

# CITY OF SOUTH HAVEN

## STANDARD SPECIFICATIONS

### PART A

## WATER MAINS, SANITARY SEWERS, AND FORCEMAINS

June 2006

Project No. N262

# **CCJM**

**C.C. Johnson & Malhotra, P.C.**

3310 Eagle Park Drive NE, Suite 101  
Grand Rapids, MI 49525-4574

**Engineering Infrastructure Solutions**

(616) 940-2007 • FAX: (616) 940-1603

E-mail: [grandrapids@ccjm.com](mailto:grandrapids@ccjm.com)

[www.ccjm.com](http://www.ccjm.com)

**PART A**

**Division 0: Not used**

**Division 1: General Requirements**

- 01010 Summary of Work
- 01012 Staking and Inspection Services
- 01013 Protection, Restoration and Notification
- 01060 Regulatory Requirements
- 01090 References
- 01200 Project Meetings
- 01300 Submittals
- 01310 Construction Progress Schedules
- 01410 Testing Services
- 01500 Construction Facilities and Temporary Services
- 01562 Cleaning
- 01630 Substitutions and Product Options
- 01700 Contract Closeout
- 01720 Project Record Documents

**Division 2: Sitework**

- 02100 Site Preparation
- 02222 Excavating, Backfilling, and Compacting for Utilities
- 02272 Soil Erosion and Sedimentation Control
- 02665 Water Distribution System
- 02723 Forcemain
- 02731 Sanitary Sewer System

**PART B**

**Division 3: Concrete**

- 03300 Cast-in-Place Concrete
- 03600 Grout

**Division 4 through Division 10: Not used**

**Division 11: Equipment**

11252 Wastewater Pump Station

11253 Chemical Feed System

**Division 12 through Division 15: Not used**

**Division 16: Electrical**

16101 Pump Station Electrical Work

16900 Controls and Instrumentation

**PART 1 - GENERAL**

**1.01 WORK COVERED BY CONTRACT DOCUMENTS**

- A. The Work includes, but is not limited to, the major items described below:
  - 1. Water mains and house services.
  - 2. Sanitary sewers and house services.
  - 3. Forcemains.
  - 4. Pump stations.

**1.02 DEFINITIONS**

- A. CITY: The City of South Haven.
- B. CONTRACTOR: The individual or entity that has an Agreement with the OWNER for completion of the Work covered by these specifications.
- C. ENGINEER: The individual or entity that has responsibility for the design of the improvements included in the Work.
- D. OWNER: The individual, entity, public body, or authority that will own the improvements included in the Work.
- E. Work: The improvements that will be completed by the CONTRACTOR.
- F. General Conditions: All other definitions and conditions related to the completion of the Work that are not described in these specifications will be in accordance with the "Standard General Conditions of the Construction Contract" prepared by the Engineers Joint Contract Documents Committee, latest edition, referred to as "General Conditions" and "Section 00700 - General Conditions."
- G. Supplementary Conditions: Any Contract requirements that are not included in the "General Conditions" or the "Standard Specifications" that are part of this document.

**1.03 GENERAL**

- A. Imperative language: These Specifications (Divisions 1 through 16) are written in the imperative and abbreviated form. This imperative language of the technical specifications is directed at CONTRACTOR unless specifically noted otherwise. Incomplete sentences shall be completed by inserting "shall", "shall be" and similar mandatory phrases by inference in the same manner as they are applied to notes on Drawings. The words "shall", "shall be", and similar mandatory phrases shall be supplied by inference where a colon (:) is used within sentences or phrases. Except as worded to the contrary, fulfill (perform) all indicated requirements whether stated in the imperative or otherwise.
- B. Related Sections: Some Sections of these Specifications (Divisions 1 through 16) may include a paragraph titled "Related Sections". This paragraph is an aid to the Project Manual user and

is not intended to include all Sections which may be related. It is CONTRACTOR's obligation to coordinate all Sections whether indicated under "Related Sections" or not.

- C. Reference to Section 00700 - General Conditions: In Divisions 1 through 16, a reference to Section 00700 - General Conditions includes by inference all amendments or supplements in Section 00800 - Supplementary Conditions.

#### **1.04 CONTRACTOR USE OF PREMISES**

- A. Except in connection with the safety or protection of persons or the Work or property at the Site or adjacent thereto, all Work at the Site shall be restricted to the following hours.
  - 1. Monday through Saturday (except legal holidays): 6:30 a.m. to 9:00 p.m.
  - 2. Sundays or legal holidays with written approval of OWNER.
- B. Work within highway rights-of-way: In accordance with Section 01060 - Regulatory Requirements.
- C. Private easements:
  - 1. OWNER will arrange for the necessary easements required for construction across privately owned land. CONTRACTOR shall carry on the construction in such a manner as to cause a minimum of inconvenience to the occupants of the properties.
  - 2. Any agreement made by CONTRACTOR with any property owner that extends the rights as granted under an easement obtained by OWNER or that provides for an additional easement shall be obtained by CONTRACTOR at CONTRACTOR's expense and shall in no way be binding upon OWNER. CONTRACTOR shall defend and hold OWNER and ENGINEER harmless against any action that may arise from activities conducted pursuant to such additional agreements or easements. Unless relieved of responsibility for surface restoration in writing by property owner, CONTRACTOR shall restore areas covered by separate agreements substantially the same as similar areas within the Project.

#### **1.05 SALVAGED MATERIALS**

- A. Ownership:
  - 1. OWNER shall have the option of retaining ownership of any or all existing equipment, materials, and items removed under this Work.
  - 2. Should OWNER decide not to retain ownership of certain items removed under the Work of this Section, those items shall become property of CONTRACTOR and shall be promptly removed from the project site
- B. Delivery:
  - 1. Deliver items which remain property of OWNER to a location, or locations, as selected by the OWNER and on site.

### **PART 2 - PRODUCTS**

#### **2.01 OTHER MATERIALS**

- A. General: All other materials which are not specified herein and are not indicated on the Drawings, but are required for proper and complete performance of the Work.
- B. Procedure:
1. Select new, first quality material.
  2. Obtain ENGINEER's review.
  3. Provide and install.

**PART 3 - EXECUTION**

Not used.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, staking and inspection services to be provided for the proper and complete performance of the Work.
  
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

**1.02 CONSTRUCTION INSPECTION**

- A. By CITY or OWNER with CITY approval:
  - 1. Resident Project Representatives: In accordance with Section 00700 - General Conditions.
  - 2. Expense: Paid by OWNER with amounts for additional inspection costs deducted from payment or payments to CONTRACTOR in accordance with Section 01700 - Contract Closeout.
  
- B. By City of South Haven.
  - 1. The CITY reserves the right to observe construction.

**1.03 CONSTRUCTION STAKING**

- A. By CONTRACTOR.

**PART 2 - PRODUCTS**

Not used.

**PART 3 - EXECUTION**

Not used.

\*\*\* END OF SECTION \*\*\*

**PART 1-GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, responsibilities for the protection, restoration and notification requirements for surface and subsurface structures, Underground Facilities and surface improvements as indicated on the Drawings, as specified herein and as necessary for the proper and complete performance of the Work.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

**1.02 NOTIFICATION AND INTERRUPTIONS**

- A. Prior to start of construction:
  - 1. Notify MISS DIG at least 72 hours in advance at 1-800-482-7171.
  - 2. Arrange for the identification of the locations of existing Underground Facilities at or contiguous to the Site.
- B. Utility interruptions:
  - 1. For a period exceeding 8 hours: Provide standby utility service.
  - 2. Provide 48 hours notice to the affected occupants of the time and duration of the anticipated shut off.
  - 3. Pay all costs relating to utility interruptions.

**1.03 PROTECTION AND RELOCATION**

- A. Be responsible for:
  - 1. Protection of structures and utilities at or contiguous to the Site in accordance with Section 00700 - General Conditions.
  - 2. Cost of cleaning, repair, relocation, raising, lowering, or replacement of structures and utilities which interfere with new Work or are damaged as a result of CONTRACTOR's operations.
  - 3. Temporary sheeting, bracing, poles, cables, sand fill or other means used to support a structure or utility exposed or endangered by CONTRACTOR's operations.
  - 4. Relocating, raising or lowering of a structure or utility for CONTRACTOR's convenience.
- B. Relocation of poles and structures:
  - 1. Be responsible for temporary and permanent relocation of power, light, telephone and other service poles and appurtenant structures.
  - 2. Make necessary arrangements with the owner of the pole or structure and pay all costs involved.

**1.04 RESTORATION**

- A. Acceptable standards for restoration:
  - 1. Restore to the better of:
    - a. Original condition.
    - b. Requirements of the Contract Documents.
    - c. 2003 MDOT Standard Specifications for Construction.
    - d. MDOT Standard Plans.
  
- B. Property corners, Government survey corners, and plat monuments:
  - 1. Protect from damage or disturbance.
  - 2. Protect discovered points until ENGINEER or OWNER has witnessed or otherwise referenced their locations.
  - 3. Replace if disturbed or removed as a result of construction:
    - a. Arrange for replacement by a Licensed Land Surveyor.
    - b. Pay all costs.
  
- C. Driving surfaces and similar improvements:
  - 1. Repair or replace damaged or removed surfaces as indicated on the Drawings and as specified herein.
  - 2. Adjust to temporary or final grade all new and existing castings (water valve boxes, manholes, catch basins and similar structures) for all gravel, bituminous or concrete surfacing or resurfacing.
  
- D. Landscaping and miscellaneous improvements:
  - 1. Includes, but is not limited to: topsoil, seeded areas, sodded areas, shrubs, trees, decorative plantings, fences, mailboxes, signs, guard posts and other similar items.
  - 2. Protect from damage by construction operations. In event of damage, replace damaged item with one of equivalent type and size.
  
- E. Cleanup limitation:
  - 1. Maintain cleanup operations within a reasonable distance of the section under construction. Reasonable will depend on circumstances, but in general shall not exceed 400-600 feet, and except in rare circumstances and with prior approval of OWNER, shall not exceed 1,000 feet.
  - 2. Cleanup shall consist of grading, removal of excess excavation and construction debris, temporary repair of roads and drives, and maintenance of ditch slopes.
  - 3. If cleanup is not maintained as specified, other construction shall be stopped, with no extension of Contract Time, until cleanup is carried out to the satisfaction of OWNER.

**PART 2 - PRODUCTS**

Not used.

**PART 3 - EXECUTION**

**3.01 PAYMENT FOR UTILITIES AND ASSOCIATED STRUCTURES**

- A. Payment for work on utilities and associated structures:
  - 1. If Work is by Utility Company: Pay costs.
  - 2. Work is by CONTRACTOR: Perform work in accordance with the requirements of utility company or authority having jurisdiction.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, the permits, requirements and fees of regulatory agencies as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
    - b. Permits and licenses required by other Sections.
  - 2. Paragraph 6.08. of Section 00700 - General Conditions requires that CONTRACTOR obtain and pay for all construction permits. This Section includes provisions for specific permits but does not include all permits.

**1.02 PERMITS**

- A. Highway, road or street:
  - 1. Work performed and operations of CONTRACTOR with the limits of right-of-ways shall fulfill the requirements of the authority having jurisdiction over and control of the right-of-ways.
- B. Soil Erosion and Sedimentation Control:
  - 1. CONTRACTOR shall:
    - a. Obtain soil erosion and sedimentation control permit from the Soil Erosion Control Officer.
    - b. Pay fees and charges.
    - c. Comply with requirements and conditions of the permit.

**1.03 OTHER PERMITS**

- A. OWNER has applied for and will obtain the following permits:
  - 1. Water System Construction (Act 399, P.A. 1976):
    - a. Agency: Michigan Department of Environmental Quality
  - 2. Wastewater System Construction (Part 41):
    - a. Agency: Michigan Department of Environmental Quality
- B. Permit compliance:
  - 1. Ensure that permit has been issued prior to beginning the Work.
  - 2. Comply with requirements of permits.

**PART 2 - PRODUCTS**

Not Used.

**PART 3 - EXECUTION**

Not Used.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
1. This Section includes provisions for references throughout the Contract Documents.

