed and pounds of seed placed. The seed tickets shall show individual plant
species along with the percent purity and percent germination. The fertilizer tickets shall show mix proportions. The Contractor shall also furnish its QA/QC data to the City Engineer.

5. Dormant seeding and snow seeding may be utilized in accordance with the referenced specification and technical memorandum, provided the final acceptance standards are met.

6. Final acceptance of seeding shall be based on an established growth of 6-inches with a uniform density to cover 70% of the designated area, free of weeds and bare spots. Any re-seeding necessary shall be performed at the Contractor’s expense.

7. Maintenance in areas seeded with 310NWT or 25B:
   (a) To reduce weed establishment, mow 2 to 3 times (30 days apart) during 1st year with the mower deck about 6”-8” off the ground. Mow one time during the 2nd year before weeds set their seeds. Burn or mow once every 3 to 5 years following the initial 2 years of maintenance to remove dead plant material and stimulate new seed.

8. **SEASON OF PLANTING**

<table>
<thead>
<tr>
<th>Seed Mix Designation</th>
<th>Seed Mix Name</th>
<th>Spring</th>
<th>Fall</th>
<th>Dormant Seeding After</th>
<th>Dormant Seeding Temperature</th>
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</thead>
<tbody>
<tr>
<td>240SR</td>
<td>Sandy Roadside</td>
<td>April 1 – June 1</td>
<td>July 20 – September 20</td>
<td>October 20</td>
<td>40</td>
</tr>
<tr>
<td>250GR</td>
<td>General Roadside</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>260CT</td>
<td>Commercial Turf</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>270RT</td>
<td>Residential Turf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>280AG</td>
<td>Agricultural uses</td>
<td>April 1 – Sept. 1</td>
<td></td>
<td>Oct. 20</td>
<td>40</td>
</tr>
<tr>
<td>310NWT</td>
<td>Native Wet Tall</td>
<td>April 15 – July 20</td>
<td>September 20 – October 20</td>
<td>October 20</td>
<td>50</td>
</tr>
<tr>
<td>25B</td>
<td>Prairie Sedge Meadow</td>
<td>April 15 – July 20</td>
<td>September 20 – October 20</td>
<td>October 20</td>
<td>50</td>
</tr>
<tr>
<td>110B</td>
<td>Oats</td>
<td>May 1 – August 1</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**C. SODDING REQUIREMENTS**

1. Sod shall be placed by the Contractor in the disturbed boulevard areas and in locations shown on the plans as directed by the City Engineer.

2. When placing sod in irregularly shaped locations, the Contractor shall produce sharp, straight joints between sod rolls.

3. Sod shall be placed to create a firm, smooth, uniform surface without ruts, knobs or wrinkles.

4. Sod placed on slopes greater than 1:4 (v:h), in ditch bottoms, and around storm sewer inlets or outlets shall be anchored with staples. Staples shall be U shaped 3 mm (0.12 inch) diameter or heavier steel wire having a span width of 25 mm (1 inch) and a length of 200 mm (8 inches) from top to bottom, after bending.

5. All re-work necessary to repair imperfections in sod placement shall be made at the Contractor’s expense.

**3.2 RAPID STABILIZATION**

A. Unless precluded by snow cover, all exposed soil areas, including topsoil stockpiles, with a continuous positive slope within 100 feet of surface waters, or from a curb, gutter, storm sewer inlet, temporary or permanent drainage ditch, or other storm water conveyance system, shall have rapid stabilization or

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1 Maximum soil temperature at a depth of 1-inch.
permanent cover for the exposed soil areas within the following time frames (For the purpose of this provision, exposed soil areas do not include surcharge areas or stockpiles of sand, gravel, aggregate, concrete, or bituminous.):

<table>
<thead>
<tr>
<th>Type of Slope</th>
<th>Temporary Protection or Permanent Cover Where the Area Has Not Been, or Will Not Be, Worked by the Contractor for:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steeper than 1 Vertical to 3 Horizontal</td>
<td>7 Days</td>
</tr>
<tr>
<td>Between 1:3 and 1:10</td>
<td>14 Days</td>
</tr>
<tr>
<td>Flatter than 1:10</td>
<td>21 Days</td>
</tr>
</tbody>
</table>

B. The City Engineer may order the work at any time during the contract and will be for small critical areas, which may or may not be accessible with normal equipment. These methods should be used for areas within 200 feet of Waters of the State and to stabilize the critical areas within the timeframe designated in the NPDES permit.