**1.02 DEFINITIONS**

- A. Abbreviations:
1. AASHTO - American Association of State Highway and Transportation Officials, 444 North Capitol Street, N.W., Suite 249, Washington, DC 20001.
  2. ACI - American Concrete Institute, P.O. Box 9094, Farmington Hills, MI 48333.
  3. AISC - American Institute of Steel Construction, Inc., One E. Wacker Drive, Suite 3100, Chicago, IL 60601.
  4. AITC - American Institute of Timber Construction, 7012 S. Revere Parkway, Suite 140, Englewood, CO 80112.
  5. ANSI - American National Standards Institute, 25 W. 43<sup>rd</sup> Street, 4<sup>th</sup> Floor, New York, NY 10036.
  6. APA - The Engineered Wood Association, P.O. Box 11700, Tacoma, WA 98411.
  7. ASTM - American Society for Testing and Materials, P.O. Box C700, West Conshohocken, PA 19428.
  8. AWS - American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126.
  9. AWWA - American Water Works Association. 6666 West Quincy Avenue, Denver, CO 80235.
  10. CRSI - Concrete Reinforcing Steel Institute, 933 N. Plum Grove Road, Schaumburg, IL 60173.
  11. MDNR - Michigan Department of Natural Resources, P.O. Box 30028, Lansing, MI 48909.
  12. MDCIS - Michigan Department of Consumer & Industry Services, Bureau of Safety and Regulation, Construction Safety Division, 7150 Harris Drive, P.O. Box 30643, Lansing, MI 48909.
  13. MDOT - Michigan Department of Transportation, P.O. Box 30050, Lansing, MI 48909.
  14. MDEQ - Michigan Department of Environmental Quality, P.O. Box 30473, Lansing, MI 48909.
  15. NCMA - National Concrete Masonry Association, 13750 Sunrise Valley Drive, Herndon, VA 20171.
  16. NEC - National Electrical Code (see NFPA).
  17. NEMA - National Electrical Manufacturers' Association, 1300 N. 17<sup>th</sup> Street, Suite 1847, Rosslyn, VA 22209.
  18. NFPA - National Fire Protection Association, P.O. Box 9101, Quincy, MA 02269.
  19. P.I. - Precast Concrete Institute, 209 W. Jackson Blvd., Chicago, IL 60606.
  20. SDI - Steel Deck Institute, P.O. Box 25, Fox River Grove, IL 60021.
  21. SJI - Steel Joist Institute, 3127 10<sup>th</sup> Avenue, North Ext., Myrtle Beach, SC 29577.
  22. UL - Underwriters' Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062.

**1.03 REFERENCES**

- A. The provisions of the Contract Documents shall govern over any conflicting provisions of the referenced documents.
- B. The provisions of Laws and Regulations shall govern over any conflicting provisions of the referenced documents.
- C. Comply with the referenced document that is in effect as of the Bid date, except when a specific date is specified.

**PART 2 - PRODUCTS**

Not used.

**PART 3 - EXECUTION**

Not used.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes all scheduling and administering of preconstruction and progress meetings as herein specified and as necessary for the proper and complete performance of the Work.
  
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these specifications.
  
- C. Scheduling and administration of meetings:
  - 1. Responsibility:
    - a. Preconstruction meeting: ENGINEER.
    - b. Progress meetings: CONTRACTOR.
  - 2. Procedures:
    - a. Prepare agenda.
    - b. Distribute written notice and agendas of meetings 4 days in advance of the meeting date.
    - c. Make physical arrangements for the meetings.
    - d. Preside at meetings.
    - e. Record minutes and include significant proceedings and decisions.
    - f. Distribute copies of the minutes within 4 days after meetings to:
      - 1) Participants.
      - 2) Others affected by proceedings.

**1.02 PRECONSTRUCTION MEETING**

- A. Schedule:
  - 1. Preconstruction meeting will be scheduled by ENGINEER:
    - a. Within 20 days after the Effective Date of Agreement.
    - b. Before starting the Work at the Site.
  
- B. Attendance:
  - 1. Representatives of the following parties are to be in attendance at the meeting:
    - a. OWNER.
    - b. ENGINEER.
    - c. CONTRACTOR.
    - d. Major Subcontractors.
    - e. CITY or regulatory agencies when appropriate.

**1.03 PROGRESS MEETINGS**

- A. Types of progress meetings:
  - 1. Regular.

2. Called.
  
- B. Schedule meetings as follows unless otherwise approved by ENGINEER:
  1. Regular: One meeting each month.
  2. Called: As the progress of the Work dictates.
  
- C. Location:
  1. Hold meetings at CONTRACTOR's field office or as indicated in the notice.
  
- D. Attendance:
  1. Representatives of the following parties are to be in attendance at the meeting:
    - a. ENGINEER.
    - b. CONTRACTOR.
    - c. Major Subcontractors as pertinent to the agenda.
    - d. OWNER's representative as appropriate.
    - e. CITY or other regulatory agencies as appropriate.
  
- E. Minimum agenda:
  1. The minimum agenda for progress meetings shall consist of the following:
    - a. Review and approve minutes of previous meetings.
    - b. Review progress of the Work since the previous meeting.
    - c. Note field observations, problems and decisions.
    - d. Identify problems which impede planned progress.
    - e. Review offsite fabrication problems.
    - f. Develop corrective measures and procedures to regain plan schedule.
    - g. Revise construction schedule as indicated.
    - h. Review submittal schedules; expedite as required to maintain schedule.
    - i. Maintenance of quality and work standards.
    - j. Review changes proposed by OWNER for their effect on the construction schedule and completion date.
    - k. Identify all claims and potential claims.
      - l. Pending changes and substitutions.
      - m. Complete other current business.

**PART 2 - PRODUCTS**

Not used.

**PART 3 - EXECUTION**

Not used.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but not is not necessarily limited to, the submittal of Shop Drawings, Samples and other information as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

**PART 2 - PRODUCTS**

**2.01 SUBMITTALS REQUIRING ENGINEER'S REVIEW AND RETURN**

- A. Drawings:
  - 1. Scale required: Unless otherwise specifically directed by ENGINEER, make all drawings accurately to a scale sufficiently large to indicate all pertinent features of the item and its method of connection to the Work.
  - 2. Type and number of prints required: Submit the number of copies to be returned plus 4.
- B. Manufacturer's literature and product data:
  - 1. Extraneous data: Where content of submitted literature from Manufacturers includes data not pertinent to this submittal, clearly indicate which portion of the contents is being submitted for ENGINEER's review.
  - 2. Number of copies required: Submit the number of copies to be returned plus 4.
- C. Calculations:
  - 1. Performance type design calculations: Prepared and sealed by a Professional Engineer licensed in the state where the project is constructed.
  - 2. Number of copies required: Submit the number of copies to be returned plus 4.
- D. Samples:
  - 1. General:
    - a. Samples:
      - a. Illustrate materials, equipment and workmanship.
      - a. Establish standards by which completed work is judged.
  - 2. Accuracy of Sample: Unless otherwise specifically directed by ENGINEER, all Samples shall be of the precise articles proposed to be furnished.
  - 3. Number of Samples required: Submit all Samples in the quantity which is required to be returned plus 1.
- E. Colors and patterns: Unless the precise color and pattern is specifically described in the Contract Documents, wherever a choice of color or pattern is available in a specified Product, submit accurate color charts and pattern charts to ENGINEER for review and selection.

**2.02 SUBMITTALS NOT REQUIRING ENGINEER'S RETURN**

- A. General:
  - 1. Including, but not necessarily limited to:
    - a. Test reports.
    - b. Certifications and affidavits.
    - c. Installation instructions.
  - 2. Number required: Submit 2 copies.
  
- B. Manuals:
  - 1. General:
    - a. Where manuals are required to be submitted covering items included in this Work, prepare all such manuals in durable plastic binders approximately 8-1/2 inches x 11 inches in size and with at least the following:
      - a. Identification on, or readable through, the front cover stating general nature of the manual.
      - a. Neatly typewritten index near the front of the manual.
      - a. Complete instructions regarding operation and maintenance of all equipment involved.
      - a. Complete nomenclature of all replaceable parts, their part numbers, current costs, and name and address of nearest vendor of parts.
      - a. Copies of all guarantees and warranties issued.
      - a. Copies of the reviewed drawings.
      - a. Copies of all data concerning all changes made during construction.
  - 2. Extraneous data: Where contents of the manuals include Manufacturer's catalog pages, clearly indicate the precise items included in this installation and delete or otherwise clearly indicate all Manufacturers' data with which this installation is not concerned.
  - 3. Number of copies required: Unless otherwise specifically directed by ENGINEER, or stipulated in the pertinent Section of these Specifications, deliver 3 copies of the manual to ENGINEER.

**PART 3 - EXECUTION**

**3.01 SCHEDULE OF SUBMITTALS**

- A. Preparation and submittal of a schedule of submittals:
  - 1. Prepare and submit a schedule of submittals as required by Section 00700 - General Conditions.
  - 2. The schedule of submittals shall include the following:
    - a. Shop Drawings.
    - b. Manufacturer's literature and product data.
    - c. Samples.
    - d. Colors and patterns.
    - e. Manuals.
    - f. Other submittals required by the Contract Documents.

3. Allow at least 15 full working days for ENGINEER's review following ENGINEER's receipt of the submittal unless ENGINEER has agreed to a shorter period for specific submittals.
  4. Schedule submittals, except operation and maintenance manuals, far enough in advance of scheduled dates for installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.
  5. Schedule submittal of operation and maintenance manuals at least 60 days prior to system Substantial Completion, unless otherwise specified.
- B. Make all submittals in accordance with the schedule of submittals.
- C. Be responsible for costs of delays caused by tardiness of submittals.

### **3.02 COORDINATION OF SUBMITTALS**

- A. General:
1. Prior to submittal for ENGINEER's review, use all means necessary to fully coordinate all material including the following procedures:
    - a. Determine and verify all field dimensions and conditions, catalog numbers and similar data.
    - b. Coordinate as required with all trades and all public agencies involved.
    - c. Secure all necessary approvals from public agencies and others; signify by stamp or other means that all required approvals have been obtained.
    - d. Clearly indicate all deviations from the Contract Documents.
- B. Grouping of submittals:
1. Unless otherwise specifically permitted by ENGINEER, make all submittals in groups containing all associated items.
  2. ENGINEER may reject partial submittals as not complying with the provisions of the Contract Documents.

### **3.03 IDENTIFICATION OF SUBMITTALS**

- A. General:
1. Consecutively number all submittals.
  2. Accompany each submittal with a letter of transmittal showing the following:
    - a. Project title and number.
    - b. OWNER.
    - c. Subcontractor.
    - d. Date of submittal.
    - e. Specification Section or Drawing number to which the submittal pertains.
    - f. Brief description of the material submitted.
    - g. Submittal identification number.
  3. Mark each submittal with:
    - a. Company name of the originator of the submittal.
    - b. Deviations from Contract Documents.
    - c. CONTRACTOR's approval of the submittal.

- d. Submittal identification number adjacent to CONTRACTOR's approval.
- B. Resubmittal:
  - 1. When material is resubmitted for any reason transmit under a new letter of transmittal with a suffix added to the original submittal identification number.
  - 2. Indicate that this is a resubmittal and refer to the previous submittal.
  - 3. Submittal log:
    - a. Maintain an accurate submittal log for the duration of the construction period, showing the status of all submittals of all types.
    - b. Make the log available to ENGINEER for review upon request.

### **3.04 RETURN OF SUBMITTALS**

- A. Submittals requiring ENGINEER review and return:
  - 1. With status "Rejected, Resubmit":
    - a. Drawings: ENGINEER will retain 1 copy and return remaining copies to CONTRACTOR.
    - b. Manufacturer's literature and product data: ENGINEER will retain 1 copy and return remaining copies to CONTRACTOR.
    - c. Other submittals: ENGINEER will notify CONTRACTOR of rejection.
  - 2. With status "Approved", and "Approved with Corrections Noted":
    - a. Drawings: ENGINEER will retain 4 copies and return remaining copies to CONTRACTOR.
    - b. Manufacturer's literature and product data: ENGINEER will retain 4 copies and return remaining copies to CONTRACTOR.
    - c. Samples: ENGINEER will retain 1 Sample and return remaining Samples to CONTRACTOR.
    - d. Colors: ENGINEER will retain color charts and pattern charts and will indicate color and pattern choices to CONTRACTOR.
    - e. ENGINEER will send 1 copy of all approved submittals to the CITY for their records.
- B. Submittals not requiring ENGINEER return: No copies will be returned.

### **3.05 RESUBMISSION REQUIREMENTS**

- A. Drawings:
  - 1. Revise initial drawings as required and resubmit as specified for initial submittal.
  - 2. Indicate on drawings all changes which have been made other than those requested by ENGINEER.
  - 3. If the same drawings are submitted with additional data and revisions, clearly identify the added data and revisions on the drawings.
- B. Other submittals: Submit as required for initial submittal.

**3.06 RE-REVIEW COSTS**

- A. Should ENGINEER be required to review a submittal more than twice because of failure of the submittal to meet the requirements of the Contract Documents, ENGINEER will record ENGINEER's expenses for performing all additional reviews. The OWNER will compensate ENGINEER for these additional services and deduct the amount paid from payments to CONTRACTOR.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, the preparation, furnishing, distribution and periodic revision of construction progress schedules as herein specified and as necessary for the proper and complete performance of the Work.
  
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

**PART 2 - PRODUCTS**

**2.01 FORM OF SCHEDULE**

- A. Preparation:
  - 1. Prepare in the form of a horizontal bar chart, CPM network, or other form approved in advance by the ENGINEER.
  - 2. Provide a separate horizontal bar column or path for each trade or operation.
  - 3. Prepare the schedule in the chronological order of the beginning of each item of work.
  - 4. Identify each column or path by:
    - a. Major Specification Section number.
    - b. Distinct graphic delineation.
  - 5. Use a horizontal time scale and identify the first work day of each week.
  - 6. Allow space for updating.
  
- B. Size: The schedule sheets shall be 11 inches x 17 inches unless otherwise approved by ENGINEER.

**2.02 CONTENT OF SCHEDULES**

- A. Construction sequence:
  - 1. Provide a complete sequence of construction by activity.
  - 2. For Shop Drawings, project data and Samples indicate the following:
    - a. Submittal dates.
    - b. Dates review copies will be required.
  - 3. Show decision dates for selection of finishes.
  - 4. Show Product procurement and delivery dates.
  - 5. Show dates for beginning and completion of each element of construction.
  
- B. Percentage completion: Show the projected percentage of completion for each item of work as of the first day of each month.
  
- C. Subschedules:

1. Provide separate subschedules showing submittals, review times, procurement schedules and delivery days.
2. Provide subschedules to define critical portions of the entire schedule.

### **PART 3 - EXECUTION**

#### **3.01 SUBMITTALS**

- A. Preliminary schedule:
  1. Submit the preliminary schedule within 10 days after the Effective Date of Agreement.
  2. ENGINEER will review schedules and will return the reviewed copy with 15 days after receipt.
  3. If required, resubmit within 7 days after receipt of a returned review copy.
  4. Meet with ENGINEER at least 10 days prior to the submission of the first Application for Payment to review the schedule.
- B. Periodic adjustment: Monthly, submit a revised schedule accurately depicting adjustments and progress to the first day of each month.
- C. Number of copies: Submit the number of copies required by the CONTRACTOR, plus 4 copies to be retained by ENGINEER.

#### **3.02 DISTRIBUTION**

- A. Reviewed schedules:
  1. Distribute copies of the reviewed schedules to:
    - a. CITY.
    - b. Job Site file.
    - c. Subcontractors.
    - d. Other concerned parties.
  2. Instructions to recipients: Instruct recipients to report all inability to comply with the schedule, and provide detailed explanations with suggested remedies.

#### **3.03 ADJUSTMENT OF PROGRESS SCHEDULE**

- A. Changes: Show all changes occurring since previous submission of the schedule.
- B. Progress: Indicate progress of each activity and show completion dates.
- C. Other items:
  1. Include major changes in scope.
  2. Include activities modified since previous updating.
  3. Include revised projections due to changes.
  4. Include other identifiable changes.
- D. Narrative report:
  1. Provide a narrative report including:

- a. A discussion of problem areas including current and anticipated delay factors and their impact.
- b. Direct action taken, or proposed, and its effect.
- c. A description of revisions including:
  - c. Their effect on the schedule due to change of scope.
  - c. Revisions in duration of activities.
  - c. Other changes that may affect the schedule.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

A. Section includes:

1. This Section includes, but is not necessarily limited to, testing services, as indicated on the Drawings, as specified herein and as necessary for the proper and complete performance of the Work.
2. Testing services will be performed by an independent testing laboratory selected by ENGINEER:
  - 1) Fine and coarse aggregate at ENGINEER's request.
  - 2) Bedding materials at ENGINEER's request.
  - 3) Fill material from onsite and offsite.
  - 4) Soil compaction tests.
  - 5) Pavement compaction tests.
  - 6) Laboratory soil Proctor tests.
  - 7) Verification of soil bearing capacity.
3. Inspections and tests required by codes or ordinances or by a plan approval authority and made by a legally constituted authority.
4. Inspections, testing services and certifications including, but not limited to, the following items shall be finished by CONTRACTOR:
  - a. Pipe leakage tests.
  - b. Pipe material yield strength tests at ENGINEER's request.
  - c. Fine and coarse aggregate certification tests by Supplier at ENGINEER's request.
  - d. Bedding material certification tests by Supplier at ENGINEER's request.
  - e. Testing in connection with ENGINEER's review of materials and equipment proposed to be incorporated into the Work.
  - f. Testing performed for CONTRACTOR's convenience.
5. CITY may elect to test or to employ either ENGINEER or an independent testing agency to test any materials or systems on the Project. The cost of this testing will be paid for by OWNER.

B. Related Sections:

1. Documents affecting work of this Section include, but are not necessarily limited to:
  - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
2. Additional requirements for testing of materials and systems mentioned in this Section may be described in other Sections of these Specifications.

**1.02 REFERENCES:**

- A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
1. ASTM Standard Specifications:
    - a. D 1556 - Density of Soil In Place by the Sand-Cone Method.
    - b. D 1557 - Moist-Density Relations of Soils and Soils Aggregate Mixture Using 10 Pound Rammer and 18 Inch Drop.
    - c. D 1586 - Penetration Test and Split Barrel Sampling of Soils.

- d. D 2166 - Unconfined Compressive Strength of Cohesive Soil.
  - e. D 2167 -Density of Unit Weight of Sod In Place by the Rubber Balloon Method.
  - f. D 2922 - Density of Soil and Soil Aggregates by Nuclear Methods.
  - g. D 2937 - Density of Soil in Place by Drive Cylinder Method.
2. MDOT:
- a. Standard Specifications for Construction.
  - b. Density Control Handbook.

### **1.03 TEST REQUIREMENTS**

- A. In accordance with:
- 1. Laws and Regulations.
  - 2. Sections of these Specifications.
  - 3. Reference procedures and requirements.
  - 4. Pertinent standards for testing.

### **1.04 COLLECTING AND TRANSPORTING SAMPLES**

- A. Samples:
- 1. Collected by independent testing laboratory and transported by independent testing laboratory to a location determined by ENGINEER.

### **1.05 RETESTING COSTS**

- A. Retesting:
- 1. When initial tests of all items except soil compaction indicate noncompliance with the Contract Documents, all subsequent testing occasioned by the noncompliance shall be performed by the same testing laboratory, and the costs thereof will be deducted by OWNER from the Contract Sum.
  - 2. The first retesting of soil compaction shall be paid for from the allowance. The second and subsequent retesting costs for soil compaction due to noncompliance with the Contract Documents shall be performed by the same testing laboratory, and the costs thereof will be deducted by OWNER from the Contract Sum.
- B. Costs:
- 1. Uncovering costs shall be paid for as described in Article 13 of Section 00700 - General Conditions.

### **1.06 REPORTS**

- A. Provide Resident Project Representative with a copy of the daily report prior to leaving the Project Site each day on which Work is performed on the Site.
- B. Provide typed copies of all laboratory reports, inspections and certifications:
- 1. ENGINEER's office: Two copies.
  - 2. CONTRACTOR's office: One copy.
  - 3. CITY: One copy.

### **1.07 SCHEDULES FOR TESTING**

- A. Establishing schedule:
  - 1. By advance discussion with the independent testing laboratory, determine the time required to perform tests and to issue findings.
- B. Revising schedule:
  - 1. When changes of construction schedule are necessary during construction, coordinate all such changes of schedule with the independent testing laboratory.
- C. Adherence to schedule:
  - 1. When the independent testing laboratory is ready to test according to the determined schedule, but is prevented from testing or taking specimens due to incompleteness of the Work, all extra costs for testing attributable to the delay may be charged to CONTRACTOR and shall not be borne by OWNER.

### **1.08 CONTRACTOR'S DUTIES**

- A. Coordinate and schedule the work of the independent testing laboratory:
  - 1. Notify ENGINEER and the independent testing laboratory 24 hours prior to expected time when testing services will be required.
  - 2. Provide the following as necessary for laboratory to properly perform its functions:
    - a. Access to the Work.
    - b. Facilities for access to the Work.
    - c. Tools.
    - d. Samples of materials.
    - e. Storage.
    - f. Assistance as requested.

### **PART 2 - PRODUCTS**

Not used.

### **PART 3 - EXECUTION**

#### **3.01 TESTING REQUIREMENTS**

- A. Fine and coarse aggregate and bedding material:
  - 1. Test to ensure compliance with the materials specifications, at the request of ENGINEER.
- B. Fill material from on site and off site: Test to ensure compliance with the material specifications.
- C. Soil compaction:
  - 1. Predominately granular soils:
    - a. Perform laboratory and field testing to verify compaction of fill, bedding, trench backfill and structure backfill meets specified density.

- b. Verify the compaction of the first 12 inches of the existing subgrade below structures, utility structures, paved areas, and areas to be filled to meets the specified density.
  2. Predominately cohesive soils:
    - a. Perform laboratory and field testing to verify compaction of fill trench backfill meets specified density.
    - b. Verify the compaction of the first 12 inches of the existing subgrade below all structures, utility structures, paved areas, and areas to be filled meets specified density.
  3. Independent testing laboratory shall inform Resident Project Representative and CONTRACTOR's onsite supervisor immediately of all onsite test results.
  4. Place no additional fill in areas where compaction results do not meet Specification requirements.
- D. Verification of soil bearing capacity:
  1. Inspect the subgrade below all structures, perform all required testing and produce written documentation that the soil is capable of supporting the structures at the design soil bearing value indicated in the Drawings with acceptable anticipated settlement.
- E. Miscellaneous tests: OWNER or ENGINEER may elect to order testing of other materials under the cash allowance.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, the furnishing and installation of the construction facilities listed below as indicated on the Drawings, as specified herein and as necessary for the proper and complete performance of the Work.
  - 2. Construction facilities:
    - a. Temporary utilities: Water and electricity.
    - b. Sanitary facilities.
    - c. Enclosures such as tarpaulins, barricades and canopies.
    - d. Storage areas.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

**1.02 STORAGE AREAS**

- A. Locations:
  - 1. The following general areas are available for storage:
    - a. Street right-of-way: Temporary storage for adjacent construction.
  - 2. Specific storage locations within the general areas:
    - a. Carefully coordinate with OWNER.
    - b. Subject to approval of OWNER.
- B. Protection and restoration:
  - 1. Protect trees and shrubs in the storage areas.
  - 2. Replace grass and other vegetation disturbed or damaged in the storage areas.
  - 3. Take reasonable means to prevent spillage of fuel, oil, chemicals and similar materials.
  - 4. Clean up spills and, if necessary, remove soil and replace with uncontaminated soil.
- C. Cleaning: Keep storage areas as clean in accordance with Section 01562 - Cleaning.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. General:
  - 1. New or used.
  - 2. Adequate in capacity for the required usage.
  - 3. Provide safe conditions.
  - 4. Comply with requirements of applicable codes and standards.

**2.02 UTILITIES**

- A. Temporary utilities:
  - 1. Equipment testing:
    - a. Furnish, install, remove and pay for associated temporary equipment, piping, pumps, fuel, power distribution, and connections.
  - 2. Water:
    - a. CONTRACTOR will provide and pay all charges.
    - b. Furnish, install, remove and pay for all temporary piping, water meters, equipment and connections.
  - 3. Electricity:
    - a. Pay for electrical usage charges.
    - b. Furnish, install, remove and pay for all temporary wiring, equipment switches, panels, connections and transformers.
  - 4. Construction telephones:
    - a. Arrange for installation and removal of and pay for temporary telephones.
    - b. Pay for local telephone usage charges and CONTRACTOR's long distance usage charges.

### **2.03 FIELD OFFICES**

- A. Contractor's Field Office: If required.
  - 1. Provide desk, two chairs, and a 2-drawer file cabinet for ENGINEER.

### **2.04 SANITARY FACILITIES**

- A. Furnish and install all required temporary toilet buildings with sanitary toilets for use of all workers; comply with all minimum requirements of the Health Department or other public agency having jurisdiction; maintain in a sanitary condition at all times.

### **2.05 OTHER TEMPORARY CONSTRUCTION FACILITIES**

- A. Furnish, install and maintain all other temporary construction facilities necessary for proper completion of the Work.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Maintain and operate systems to ensure continuous service.
- B. Modify and extend systems as Work progress requires.