C. The approximate number of locations requiring rapid stabilization will be indicated in the Plans. The City Engineer may adjust the number of locations and sequence of the work based on project conditions. Mobilization to each location or groups of locations shall be incidental. The approximate quantities of work per mobilization to the areas requiring rapid stabilization is dependent on method as follows:

1. Minimum Areas / Quantities for application (approximate)
   (a) **Method 1** - 1-2 acres.
   (b) **Method 2** - 1-2 acres.
   (c) **Method 3** – 4,000 gallons.
   (d) **Method 4** - 200-400 square yards.
   (e) **Method 5** - 10-20 tons.

2. Placement
   (a) Shaping of areas shall be observed by the City Engineer prior to placement of any of the rapid stabilization materials
   (b) **Method 1**, Apply type 1 mulch and anchor with disc anchoring - Prior to placement the soil surface shall be in a loose condition so that the mulch can be anchored. The mulch shall be placed in the areas directed by the City Engineer and to obtain approximately 90% ground coverage. Wherever possible the mulch shall be placed by blower equipment and in inaccessible areas may have to be placed by hand. Immediately after placement, the mulch shall be anchored with a disc-anchoring tool per specification 2575.3H.
   (c) **Method 2**, Apply type 1 mulch and tack it with type 1 hydraulic soil stabilizer. - The same placement procedure applies, as in Method 1 except the mulch shall be sprayed with type 1 hydraulic soil stabilizer at a rate of 220 g/ha (200 pounds/per acre) per specification 2575.3H. No disc anchoring.
   (d) **Method 3**, Hydro spread of seed, fertilizer and hydraulic soil stabilizer. - Rate of slurry application shall be variable depending on surface roughness, slope configuration and degree of undulation. Amount of material applied shall be such to obtain 100% soil surface coverage. To obtain the coverage, two (2) passes may be necessary. In inaccessible areas, the mix may be pumped through a hose.
   (e) **Method 4**, Hand install seed, fertilizer and erosion control blanket. - The fertilizer seed and erosion control blanket shall be placed as described in 2575.3. The upgrade end of each blanket strip shall be buried at least 150mm (6 inches) in a vertical check slot. Staples shall be placed at seams, and throughout the blanket at a maximum spacing of 2 feet.
(f) **Method 5,** Place geotextile and rock in various configurations. Rock and geotextile shall be placed in the areas and to the configurations directed by the City Engineer.

****END OF SECTION****
PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the milling of concrete or bituminous pavement as shown on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2232 shall apply to the milling of all pavements, except as modified herein.

B. Mn/DOT Specification Section 2211 shall apply to the installation of milled materials as an aggregate base, except as modified herein.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. All milled materials shall remain the property of the Owner and shall be stockpiled by the Contractor for later reuse by the Owner.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. No exception to the referenced specifications is made.

****END OF SECTION****
PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the repairing of the existing bituminous surface improvements shall including routing, cleaning and sealing the existing surface prior to placement of the overlay.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 3723 shall apply to the sealing of all cracks for airports, except as modified herein.

B. Mn/DOT Specification Section 3719 shall apply to the sealing of all cracks for roadways, except as modified herein.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. Crack Sealant

1. The crack sealant compound shall be packaged in sealed containers. Each container shall be clearly marked with the name of the manufacturer, the trade name of the sealant, the manufacturer's batch and lot number, the pouring temperature, and the safe heating temperature.

2. Mixing of different manufacturer's brands or different types of sealant shall be prohibited

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. A copy of the manufacturer's recommendations pertaining to the heating and application of the joint sealant material shall be submitted to the City Engineer prior to the commencement of work. These recommendations shall be adhered to and followed by the contractor. The temperature of the sealer in the field application equipment shall never exceed the safe heating temperature recommended by the manufacturer. Any given quantity of material shall not be heated at the pouring temperature for more than six hours and shall never be reheated. Sealing shall not proceed if the temperature of the material has not reached or has fallen below the manufacturer's recommended minimum application temperature.