### **3.02 TEMPORARY CONTROLS**

- A. Traffic control:
  - 1. Provide adequate warning lights, signs, barricades and flagman; and take all necessary precautions for the protection of the Work, and the safety of the general public.

2. Lights, signs and barricades shall conform to the Michigan Manual of Uniform Traffic Control Devices.
  3. All lights, signs, barricades and other protective devices shall be installed and maintained in conformity with applicable statutory requirements and, where within highway rights-of way, as required by the authority having jurisdiction there over.
- B. Detours:
1. Shall be approved by OWNER and highway authority having jurisdiction prior to closing any road.
  2. CONTRACTOR shall secure above approvals and comply with all conditions thereof at CONTRACTOR's expense.

### **3.03 BYPASS PUMPING**

- A. Sanitary Sewer:
1. Maintain existing sewer in service during construction
  2. Provide bypass pumping if sewer flow must be stopped for more than 30 minutes.
  3. CONTRACTOR shall submit plan for bypass pumping to CITY for approval.
  4. CONTRACTOR shall notify CITY 48 hours in advance of any flow interruption.
  5. Schedule flow interruptions during periods of low flow in system.

### **3.04 REMOVAL**

- A. Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the Work. Remove all such temporary facilities and controls as rapidly as progress of the Work will permit.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, maintaining all structures and the Site in a standard of cleanliness as indicated on the Drawings, as specified herein and as necessary for the proper and complete performance of the Work.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
    - b. In addition to standards described in this Section, comply with all requirements for cleaning up as described in various other Sections of these Specifications.

**1.02 QUALITY ASSURANCE**

- A. Inspection:
  - 1. Daily and more often if necessary.
  - 2. Conduct inspections to verify that requirements of cleanliness are being met.

**1.03 DELIVERY, STORAGE AND HANDLING**

- A. Hazards control:
  - 1. Volatile wastes:
    - a. Store in covered metal containers.
    - b. Remove from premises daily.
  - 2. Prevent accumulation of wastes which create hazardous conditions.
  - 3. Provide adequate ventilation during use of volatile or noxious substances.

**1.04 PROJECT CONDITIONS**

- A. Cleaning and disposal:
  - 1. Conduct operations to comply with local ordinances and anti-pollution laws.
  - 2. Not allowed:
    - a. Burning or burying of rubbish or waste materials on site.
    - b. Disposal of volatile wastes in storm or sanitary sewers:
      - 1) Volatile wastes include, but are not limited to, mineral spirits, oil or paint thinner.
    - c. Disposal of wastes into streams or waterways.

**PART 2 - PRODUCTS**

**2.01 MATERIALS AND EQUIPMENT**

- A. Compatibility:
  - 1. Compatible with the surface being cleaned.
  - 2. Recommended by the Manufacturer of material being cleaned.

3. As approved by ENGINEER.

### **PART 3 - EXECUTION**

#### **3.01 PROGRESS CLEANING**

- A. General:
  1. Store materials:
    - a. In an orderly arrangement allowing maximum access.
    - b. To allow unimpeded drainage and traffic.
    - c. Provide for the required protection of materials.
  2. Scrap, debris, waste material and other items not required for construction of the Work.
    - a. Do not allow accumulation.
    - b. Remove from Site at least each week and more often if necessary.
    - c. Provide adequate storage for all materials awaiting removal.
  3. Observe all requirements for fire protection and protection of the environment.
- B. Site:
  1. Daily, and more often if necessary:
    - a. Inspect the Site.
    - b. Pick up all scrap, debris and waste material; remove all such items to the place designated for their storage.
  2. Weekly, and more often if necessary:
    - a. Inspect all arrangements of materials stored onsite.
    - b. Restack or otherwise service all arrangements to meet the requirements of paragraph 3.01-A.1.
  3. At all times maintain the Site in a neat and orderly condition which meets the approval of ENGINEER.
  4. Paved surfaces: Keep clean.
  5. Dust control:
    - a. Control dust on or near the Work by the application of water, salt, chloride or other approved means.
    - b. If CONTRACTOR fails to correct unsatisfactory conditions within 24 hours after due notification:
      - 1) OWNER may arrange for such work to be performed by other means.
      - 2) Pay costs.

#### **3.02 FINAL CLEANING**

- A. Definitions:
  1. Clean: The level of cleanliness generally provided by commercial building maintenance subcontractors using commercial quality building maintenance equipment and materials.
- B. Prior to completion of the Work:
  1. Remove from the Site all tools, surplus materials, equipment, scrap, debris and waste.
  2. Conduct final progress cleaning as described in Section 3.01 above.
- C. Site:
  1. Unless otherwise specifically directed by ENGINEER:
    - a. Hose down all paved areas onsite and all public sidewalks directly adjacent to the Site.

- b. Rake clean other surfaces of the grounds.
2. Remove all resultant debris.

D. Timing:

1. Schedule final cleaning as approved by ENGINEER to enable OWNER to accept a completely clean project.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, substitutions and Product options as indicated on the Drawings, as specified herein and as necessary for the proper and complete performance of the Work.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

**1.02 SUBMITTALS**

- A. Submit in accordance with Section 01300 - Submittals.
- B. List of all Products proposed for installation:
  - 1. Submit 5 copies within 30 days after the Effective Date of Agreement unless otherwise indicated elsewhere in the Standard Specifications.
  - 2. Tabulate the list by each Specification Section.

**1.03 CONTRACTOR'S OPTIONS**

- A. Products specified only by reference standards or by description:
  - 1. Select any Product meeting the standards or description by any Supplier unless otherwise required elsewhere in the Standard Specifications.
  - 2. Submit for ENGINEER's review:
    - a. Name and address of Supplier.
    - b. Trade name.
    - c. Model or catalog designation.
    - d. Manufacturer's data including:
      - 1) Performance and test data.
      - 2) Compliance with reference standards.
- B. Products specified by naming one or more Suppliers without an "or equal" clause:
  - 1. Use specified Product of one of the Suppliers named.
  - 2. No substitutions.
- C. Products specified by naming one or more Suppliers with an "or equal" clause:
  - 1. Indicates the option of selecting equivalent Products by stating "or equal" clause after the specified Suppliers.
  - 2. ENGINEER may waive some or all of the requirements specified for substitutions if, at ENGINEER's sole discretion, the proposed equivalent Product is considered an "or equal".
  - 3. If, at ENGINEER's sole discretion, the proposed equivalent Product does not qualify as an "or equal", it will be considered as a proposed substitute and a substitution request submittal will be required.

**1.04 SUBSTITUTIONS**

- A. Substitutions after the Effective Date of Agreement:
  - 1. With 30 days after the Effective Date of Agreement.
  - 2. ENGINEER will consider formal requests for substitution of Products in place of those specified unless otherwise prohibited elsewhere in the Standard Specifications.
  
- B. Substitution request submittals:
  - 1. Submit 5 copies of the request for substitution including the following:
    - a. Complete data substantiating compliance of the proposed substitution with the Contract Documents.
    - b. For Products:
      - 1) Names and addresses of Manufacturer and Supplier.
      - 2) Product identification.
      - 3) Manufacturer's literature, including:
        - a) Product description.
        - b) Performance and test data.
        - c) Reference standards.
      - 4) Samples.
      - 5) Name and address of similar projects on which the Product was used and date of installation.
    - c. For construction methods:
      - 1) Detailed description of the proposed method.
      - 2) Drawings illustrating methods.
    - d. Itemized comparison of proposed substitution with Product or method specified.
    - e. Data relating to changes in the construction schedule.
    - f. Accurate cost data on the substitution and comparison with the Product or method specified.
    - g. Changes to the Work which would be caused by the substitution.
  
- C. CONTRACTOR's responsibilities:
  - 1. In making a request for a substitution, CONTRACTOR represents:
    - a. CONTRACTOR has personally investigated the proposed Product or method and determined that it is equal or superior in all respects to that which is specified.
    - b. CONTRACTOR will provide the same guarantee for the substitution as for the Product or method specified.
    - c. CONTRACTOR will coordinate installation of the accepted substitution into the Work making such changes as may be required for the Work to be completed in all respects.
    - d. CONTRACTOR waives all claims for additional cost related to the substitution which consequently become apparent.
    - e. Cost data is complete and includes all related costs under CONTRACTOR'S contract, but excludes costs under separate contracts and ENGINEER's redesign costs.
  
- D. Substitutions not considered:
  - 1. Substitutions will not be considered if:
    - a. They are indicated or implied on Shop Drawings or Product data submittals without formal request submitted in accordance with this Section.

- b. Acceptance will require substantial revision of the Contract Documents.

**PART 2 - PRODUCTS**

2.01 Not Used.

**PART 3 - EXECUTION**

3.01 Not Used.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, the instructions for and the responsibilities of each party in contract closeout as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

**1.02 SUBSTANTIAL COMPLETION**

- A. CONTRACTOR:
  - 1. When CONTRACTOR considers that the Work or any portion of the Work is ready for its intended use, CONTRACTOR shall submit:
    - a. Written certification to ENGINEER and OWNER that the Work, or designated portion of the Work, is substantially complete.
    - b. A list of major items to be completed or corrected.
    - c. Request that ENGINEER issue a certificate of Substantial Completion.
- B. ENGINEER's inspection:
  - 1. ENGINEER will make an inspection:
    - a. Within 10 days after receipt of certification.
    - b. Together with OWNER and CONTRACTOR.
- C. ENGINEER's determination of Substantial Completion in response to CONTRACTOR's request:
  - 1. Should ENGINEER consider the Work or designated portion of the Work substantially complete, the following steps shall be taken:
    - a. CONTRACTOR shall prepare and submit to ENGINEER a list of items to be completed or corrected as determined by the inspection.
    - b. ENGINEER will prepare and deliver to OWNER:
      - 1) A tentative certificate of Substantial Completion.
      - 2) A tentative list of items to be completed or corrected before final payment.
    - c. OWNER shall have 7 days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list.
    - d. ENGINEER will, within 14 days after delivery of tentative certificate to OWNER, decide:
      - 1) Not substantially complete:
        - a) ENGINEER: Issue written notice to CONTRACTOR stating reasons.
      - 2) Substantially complete:
        - a) ENGINEER: Issue definitive certificate of Substantial Completion and a final list of items to be corrected or completed.

2. Should ENGINEER consider that the Work or designated portion of the Work is not substantially complete, the following steps shall be taken:
  - a. ENGINEER shall notify CONTRACTOR in writing stating ENGINEER's reasons.
  - b. CONTRACTOR shall complete the work and send a second written notice to ENGINEER certifying that the Project, or designated portion of the Project is substantially complete.
  - c. ENGINEER and OWNER will reinspect the work.

### **1.03 FINAL INSPECTION**

- A. CONTRACTOR certification:
  1. Prior to final inspection, CONTRACTOR shall submit written certification that:
    - a. The Contract Documents have been reviewed.
    - b. The Project has been inspected in compliance with the Contract Documents.
    - c. Work has been completed in accordance with the Contract Documents.
    - d. Equipment and systems have been tested in the presence of the OWNER's representative and are operational.
    - e. The Project is complete and ready for final inspection.
- B. ENGINEER's inspection:
  1. The ENGINEER will make final inspection:
    - a. Within 10 days after receipt of certification.
    - b. Together with CITY, OWNER and CONTRACTOR.
- C. ENGINEER's determination of final completion:
  1. Should ENGINEER consider the Work finally complete in accordance with the requirements of the Contract Documents, ENGINEER shall request CONTRACTOR to make Project closeout submittals.
  2. Should ENGINEER consider the Work not finally complete:
    - a. ENGINEER shall notify CONTRACTOR in writing stating the reasons.
    - b. CONTRACTOR:
      - 1) Take immediate steps to remedy the stated deficiencies.
      - 2) Send a second written notice to ENGINEER certifying that the Work is complete.
    - c. ENGINEER, CITY and OWNER will reinspect the Work.

### **1.04 REINSPECTION COSTS**

- A. Should ENGINEER be required to perform second inspections because of failure of the Work to comply with the original certifications of CONTRACTOR, OWNER will compensate ENGINEER for additional services and deduct the amount paid from payment or payments to CONTRACTOR.

### **1.05 CLOSEOUT SUBMITTALS**

- A. CONTRACTOR:
  1. Provide closeout submittals as required in the Contract Documents.
  2. These submittals shall include, but not necessarily be limited to:

- a. Project record documents.
- b. Guarantees.

**1.06 EVIDENCE OF PAYMENTS AND RELEASE OF LIENS**

- A. Affidavits:
  - 1. Submit with final Application for Payment an affidavit of payment of debts and release of claims.
  - 2. Affidavit shall include:
    - a. CONTRACTOR's release or waiver of lien.
    - b. Consent of surety of final payment.
  