B. Sealant materials may be placed during a period of rising temperature after the air temperature in the shade and away from artificial heat has reach 40 degrees F and indications are for a continued rise in temperature. During a period of falling temperature, the placement of sealant material shall be suspended when the air temperature, in the shade and away from artificial heat, reaches 40 degrees F. Sealant shall not be placed when in the opinion of the City Engineer, the weather or roadbed conditions are unfavorable.

C. Routing and sealing will be permitted only during daylight hours between May 1 and October 15.
D. The City Engineer shall determine the actual areas which will be repaired by marking the existing cracks to be routed, cleaned and sealed. The routing, cleaning and sealing shall extend the full width of the surface on transverse cracks.

E. The Contractor shall conduct the bituminous crack sealing operations so that routing, cleaning and sealing is a continuous operation. Traffic shall not be allowed to kneed together or damage the reservoir once it has been created. Routed cracks not sealed before traffic is allowed on the surface shall be re-routed at no additional cost to the City.

1. **ROUTING.** The routing equipment shall be mechanical and power driven and shall be capable of following the existing cracks. All cracks shall be routed 1 inch wide x 1 inch deep. The cracks shall be routed with sharp router blades to the specified dimensions without deviation from the existing crack or creating excessive spalling. Equipment designed to “plow” the cracks to dimension will not be permitted. Wet sawing will not be allowed.

2. **CLEANING.** Immediately prior to cleaning and sealing the cracks, the entire bituminous surface shall be cleaned to remove all loosened bituminous particles and foreign material and the cracks shall be blown clean with oil-free compressed air. Compressed air shall be 100 psi and 75 cfm minimum at the nozzle. The crack and surface area six (6) inches on both sides will then be cleaned and dried with a hot compressed air heat lance. The heat lance shall meet the following requirements: temperature of heated air at exit or orifice minimum of 2,800 degrees F. Velocity of exiting heated air minimum of 2,800 fps. The application time and final results of the cleaning are subject to the City Engineers approval.

3. **SEALING.** After the cracks have been properly cleaned, the Contractor shall install a foam backer rod in those cracks wider than 1/4 inch which extend below the bottom to the routed joint. The backer rod shall be compressed to fill the entire width of the crack and shall not protrude up above the bottom of the routed reservoir. The Contractor shall install a bond breaker tape at the bottom of the routed reservoir for those cracks less than 1/4 inch in width which extended below the bottom of the routed joint.

F. The sealant shall be placed evenly in two separate applications. The first application shall fill the reservoir to approximately three-fourths the depth of the routed joint. After the first application has sufficiently cooled, the second application shall be placed to provide an “over bond” seal with the bituminous pavement. The over band shall be of the width and thickness to assure a tight seal with the pavement surface. The sealant shall be pressure applied with a wand type applicator; pour pots or similar devices shall not be used to apply the crack sealant. The applicator wand shall be returned to the machine and the crack sealant materials recirculated immediately upon completion of each crack.

****END OF SECTION****
SECTION 02980 - CONCRETE PAVEMENT PATCH

PART 1 -- GENERAL

1.1 SUMMARY
A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of concrete curbing and driveway paving as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES
A. Mn/DOT Specification Section 2461 and 2301 shall apply to the construction of concrete pavement patching, except as modified herein.
B. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.
C. Mn/DOT Standard Plates

1.3 SUBMITTALS
A. The concrete mix to be used shall be a high early design and shall conform to Mn/DOT Mix. No. 3A43 for manually placed concrete. A current mix design may be submitted and accepted, provided it represents the aggregate source and ready mix source used for this project and is approved by the City Engineer. Two copies of the certified mix design shall be submitted to the City Engineer for review prior to the construction of the project.