- B. Execution: All submittals shall be duly executed before delivery to ENGINEER.

**PART 2 - PRODUCTS**

Not used.

**PART 3 - EXECUTION**

Not used.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not normally limited to, procedures for the maintenance, recording and submittal of Project documents as herein specified indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.
  
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

**1.02 MAINTENANCE OF DOCUMENTS AND SAMPLES**

- A. Storage:
  - 1. Store documents and Samples.
  - 2. Provide secure storage space for storage of Samples.
  
- B. Filing:
  - 1. File record documents in accordance with CSI Masterformat.
  
- C. Maintenance:
  - 1. Maintain documents in a clean, dry, legible condition and in good order.
  - 2. Do not use record documents for construction purposes.
  
- D. Availability:
  - 1. Make documents and Samples available at all times for inspection by ENGINEER.

**1.03 RECORDING**

- A. Labeling: Label each document "PROJECT RECORD" in neat large printed letters.
  
- B. Recording:
  - 1. Record actual revisions to the Work.
  - 2. Record information concurrently with construction progress.
  - 3. Do not conceal any work until required information is recorded.
  
- C. Drawings:
  - 1. Legibly mark, with notes or graphic representations, to record actual construction:
    - a. Horizontal and vertical locations of Underground Facilities and appurtenances, referenced to permanent surface improvements.
    - b. Field changes of dimension and detail.
    - c. Changes made by Field Order, Work Change Directive or Change Order.
    - d. Details not on original Contract Drawings.

2. At ENGINEER's option, after ENGINEER's review of the record drawings, transfer all marks to a set of mylars provided by ENGINEER.

**1.04 SUBMITTAL**

- A. CONTRACTOR: At Contract closeout deliver record documents to the PROJECT ENGINEER for the CITY or OWNER.
- B. PROJECT ENGINEER:
  1. Review record documents for accuracy.
  2. Certify and sign documents as "Record Drawings" for project.
  3. Send record documents to CITY with transmittal letter in duplicate, containing:
    - a. Date.
    - b. Project title and number.
    - c. ENGINEER's name and address.
    - d. CONTRACTOR's name and address.
    - e. Title and number of each Record Document.
    - f. Signature of ENGINEER certifying documents.

**PART 2 - PRODUCTS**

Not used.

**PART 3 - EXECUTION**

Not used.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, the major items listed below as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.
  - 2. Major items:
    - a. Clearing Sites of above-grade trees, shrubs, grass and plant life.
    - b. Removal of above grade and below grade improvements including:
      - 1) Concrete slabs, walks, curbs, drives and similar structures.
      - 2) Culverts.
      - 3) Masonry and concrete structures.
      - 4) Fences.
      - 5) Manholes, catch basins and inlets.
    - c. Removal of roots and stumps.
    - d. Removal of rocks, boulders and debris.
    - e. Stripping and removal of sod.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
    - b. Section 02222 - Excavating, Backfilling and Compacting for Utilities.

**1.02 REFERENCES**

- A. Except as herein specified or as indicated on the Drawings, the Work of this Section shall comply with the following:
  - 1. MDOT publications.
    - a. 2003 Standard Specifications for Construction.
    - b. Standard Plans.

**1.03 DEFINITIONS**

- A. Terms:
  - 1. Surface improvements: All surface improvements beyond what might be encountered in an open unimproved field.

**1.04 SUBMITTALS**

- A. Submit in accordance with Section 01300 - Submittals.
- B. Permit to store or dump removed materials:
  - 1. On property owned, leased or occupied by someone other than OWNER.
  - 2. Submit prior to storing or dumping.
  - 3. Permit shall absolve OWNER from responsibility for storing or dumping.

**1.05 QUALITY ASSURANCE**

- A. Trimming:
  - 1. Trimming of limbs and branches and the painting of tree wounds shall be actively supervised by a member of one of the following:
    - a. ASCA American Society of Consulting Arborists.
    - b. ISA International Society of Arboriculture.
    - c. NAA National Arborist Associations.
- B. Interference:
  - 1. Ensure that Site preparation work does not unduly interfere with pedestrian and vehicular traffic.
  - 2. Obtain ENGINEER's and governing authority's approvals prior to closing a public street.

**1.06 PROJECT CONDITIONS**

- A. Burning:
  - 1. Not permitted.

**PART 2 - PRODUCTS**

Not used.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Soil erosion control:
  - 1. Provide soil erosion control in accordance with Section 02272 - Soil Erosion and Sedimentation Control prior to starting Site preparation work.
- B. Protection of trees and shrubs:
  - 1. Protect trees and shrubs which are to remain from permanent damage by construction operations.
  - 2. Prevent vehicles from driving within area under dripline of trees which are to remain.
- C. Maintain designated temporary roadways, walkways, and detours for vehicular and pedestrian traffic.

**3.02 APPLICATION**

- A. Clearing:
  - 1. Remove trees, shrubs, plant life, grass, stumps, rocks, boulders, and debris from within the construction limits.
  - 2. Remove roots, rocks, and boulders to a depth of 1-foot below finish grade in the following areas:
    - a. Proposed buildings or structures.

- b. Proposed pavements and walks.
  - c. Other areas where compaction of the subgrade is required.
- B. Prevent construction operations from damaging or disturbing:
- 1. Trees or roots of trees which are to remain.
  - 2. Surface improvements which are to remain.

**3.03 DISPOSAL OF EXCESS MATERIAL**

- A. General:
- 1. Remove and properly dispose of all material not needed to complete Project.
  - 2. Dispose of excess material at a location off the Site.
  - 3. Dispose of excess topsoil at a location on the Site as directed by OWNER.
  - 4. Disposal of materials shall not violate laws, rules, regulations and the like regarding the filling of flood plains, wetlands and other environmentally sensitive areas.
  - 5. Provide adequate controls to maintain disposal sites in a neat and safe conditions by periodic leveling of material, the control of erosion and such other practices as are necessary.
  - 6. Grade and hydromulch the disposal area.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
1. This Section includes, but is not necessarily limited to, the furnishing and installation of the major items listed below, as indicated on the Drawings, as specified herein and as necessary for the proper and complete performance of the Work.
  2. Major items:
    - a. Clearing.
    - b. Excavation and trenching in earth and in rock.
    - c. Disposal of items from clearing and unsuitable or excess excavated materials.
    - d. Complete drainage of excavations.
    - e. Temporary or permanent sheeting, bracing and shoring of excavations.
    - f. Installation of normal and special foundations, bedding and backfill materials.
- B. Related Section:
1. Documents affecting work of this Section include, but are not necessarily limited to General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
    - a. Section 02665 - Water Distribution System
    - b. Section 02723 - Forcemain
    - c. Section 02731 - Sanitary Sewer System

**1.02 REFERENCES**

- A. Except as herein specified or as indicated on the Drawings, the Work of this Section shall comply with the following:
1. ASTM Standards:
    - a. D 1557 - Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures using 10 lb. Rammer and 18-inch Drop.
  2. MDOT publications:
    - a. 2003 Standard Specifications for Construction.
    - b. Standard Plans.

**1.03 DEFINITIONS**

- A. Terms:
1. Backfilling: The placement of fill on a site.
  2. Bedding: The material placed around a utility between 4 inches below to 12 inches above the utility and the full width of the trench.
  3. Compaction: The act of placing and condensing fill material to increase its density and stability.
  4. Driving surface: A pavement, shoulder, aggregate driving surface, roadway, parking area, or maneuvering area, subbase or pavement structure.
  5. Excavation:
    - a. Removing the following materials from their present location:

- 1) Native material.
- 2) Natural items such as trees, stumps, logs and other vegetation.
- 3) Man-made items such as:
  - a) Bituminous and concrete paving.
  - b) Curbs.
  - c) Rip-rap.
  - d) Head walls.
  - e) Underground utilities.
  - f) Manholes and catch basins.
  - g) Foundations.
  - h) Debris.
6. Extra earth excavation: Excavation of native material from below the normal trench bottom.
7. Fill: Soil, native material, imported material or other material which is placed over the subgrade, over excavated areas, under roadways, under parking areas, under walks, under buildings, under structures and anywhere else on the site.
8. Foundation material: The material placed in a trench undercut to replace extra earth excavation.
9. Grading: The act of moving soil from one location on the site to another to achieve the contours and elevations as indicated on the Drawings and as herein specified.
10. Granular material:
  - a. The material placed between the top of bedding and the bottom of suitable material, or the surface restoration or driving surface, as indicated on the schedules at the end of this section.
  - b. Used under and adjacent to driving surfaces or structures.
11. Hardpan:
  - a. Cemented soil layers.
  - b. Not hard clay layers that are not cemented.
12. Imported material: Soil material which is purchased by CONTRACTOR and hauled onto the Site.
13. Native material: Soil and other natural earth materials, except rock, which are existing on the Site prior to the start of Work.
14. Normal trench bottom: The surface of the undisturbed native material at an elevation 4-inches below the bottom of the utility.
15. Rock excavation:
  - a. Excavation of igneous, metamorphic or sedimentary rock or hardpan which cannot be excavated without continuous drilling and blasting or continuous use of a ripper or other special equipment.
  - b. Excavation of all boulders of ½ cubic yard or more in volume.
16. Special foundations:
  - a. Specially constructed systems for support of underground utilities such as timber piling, concrete foundations and surcharge techniques.
  - b. Extra earth excavation and placing imported or native materials is not a special foundation.
17. Structure: A building, retaining wall, sidewalk, curb, tank, manhole, catch basin, junction box, footing, slab or other similar construction.
18. Suitable material:
  - a. Native material excavated from the trench and approved as backfill by ENGINEER.

- b. Not used under or adjacent to driving surfaces or structures.
  - c. Placed between the top of the bedding or granular material as indicated on the Drawings and the bottom of the surface restoration.
19. Other definitions: Other earthwork terms not defined herein or in the Contract Documents shall be as defined in MDOT Standard Specifications.

#### **1.04 DESIGN AND PERFORMANCE REQUIREMENTS**

- A. Trench bottom suitability:
  - 1. Be responsible for the suitability of the normal trench bottom in supporting the utility, bedding and backfill.
  - 2. Notify ENGINEER and await ENGINEER's decision if a possible unsuitable condition exists.
  - 3. Poor dewatering techniques or lack of excess water control shall not be a reason for additional payment for remedial measures.
- B. Settlement guarantee:
  - 1. Guarantee that no settlement or damage as a result of settlement will occur in backfill areas for a period of one year following Substantial Completion of the Project.
  - 2. Be financially responsible for and make all repairs necessary as a result of settlement.
- C. Trench wall stability:
  - 1. Be responsible for the structural design of all sheeting, shoring and bracing to support trench side walls from collapsing.
  - 2. Be responsible for the structural design and stability of a pipe-laying box if utilized on the Project to prevent trench walls from collapsing.

#### **1.05 QUALITY ASSURANCE**

- A. Testing:
  - 1. Testing will be performed in accordance with Section 01410 - Testing Services.
- B. Compaction:
  - 1. Determine density by the modified Proctor method, ASTM D 1557.
  - 2. Compact all fill, granular material, suitable material and bedding to at least 95% maximum density.
  - 3. The first 12 inches of native material at the bottom of utility trenches:
    - a. Test for density.
    - b. Compact to at least 95% maximum density if the existing density is below 95%.
  - 4. All suitable material and fill in areas not under or adjacent to driving surfaces and structures compact to 90% of maximum density.

#### **1.06 PROJECT CONDITIONS**

- A. Dust control:
  - 1. Use all legal means necessary to control dust on and near the Work and on and near all off-site borrow areas if such dust is caused by CONTRACTOR's operations during

performance of the Work or if resulting from the condition of the Site when earthwork operations are suspended.

2. Moisten or otherwise treat haul roads, delivery roads, temporary site access roads and other surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other work on the Site.
3. Periodically scrape or broom adjacent streets to remove tracked dirt.

**B. Existing structures and utilities:**

1. Call Miss Dig to locate all existing underground utilities prior to starting excavation.
2. Where service lines or structures are encountered which are in active use:
  - a. Provide adequate protection for them.
  - b. Be responsible for damage to such utilities.
3. Provide stand-by utility service if temporary removal is necessary for a period exceeding 2 hours.
4. Where utility service connections to occupied buildings must be temporarily disconnected, give 8 hours notice to the affected occupants of the time and duration of the anticipated shut off.
5. Raise, lower, or move underground utilities or structures which interfere with the line or structure being constructed as part of this Work.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

**A. Fill Material:**

1. Approval required:
  - a. All fill material shall be subject to the approval of ENGINEER.
2. Notification:
  - a. For approval of imported material, notify ENGINEER at least 1 week in advance of intention to import material, designate the proposed borrow area, and permit ENGINEER to sample as necessary from the borrow area for the purpose of making acceptance tests to prove the quality of the material.

**B. Foundation material:**

1. Crushed stone: 1-1/2-inch maximum size.

**C. Bedding:**

1. MDOT Granular Material Class II modified to 100% passing a 1/2-inch sieve.

**D. Suitable material:**

1. Native material:
  - a. Soil exclusive of blue clay, organic matter, frozen lumps or other deleterious substances.
  - b. Containing no rocks or lumps over 3 inches in greatest dimension.
  - c. Obtain approval for using native material as backfill from ENGINEER.
2. Imported material:
  - a. MDOT Granular Material Class II.

- b. Where approved by the ENGINEER.
  
- E. Granular material:
  - 1. Native material:
    - a. Granular material:
      - 1) MDOT Granular Class II, or
      - 2) Which can be compacted to specified level with reasonable level of effort.
    - b. Exclusive of clay, organic matter, frozen lumps or other harmful substances.
    - c. No rocks or lumps over 3 inches in greatest dimension.
  - 2. Imported material:
    - a. MDOT granular material Class II.
    - b. Where approved by ENGINEER.

## **2.02 OTHER MATERIALS**

- A. All other materials, not specifically described but required for proper completion of the work of this Section, shall be as selected by CONTRACTOR subject to the approval of ENGINEER.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Topsoil:
  - 1. Remove all topsoil to the depths at which subsoil is encountered, from all trench areas and from all areas which are to be cut to lower grades or filled.
  - 2. With ENGINEER's approval, topsoil to be used for finish grading may be stored onsite.
  - 3. Other topsoil may be used for fill in noncritical areas with approval of ENGINEER.
  - 4. Properly dispose of all excess topsoil.
  
- B. Obstructions:
  - 1. Remove and dispose of trees, stumps, roots, boulders, sidewalks, driveways, pavement, pipes and the like, as required for the performance of the Work.
  - 2. Exercise care in excavating around catch basins, inlets and manholes.
  - 3. Avoid removing or loosening castings.
  - 4. Repair and replace damaged or displaced castings; remove dirt entering the structures during the performance of the Work at no additional cost to OWNER.
  - 5. Exercise care in excavating around trees which are to remain after construction. Tunnel under tree roots whenever practical to avoid cutting major root systems.
  
- C. Signage:
  - 1. Inventory Michigan Department of Transportation signage for:
    - a. Longitudinal placement.
    - b. Lateral offset.
    - c. Sign bottom height.
  - 2. Submit report in writing to ENGINEER prior to removal of signs.
  - 3. Remove signs from their supports and store vertically during construction.
  - 4. Protect sign face from damage to the high intensity sheeting.

5. Signs damaged by Work: Replace in kind with new materials.
  6. Re-erect signs as soon as practical.
- D. Mailboxes and other movable features:
1. Witness location prior to removal. Relocate to accessible location and maintain during construction.
  2. Relocate to original position and condition as soon as practical.
- E. Cutting paved surfaces and similar improvements:
1. All cuts shall be a minimum of 1 foot wider than trench on each side. When the remaining width of paved surface is less than 4 feet, remove the entire paved surface.
  2. Before removing pavement, mark the pavement neatly, paralleling pipe lines and existing street lines. Space the marks the width of the trench.
  3. Concrete:
    - a. Pavements and driving surfaces: Saw cut if over 3 feet from expansion or construction joint, otherwise remove to joint.
    - b. Sidewalks: Remove to joints.
    - c. Curb and gutter: Remove to joints.
  4. Final surface course bituminous: Saw cut joints unless otherwise approved by ENGINEER.
  5. Do not disturb or damage the adjacent pavement. If the adjacent pavement is disturbed or damaged, remove and replace the damaged pavement.
  6. CONTRACTOR may tunnel under curbs that are encountered. Remove and replace curb disturbed by construction.
  7. Dispose of materials removed.
- F. Utilities to be abandoned:
1. When pipes, conduits, sewers or other structures are removed from the trench leaving dead ends in the ground, such ends shall be fully plugged or sealed with caps or mortar.
  2. Abandoned structures such as manholes or chambers shall be entirely removed unless otherwise specified or indicated on the Drawings.
  3. All materials from abandoned utilities which can be readily salvaged shall be removed from the excavation and stored on the Site.
  4. All salvageable materials will remain the property of OWNER unless otherwise indicated by OWNER.
- G. Extra earth excavation:
1. If soft material, which in the opinion of ENGINEER is not suitable, is encountered below the normal trench bottom or below a structure ENGINEER may order the removal of this soft material and its replacement with specified material in order to make a suitable foundation for the construction of the utility or structure.
  2. All extra earth excavation made at the order of ENGINEER will be paid for on the basis of the actual quantity of material excavated. Do not proceed further until instructions are received and necessary measurements made for purposes of establishing additional volume of excavation.
  3. No extra payment will be made if removal is required as a result of poor dewatering techniques.

**3.02 EXCAVATION AND TRENCHING**

- A. General:
  - 1. By open cut from surface unless designated otherwise.
  - 2. Slope sides of trench adequately for protection of the Work.
  
- B. Maximum length of open trench:
  - 1. In public right-of-way: 200 feet.
  - 2. In private easements: 200 feet or as stated in Contract Documents.
  - 3. Other locations: 400 feet.
  
- C. Trench depth: On line and to grade required for pipe or structure installation.
  
- D. Width:
  - 1. Minimum clearance on each side of utility: 6 inches.
  - 2. Maximum width of trench at 12 inches above the top of utility (top of bedding):
    - a. Up through 30-inch diameter utility: 16 inches plus utility diameter.
    - b. Greater than 30-inch diameter utility: 24 inches plus utility diameter.
  - 3. Maximum width of trench at ground surface:
    - a. Not outside of the property line or easement.
    - b. As required for protection of the Work.
    - c. Use sheeting, bracing and shoring if required.
  - 4. Provide sufficient space in the trench to permit the joint to be properly made.
  
- E. Depth:
  - 1. Excavate to provide the elevations, grades, and depths of cover indicated on the Drawings and herein specified.
  - 2. The 4 inches of required bedding material below the utility may be omitted if:
    - a. Approved by ENGINEER.
    - b. CONTRACTOR arranges and pays for testing of the native material.
    - c. The native material complies with MDOT Granular Material Class II material, modified so that 100% passes a 1/2-inch sieve.
    - d. The material is compacted as specified herein.
  
- F. Rock excavation:
  - 1. Where rock excavation is encountered within the excavation, the surface of the rock shall be sufficiently exposed to permit adequate measurements to be taken before the rock excavation is started.
  - 2. Notify ENGINEER prior to removal if rock is encountered.
  - 3. No utility shall be within 6 inches of rock.
  - 4. Blasting:
    - a. Only with permission of ENGINEER and in accordance with laws and regulations applying thereto.
    - b. Secure permit if required.
    - c. Notify utility and public agencies.
    - d. Explosives shall be used with extreme care by experienced workers only.
    - e. Hours shall be fixed by ENGINEER.

- f. CONTRACTOR solely responsible for safety, damage and control of blasting operations.

**3.03 DISPOSAL OF EXCESS EXCAVATED MATERIAL**

- A. General: CONTRACTOR responsibility and expense.
- B. Disposal sites:
  - 1. Material shall be disposed of by CONTRACTOR in the location of the CONTRACTOR's option if not desired by OWNER or individual property owners onsite.
  - 2. OWNER may establish disposal sites, but at his option, may choose not to accept certain materials, including but not necessarily limited to, items from clearing, muck, peat, marl and whole or broken man-made items removed by construction. Dispose of such materials at locations other than as designated by OWNER.
  - 3. Disposal of materials shall not violate laws, rules, regulations and the like regarding the filling of flood plains, wetlands and other environmentally sensitive areas.
  - 4. Concrete pavement may not be used as fill within 500 feet of Lake Michigan shore.
  - 5. Provide adequate controls to maintain disposal sites in a neat and safe condition by periodic leveling of material, the control of erosion and such other practices as are necessary.

**3.04 EXCESS WATER CONTROL**

- A. Regulations and permits:
  - 1. Obtain all necessary soil erosion control permits in accordance with P.A. 347 of 1972, the Soil Erosion and Sedimentation Control Act, and all pertinent rules, laws and regulations.
- B. Unfavorable weather:
  - 1. Do not place, spread or roll any fill material during unfavorable weather conditions.
  - 2. Do not resume operations until moisture content and fill density are satisfactory to ENGINEER.
- C. Pumping and drainage:
  - 1. Provide, maintain and use at all times during construction, adequate means and devices to promptly remove and dispose of all water from every source entering the excavations or other parts of the Work.
  - 2. Dewater by means which will ensure dry excavations and preserve final lines and grades and do not disturb or displace adjacent soil.
  - 3. Perform pumping and drainage:
    - a. In such a manner to cause no damage to property, pedestrians, vehicular traffic or the work of other contractors.
    - b. In accordance with all pertinent laws, ordinances and regulations.
  - 4. Do not overload or obstruct existing drainage facilities.
- D. General:
  - 1. Keep excavations dry during construction.
  - 2. Remove water by use of wells, well points, portable pumps, bailing, drains, underdrains or other acceptable methods.

3. Provide crushed stone or gravel as required to aid dewatering operations.
4. Divert or temporarily reroute existing sewers and drainage of discharge lines to adequate and acceptable outlets during construction. CONTRACTOR responsible to ascertain availability of outlets.
5. Divert surface water from entering excavations by construction and maintenance of channels or berms.
6. Sediment traps and other soil erosion control measures shall prevent soil particles from entering any sewer, watercourse or similar conveyance.
7. Protect all pipes, facilities and structures, existing and new, from hydrostatic uplift.

### **3.05 SHEETING, SHORING AND BRACING EXCAVATIONS**

#### **A. General:**

1. Furnish, put in place and maintain all sheeting, bracing and shoring as may be required to properly support the sides of all excavations and to prevent all movement of earth which could in any way injure the Work or adjacent property.
2. Exercise care in the removal of sheeting, shoring, bracing and timbering to prevent collapse or caving of the excavation faces being supported and damage to the Work and adjacent property.
3. A pipe-laying box may be used in lieu of sheeting.

#### **B. Sheeting:**

1. Do not install by jetting.
2. Remove as backfilling proceeds, unless ordered left in place by ENGINEER. Use care to fill and compact voids created by removal, especially below mid-height of utility.
3. Sheeting left in place:
  - a. Requires written approval of ENGINEER.
  - b. Cut off minimum of 2 feet below finished grade.

### **3.06 TRENCH CONSTRUCTION**

#### **A. Excavation:**

1. Excavation to the normal trench bottom elevation with an accuracy of  $\pm 0.10$  feet.

#### **B. Extra earth excavation:**

1. Excavate below the normal bottom and fill with foundation material only if approved by ENGINEER and in accordance with Article 3.02D.
2. Upon notification to ENGINEER that native material may be unsuitable, reasonable amounts of probing and investigative excavation to determine the extent of unsuitable material shall be performed by CONTRACTOR.

#### **C. Special foundations:**

1. Special foundations shall be determined on an individual basis by ENGINEER in cooperation with CONTRACTOR, unless otherwise provided in the Contract Documents.