PART 2 -- PRODUCTS

2.1 MATERIAL
A. The concrete mix to be used shall conform to Mn/DOT Mix No. 3A43 for manually placed concrete.
B. If high early strength concrete is designated in the Schedule of Unit Prices', the mix design shall be enhanced as specified in Section 2461.3C.
C. The coarse aggregate shall be Class A material as specified in Mn/DOT Specification 3137.
D. Fly ash and/or calcium chloride shall not be added without written permission from the City Engineer.
E. Joint sealer shall be a silicone based product.
F. Bituminous Paving Materials for Overlay
   1. Bituminous material for the mixture shall be PG 58-28 (previously 120/150 penetration grade) asphaltic cement.
   2. No recycled materials will be allowed in the bituminous wearing course.
   3. The Type 41 mix shall be produced with size 'B' aggregate for lifts of 1-1/2" and more, and shall be produced with size 'A' aggregate for lifts of less that 1-1/2".
PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. Excavate to the elevation shown on the design detail plate. Salvage material suitable for backfill.

B. Rebar shall be installed on 18” spacing along the longitudinal perimeter of the patch area (to bridge the transverse direction of traffic flow). Bars shall be # 5 bars and shall be 30” long with a 12” embed depth into the existing concrete pavement. Bars shall be thoroughly anchored in the existing concrete with an approved grout. If the area to be patched transverses an expansion joint, the City Engineer shall direct the placement of the tie bars. No bars shall be placed between separate structural units, unless the units were previously tied.

C. Furnish and install a 3” granular bed under the concrete patch. The bed shall be thoroughly compacted prior to placing concrete.

D. Depth:

1. The bottom of the concrete patch shall match or extend below the bottom of the concrete adjacent to the patch, unless otherwise directed by the City Engineer.

2. The top of concrete shall match the top of the adjacent concrete and follow the slope of the original concrete which was removed.

E. Joints:

1. The joints shall match with the adjacent control joints. The Contractor shall be fully responsible for proper jointing patterns. Mismatched jointing will require removal and replacement of components in order to achieve the desired results. All removal and replacement of rejected construction shall be at the Contractor's expense.

2. Joints shall be sawn to 1/3 the thickness of the patch.

3. All joints shall be sealed.

F. The tooling tolerances as outlined in specification 2531 for surface uniformity, alignment and jointing shall be reviewed by the Contractor prior to the construction. Defects found during examinations will require the Contractor to remove and replace those areas. No deduction in unit price will be acceptable to satisfy defective areas found.

G. Backfill along exposed edges of slabs and/or behind the curb with selected salvage material from the excavation to the elevation shown on the design detail plate.

H. Cold Weather Protection:

1. All concrete pavement patches, including exposed edges of the slab, shall be cured according to Specification 2531 prior to applying protection.

I. Bituminous Overlay

1. If the original pavement had a bituminous overlay, the Contractor shall place an overlay over the newly installed patch. The finished, top surface of the overlay shall match the adjacent bituminous pavement and shall be sloped to promote and maintain drainage patterns.

3.2 FIELD QUALITY CONTROL

A. Compression Strength Testing
1. The Contractor shall furnish the necessary 6” x 12” concrete cylinder forms and make one triplicate set of concrete test cylinders each working day that concrete is poured. The Contractor shall deliver the test cylinders to an independent testing laboratory, approved by the City Engineer, for seven day and twenty-eight day compressive strength tests.

2. The independent testing labs shall send copies of the test results to the City and the City Engineer.

3. The Contractors shall cooperate with the individuals conducting the testing operations.

****END OF SECTION****
SECTION 03315 - MISCELLANEOUS CONCRETE STRUCTURES

PART 1 -- GENERAL

1.1 SUMMARY

A. This section covers the furnishing of all labor, materials, tools, equipment and performances of all work and services necessary or incidental to the construction of miscellaneous concrete structures as indicated on the drawings or as specified herein.

1.2 SPECIFICATION REFERENCES

A. Mn/DOT Specification Section 2411 shall apply to the construction of reinforced concrete utility vaults, except as modified herein.

B. Mn/DOT Specification Section 2451 shall apply to the structure excavation and backfill construction for reinforced concrete utility vaults, except as modified herein.

C. Unless noted otherwise, the provisions in this section are in addition to the referenced specification.

1.3 SUBMITTALS

A. The concrete mix to be used shall conform to Mn/DOT Mix. No. 3Y43. The mix proportions shall be determined by an independent certified testing laboratory secured by the Contractor. A current mix design may be submitted and accepted, provided the aggregate source is the same as that being used for this project. Two copies of the certified mix design shall be submitted to the City Engineer for review prior to the construction of the project.