#### **D. Bedding:**

1. Place the bedding material up to 1/8 the height of the utility. Compact as herein specified.

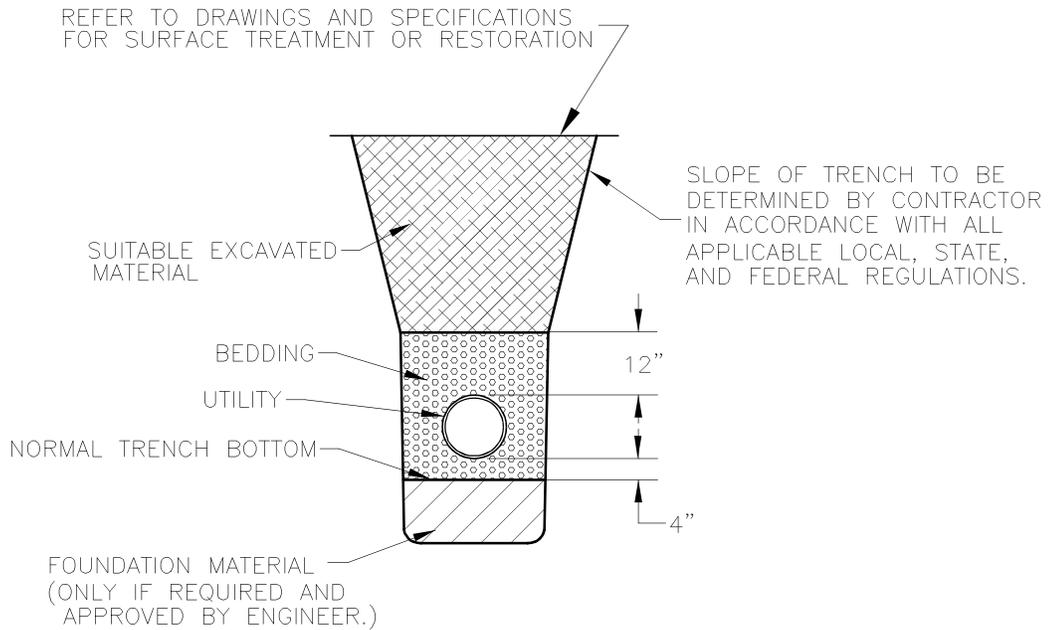
2. Accurately shape the bedding material to fit the pipe shape. Recess the bedding to relieve the pressure on the bell or other projecting utility joint.
  3. After laying out the utility, tamp additional bedding in place up to the midpoint of the utility. Use hand-held tampers to achieve the required compaction.
  4. Place additional bedding up to 12 inches above the top of the utility. Use hand operated compactors to achieve required compaction.
  5. Place all bedding in maximum lifts of 6 inches.
  6. No payment shall be made for pea gravel or crushed stone bedding when used for CONTRACTOR convenience or when used without authorization of ENGINEER.
- E. Trench backfill:
1. Use backfill material as each Drawing detail indicates and as the material is defined herein.
  2. Place all backfill in 12-inch lifts and compact as herein specified. ENGINEER will consider greater lifts if testing indicates that the required compaction is being achieved.

### **3.07 CLEANUP**

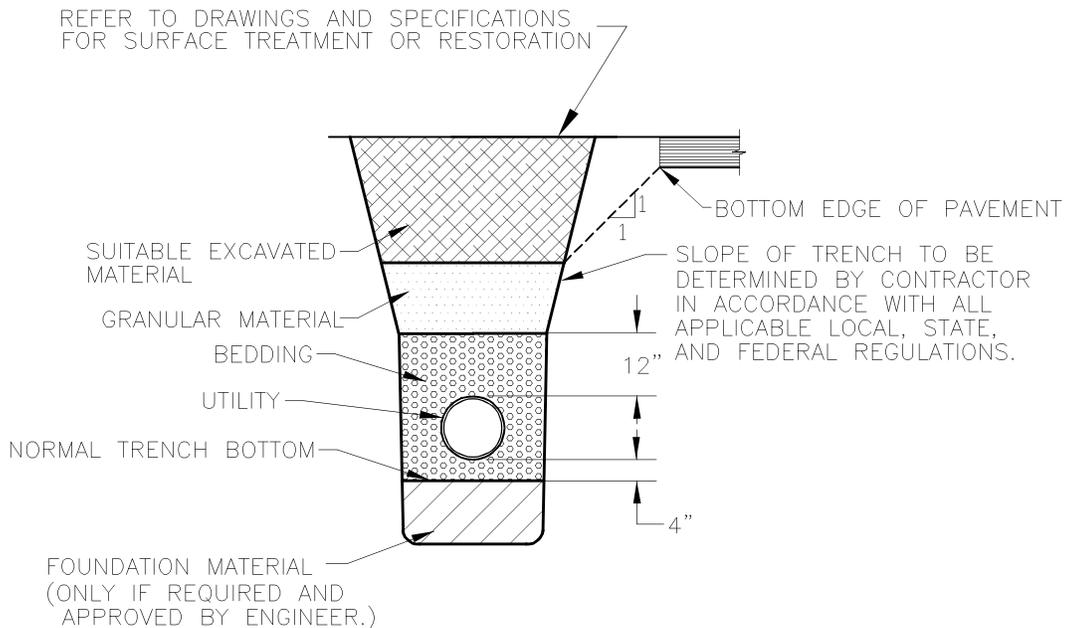
- A. Upon completion of the work of this Section, remove all rubbish, trash and debris resulting from construction operations. Remove surplus equipment and tools. Leave the site in a neat and orderly condition acceptable to ENGINEER, and in conformance with Section 01562 - Cleaning.

### **3.08 SCHEDULES**

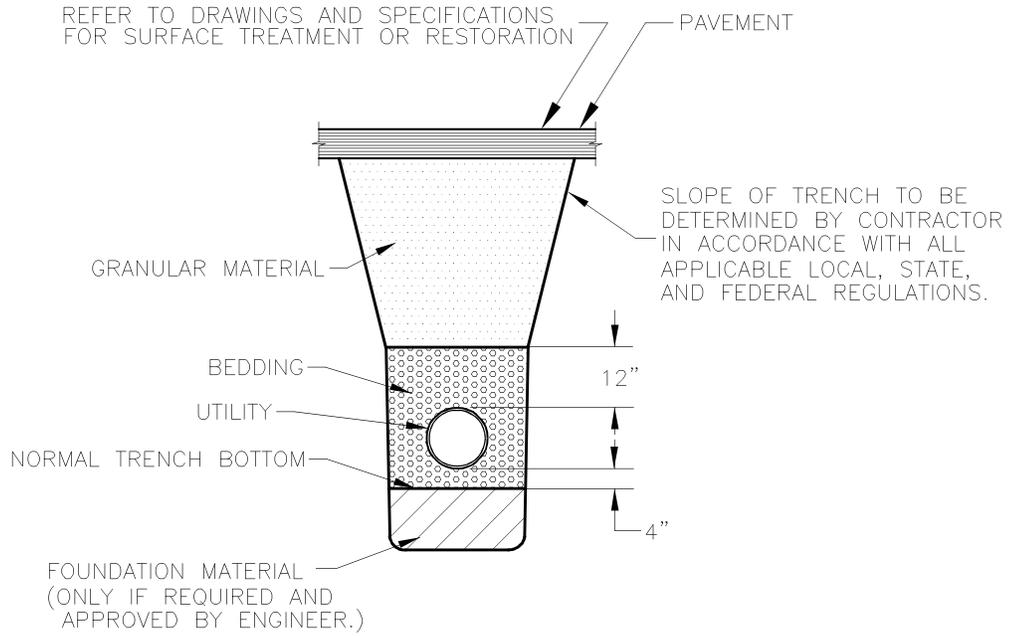
- A. Trench Details:
1. Trench in Open Field.
  2. Trench Adjacent to Pavement.
  3. Trench under Pavement.



TRENCH IN OPEN FIELD  
 NO SCALE



TRENCH ADJACENT TO PAVEMENT  
 NO SCALE



**TRENCH UNDER PAVEMENT**  
NO SCALE

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, the furnishing and installation of soil erosion and sedimentation control measures as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
    - b. Section 01060 - Regulatory Requirements.

**1.02 REFERENCES**

- A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the following:
  - 1. Soil erosion control and sedimentation rules and guidelines of: the City of South Haven and the Van Buren County Soil Erosion Control Officer.
  - 2. MDOT:
    - a. 2003 Standard Specifications for Construction.
    - b. Standard Plans.

**1.03 SUBMITTALS**

- A. Submit in accordance with Section 01300 - Submittals.
- B. Soil erosion control plan:
  - 1. CONTRACTOR is responsible for design, permitting, installation, and maintenance of soil erosion control plan.

**1.04 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Fabrication and installation personnel:
    - a. Trained and experienced in the fabrication and installation of the materials and equipment.
    - b. Knowledgeable of the design and the reviewed Shop Drawings.
- B. Regulatory Requirements: Comply with the Soil Erosion Control Act, and other state and local laws that affect the Work.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Receiving and storage:

1. All materials shall be delivered in original, unbroken, brand marked containers or wrapping as applicable.
  2. Handle and store materials:
    - a. In a manner which will prevent:
      - 1) Deterioration or damage.
      - 2) Contamination with foreign matter.
      - 3) Damage by weather or elements.
    - b. In accordance with Manufacturer's directions.
- B. Rejected material and replacements:
1. Reject damaged, deteriorated or contaminated material and immediately remove from the Site.
  2. Replace rejected materials with new materials at no additional cost to OWNER.

## **PART 2 - PRODUCT**

### **2.01 SOIL EROSION AND SEDIMENTATION CONTROL MATERIALS**

- A. Silt fence:
1. Exxon GTF-180; or equal.
  2. In compliance with MDOT 8.09.06.
- B. Soil erosion control blankets:
1. 4:1 slopes or greater: None required.
  2. 3:1 slopes and road ditches: North American Green S150.
  3. 2:1 slopes: North American Green DS150.
  4. Creek sideslopes and bottom: North American Green C125.
- C. Stone filter berm:
1. 4-inch minimum clean washed stone.
  2. Crushed concrete not acceptable.
- D. Straw bales: Bound straw or hay bales measuring minimum 2-foot x 2-foot x 3-foot.

## **PART 3 - EXECUTION**

### **3.01 GENERAL**

- A. Site evaluation:
1. Conduct a field evaluation of the Site:
    - a. Prior to start of the Work, and weekly during construction.
    - b. With representatives of:
      - 1) ENGINEER.
      - 2) Local enforcing agency.
- B. Set up:

1. Construction operations shall be conducted in such manner to reduce erosion and sedimentation to a practical minimum.
  2. Temporary or permanent sedimentation controls shall be constructed, to the extent possible, prior to commencing grubbing operations.
  3. Grading operations shall follow immediately after grubbing operations; otherwise temporary erosion and sedimentation controls may be required between successive construction stages.
- C. Time limitations:
1. Permanent soil erosion controls for all slopes, channels, ditches, or any disturbed land areas shall be completed within 15 calendar days after final grading of the section or any portion thereof.
  2. Where it is not possible to permanently stabilize a disturbed area, appropriate temporary erosion controls shall be implemented within 15 calendar days after cessation of grading activity, whether or not the Work is complete.
  3. All temporary soil erosion controls shall be maintained until permanent soil erosion controls are completed.
- D. Area limitations:
1. The surface area of erodible earth material exposed at any one time will be limited to only that area required to perform the work.
  2. Do not cause disturbance to lands and waters outside the grading limits unless such work is found necessary and approved by ENGINEER.
  3. Where work is conducted outside the right-of-way, such as borrow operations, waste or disposal areas, haul roads, and storage sites, temporary and permanent erosion and sedimentation controls shall be provided by CONTRACTOR in accordance with Act 347 of P.A. 1973, or as amended.
- E. Installation:
1. Filter bag:
    - a. Furnish, place, and dispose of a minimum 250 square foot filter bag constructed of sand bags lined with geotextile blanket at all dewatering discharge locations. Water pumped from construction operations shall be pumped into and allowed to filter through the filter bag before entering any stream.
    - b. The filter bag shall be disposed of by CONTRACTOR at the completion of its use off the project Site.
    - c. The location or locations of the filter bag shall be determined by CONTRACTOR.
  2. Silt fence:
    - a. Erect, maintain, remove, and dispose of, when no longer required, an erosion/sediment barrier, consisting of a post or pole supported geotextile, in accordance with the Drawings.
    - b. Installation shall be accomplished as indicated on the Drawings or, with the approval of ENGINEER, in accordance with the Manufacturer's published recommended practice.

- c. Sections which are damaged due to CONTRACTOR's operations or negligence during erection or during the contract time shall be immediately mended, patched, or replaced at the CONTRACTOR's expense.
  - 3. Straw bales:
    - a. Place sufficient number of straw bales around catch basin inlets, in ditch lines, to prevent sediment from entering structures, or migrating down ditch.
    - b. Hold bales with two steel reinforcing bars per bale.
    - c. Place silt fence in front of straw bales.
  - 4. Temporary seeding: Provide temporary seed if permanent seed will not be placed within a two-week period or grade of bare soil will not be changed for a two-week period.
- F. Maintenance of erosion and sedimentation control: Maintain all temporary erosion and sedimentation controls during the period that the temporary controls are required and all permanent erosion controls until the contract has been completed and accepted. Such maintenance shall consist of the repair of all damaged areas, replacement of lost facilities, and periodic removal of sediment.
- G. Removal of erosion control facilities:
  - 1. Temporary erosion and sedimentation controls shall be removed or obliterated when the permanent controls are in place and functioning properly unless ordered to be left in place by ENGINEER. Mulch placed for temporary erosion control shall be incorporated into the slope, or removed, prior to placement of topsoil or permanent seeding or both and fertilizing operations.
  - 2. Care shall be exercised during such removal to minimize erosion or sedimentation of watercourses.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
1. This Section includes, but is not necessarily limited to, the furnishing and installation of water mains, valves, hydrants and appurtenances as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.