B. The Contractor shall submit design of the utility vault reinforced concrete top slab for approval by the City Engineer.

PART 2 -- PRODUCTS

2.1 MATERIALS

A. The casting assembly for the utility vaults shall be Mn/DOT 700-7 with Mn/DOT 712 gasketed cover and concealed pickholes or approved equal and stamped "ELECTRIC".

B. Concrete

C. Steel reinforcement shall be deformed Billet Steel bars, grade 60 conforming to AASHTO M 31.

PART 3 -- EXECUTION

3.1 CONSTRUCTION REQUIREMENTS

A. The utility vaults shall be constructed to the following dimensions:

1. Wall Thickness: 8"
2. Base Thickness: 8"
3. Top Slab Thickness: 8"
4. Interior Dimensions: 5'(W) x 6'(L) x 7'(HT)
5. Manhole Location: Center of Structure
6. Top of Top Slab to Top of Casting: 16"
7. Utility Line Openings: Where Required
8. The Contractor shall construct a 2" keyway around the base aligned with the center of structure walls.

B. Steel reinforcement for utility vaults shall be placed as follows:

1. Base Slab: #5 bars - 12" c. to c. Bars placed 1 -1/2" from bottom of slab. Bars shall be bent at the edges of the slab and extended a minimum of 18" above the top of base.
2. Walls: #5 bars - 12" c. to c. ( x 2 ) Bars placed 1 -1/2" from interior and exterior wall face. Stagger interior and exterior horizontal bar spacing. Exterior vertical bars shall be tied to the extended base slab steel providing for an overlap of 18".
3. Top Slab: Design submitted by Contractor. (#5 bars minimum).
   (a) The utility vaults walls are to be constructed around existing underground electric utility lines. The Contractor will be required to construct the vault walls and base with cast-in-place concrete. The Contractor may use pre-cast concrete for the vault top slab. The Contractor shall seal the joint between the cast-in-place walls and the pre-cast top slab (if used) with non-shrink grout.

C. All concrete shall be consolidated by means of mechanical vibration. Consolidation by hammering forms alone will not be allowed.

D. CONTRACTOR SHALL take one (1) set of concrete cylinders for each day's pour of 25 cubic yards or less, plus one set for each additional 50 cubic yards poured on that day. Cylinders shall be of representative concrete, taken from mixer discharge at actual time of pouring. Contractor will pay all costs of preparing, transporting to laboratory, and making of tests. All such tests shall be made at an independent testing laboratory approved by the CITY ENGINEER.

E. Each set shall consist of three cylinders. One Cylinder shall be tested at five (5) days, the second at seven (7) days and the third at twenty-eight (28) days. The cylinders shall be numbered consecutively and labeled with date of pour, slump when poured, location in building at which representative concrete is placed and name of CONTRACTOR and project. Copies of tests shall be sent to the CITY ENGINEER and CONTRACTOR. Compression tests shall be performed in accordance with ASTM C39.

F. If the average strength of any set of 7-day and 28-day job-cured cylinders falls below the required strength, the cost of any additional cement found necessary to correct subsequent mixes shall be borne by the CONTRACTOR. Also, if the strength is found deficient, the cost of hardened concrete or load tests shall be borne by the CONTRACTOR. The CITY ENGINEER reserves the right to reject any portions of such questionable areas, if in his opinion, the tests indicate that such areas will not safely carry the design loads.

G. All concrete which fails to meet these specifications is subject to removal and replacement at the cost of the CONTRACTOR.

H. Backfilling of the cast-in-place structures may commence if the five-day compression test shows a minimum compression strength of 3000 p.s.i. Imported granular backfill or suitable on site materials shall be used for backfill material. The top two (2') feet of backfill material shall be representative of adjacent in-place materials. Compaction of the structure backfill shall be by the "Ordinary
Compaction Method”. The Contractor shall be responsible for replacement of all work damaged by any subsequent settlement that occurs adjacent to structures due to insufficient compaction effort.

****END OF SECTION***