**1.02 REFERENCES**

- A. Except as herein specified or as indicated on the Drawings, the work of this Section shall comply with the latest editions of following:
1. AWWA Standards:
    - a. C110 - Ductile-Iron and Gray-Iron Fittings, 3 in. through 48 in., for Water and Other Liquids.
    - b. C151 - Ductile-Iron Pipe, Centrifugally Cast, for Water.
    - c. C153 - Ductile-Iron Compact Fittings, 3 in. through 16 in., for Water Service.
    - d. C502 - Dry Barrel Fire Hydrants.
    - e. C509 - Resilient Seated Gate Valves for Water Supply Service.
    - f. C515 - Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service.
    - g. C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.
    - h. C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
    - i. C651 - Disinfecting Water Mains.
    - j. C800 - Underground Service Line Valves and Fittings.
  2. MDOT:
    - a. 2003 Standard Specifications for Construction.

**1.03 SUBMITTALS**

- A. Shop Drawings:
1. Submit for:
    - a. Water main system components.
    - b. Thrust control method.
    - c. Tapping materials and methods.
    - d. Details for each connection to existing water main.
    - e. Proposed equipment and method for flushing, pressure testing, leakage testing, and chlorination.
  2. Required information:
    - a. Dimensions and engineering data.
    - b. Inside lining and outside coating.
    - c. Name of Manufacturer and model.
    - d. Materials of construction.
- B. Procedures for flushing, pressure testing, and chlorinating:
1. Equipment.
  2. Methods.
- C. Operation and maintenance manuals:

1. Submit for valves and operators.
  2. Required information:
    - a. Outline, cross sections, assembly drawings, and engineering data.
- D. As-built Drawings:
1. Revise construction drawing as constructed.
    - a. Submit drawing file on disc compatible with AutoCAD.
    - b. Submit reproducible copy on mylar.
  2. Report witness measurements on valves, fittings and curb boxes.
    - a. Provide measurements from three permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.

#### **1.04 QUALITY ASSURANCE**

- A. Qualifications:
1. Installation personnel:
    - a. Trained and experienced in the installation of the materials.
    - b. Knowledgeable of the design and the reviewed Shop Drawings.

#### **1.05 DELIVERY, STORAGE AND HANDLING**

- A. Receiving and storage:
1. All materials shall be delivered in original, unbroken, brand marked containers.
  2. Handle and store materials:
    - a. In a manner which will prevent:
      - 1) Deterioration or damage.
      - 2) Contamination with foreign matter.
      - 3) Damage by weather or elements.
    - b. In accordance with Manufacturer's directions.
- B. Rejected material and replacements:
1. Reject damaged, deteriorated or contaminated material and immediately remove from the Site.
  2. Replace rejected materials with new materials at no additional cost to OWNER.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURED PRODUCTS**

- A. Made in the United States or Canada.

#### **2.02 PIPE AND FITTINGS**

- A. Ductile-Iron Pipe (DIP):
1. Pipe: AWWA C151, Class 52 thickness.
  2. Joints:
    - a. Mechanical joint with ductile-iron glands.
    - b. Push-on joint.

- c. Mechanical joint restraint:
    - 1) Ebaa Iron Sales, Inc.; Series 1100 Megalug.
    - 2) Ford Meter Box Company; Uni-Flange Series 1300 or 1400.
    - 3) Romac Industries, Incorporated; Grip Ring.
  - d. Push-on joint restraint:
    - 1) Ford Meter Box Company; Uni-Flange Series 1390.
  - e. Single Rubber Gasket.
  - f. Bolting materials: 304 or 316 stainless steel.
- B. Fittings:
- 1. Fittings: AWWA C153.
  - 2. Joints:
    - a. Mechanical joint.
  - 3. Tapping sleeve - stainless steel.
- C. Pipe and Fittings:
- 1. Lining: Cement-mortar, standard thickness.
  - 2. Outside coating: Asphaltic coating, pipe and fittings.
  - 3. Certified to NSF Standard 61.
  - 4. Electrical conductivity: Provide conductivity straps or cables.
    - a. Installed by Manufacturer at factory where pipe is manufactured.
    - b. Certified by Manufacturer for same corrosion resistance standards as pipe.

## **2.03 VALVES**

- A. Gate valves:
- 1. 3-inch to 16-inch diameter:
    - a. Valves: AWWA C509 or C515.
    - b. Opening direction: Clockwise as viewed from the top.
    - c. Non-rising stem.
    - d. Coating: Coat interior and exterior in accordance with AWWA C550 using fusion-bonded epoxy having 3rd party certification of compliance with NSF 61 - Drinking Water System Components - Health Effects.
    - e. Valve actuators: 2-inch square nut for buried service.
    - f. Resilient seat attachment: Bonded method. Mechanical fastening not allowed.
    - g. Stem sealing: O-ring.
    - h. Manufacturers:
      - 1) American Flow Control.
      - 2) Traverse City Iron Works.
      - 3) East Jordan Iron Works.
      - 4) Approved equal.

## **2.04 VALVE BOXES**

- A. Valves 16-inch diameter and smaller:
- 1. Style: Buffalo style, 5-1/4-inch shaft, three section, designed to cover valve completely.
  - 2. Materials of construction: Cast iron.
  - 3. Height adjustment: Screw type.

4. Cover: Non-locking.
5. Base section:
  - a. No. 4 round base: Valves 8-inch and smaller.
  - b. No. 6 round base: Valves 12-inches and smaller.
  - c. No. 8 round base: Valves 16-inches and smaller.
  
- B. Lid marking: "WATER".
  
- C. Coat inside and outside with bituminous varnish.
  
- D. Manufacturers:
  1. Tyler.
  2. Or equal.

## **2.05 FIRE HYDRANTS**

- A. Manufacturers and models:
  1. East Jordan Iron Works, Model 5-BR.
  2. Traverse City Iron Works, Model TVC-5.
  3. No substitutions.
  
- B. General:
  1. Hydrant: AWWA C502.
  2. Bury length: 5.5 feet.
  3. Outlet nozzles:
    - a. Hose:
      - 1) Quantity: 2.
      - 2) Diameter: 2-1/2 inches.
      - 3) Threads: National Standard - NFPA 1963, Standard for Fire Hose Connections.
      - 4) Brass.
      - 5) Fastened by mechanical means.
    - b. Pumper:
      - 1) Quantity: 1.
      - 2) Diameter: 4-1/2 inches.
      - 3) Threads: National Standard - NFPA 1963, Standard for Fire Hose Connections.
      - 4) Brass.
      - 5) Fastened by mechanical means.
    - c. Caps:
      - 1) Cast iron.
      - 2) Chained to hydrant barrel.
      - 3) Operating nut: 1-1/2-inch pentagon.
  4. Main valve:
    - a. Size: 5-1/4-inch nominal diameter.
    - b. Valve seat and drip shut-off: Brass or bronze threaded into brass liner.
    - c. Seating valve: Rubber.
  5. Inlet connection:
    - a. Size: 6 inch.
    - b. Connection: Mechanical joint.

6. Operating stem and mechanism:
  - a. Opening direction: Counterclockwise as viewed from the top.
  - b. Operating nut: 1-1/2-inch pentagon.
  - c. Weather shield: Cast iron.
  - d. Stem shall be bronze where it passes stem seal.
7. Drain outlet: Tapped with bronze lined drain and bronze plug.
8. Color: Red.
9. Traffic flange.

## **2.06 SERVICE FITTINGS**

- A. General:
  1. Service line: Copper, ASTM B88, type K, annealed and soft temper.
  2. Size: 1-inch minimum.
  3. End connections: Flared or compression.
  4. AWWA C800.
- B. Corporation stops:
  1. Ford; Model F1000.
  2. Mueller Co.; Model H-15000.
  3. Hays Manufacturing Co.; Model 5200.
  4. McDonald; Model 4701-22.
- C. Curb stops:
  1. Ford; Model B44-777.
  2. Hays Manufacturing Co.; Model 5045.
  3. Mueller Co.; Model H-15201.
  4. A.Y. McDonald Manufacturing Co.; Model 6100-22.
- D. Curb boxes:
  1. 1-inch curb stop ball size: 1-1/2 inch upper section with 1-1/2 inch pentagon plug in lid and arch base.
  2. 1-1/2 inch and 2-inch curb stop ball sizes: 2-inch upper section with 2-inch pentagon plug in lid and arch base.
  3. A.Y. McDonald Manufacturing Co.; Model 5605 or 5606, or equal.
- E. Service saddles:
  1. Style: Double strap.
  2. Body: Ductile iron ASTM A536.
  3. Straps: Carbon steel, ASTM A108 with electro-galvanized finish ASTM B633.
  4. Manufacturers and model:
    - a. Smith-Blair, Inc., Model 313.
    - b. JCM Industries, Inc., Model 402.
    - c. Or equal.
- F. Water Service Meter Connections (indoors):
  1. Copper: ASTM B 88, Type K, annealed and soft-temper.
  2. Copper horns: Ford No. 3 Copperhorn, or equal.

- a. Size to fit meter provided by CITY.
  3. Valves:
    - a. Inlet ball valve: Ford BH, or equal.
      - 1) Bronze body, tee head, stem.
      - 2) O-rings: Buna-N.
      - 3) Valve seats.
      - 4) Ball: Fluorocarbon-coated brass.
    - b. Outlet check valve: Ford HS81, or equal.
      - 1) Bronze body.
      - 2) Valve seats: Buna-N.
      - 3) Spring assisted.
      - 4) Removable end cap.
  4. Couplings and fittings: Brass, ASTM B62 85-5-5-5.
- G. Meter Pits:
1. Copper: ASTM B88, Type K, annealed and soft-temper.
  2. Coppersetter: Ford Series 80, or equal.
    - a. Size to fit meter provided by CITY.
  3. Valves:
    - a. Inlet angle ball valve: Ford BA23, or equal.
      - 1) Bronze body, tee head, stem.
      - 2) O-rings: Buna-N.
      - 3) Valve seats: Buna-N.
      - 4) Ball: Fluorocarbon-coated brass.
      - 5) Meter coupling nut.
    - b. Outlet angle check valve: Ford HA31, or equal.
      - 1) Bronze body.
      - 2) Valve seats: Buna-N.
      - 3) Spring assisted.
      - 4) Removable end cap.
      - 5) Meter coupling nut.
  4. Couplings and fittings: Brass ASTM B62 85-5-5-5.
  5. Meter pit:
    - a. Provided by CITY with meter.

## **2.07 INSULATION**

- A. Type: Extruded-polystyrene board insulation.
- B. Thickness: 2-inches.
- C. Compressive strength, ASTM D1621: 40 psi minimum.
- D. Manufacturers:
  1. DiversiFoam Products; Certifoam® 40.
  2. Dow Chemical Company; Styrofoam™ Highload 40.
  3. Owens Corning; Foamular® 400.
  4. Or equal.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. General:
  - 1. Install pipe, fittings and appurtenances in strict accordance with Manufacturer's recommendations and as specified herein.
  - 2. Install items to be embedded before concrete is placed.
  - 3. Fasten embedded items securely to prevent movement when concrete is placed.
  - 4. Prevent entrance of foreign materials.
  - 5. Line and grade:
    - a. Lay pipe to grades and elevations indicated on the Drawings.
    - b. Where no grades are indicated, lay pipe with a minimum of 5 feet of cover below final grade.
  - 6. Take care in loading, transporting and unloading to prevent injury to the pipe or coatings. Do not drop pipe or fittings.
  - 7. Repair damage to coatings and linings as directed by ENGINEER.
  
- B. Placement of pipe:
  - 1. Bearing: Support entire length of pipe barrel evenly with extra excavation at joints.
  - 2. Bell and spigot: Clean and lubricate immediately prior to assembly.
  
- C. Ductile iron pipe:
  - 1. Install pipe and fittings and hydrants in accordance with AWWA C600 except as otherwise provided herein.
  - 2. Provide fittings, in addition to those indicated on the Drawings, to cross utilities which may be encountered upon opening the trench.
  - 3. Cut pipe by machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel cut end for push-on joint 30 degrees by grinding or filing back at least one-eighth inch.
  - 4. If defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to OWNER.
  
- D. Valves and valve boxes:
  - 1. Set plumb on 4 inches of compacted MDOT Class II granular material, or pea stone.
  - 2. Valve boxes:
    - a. Shall not transmit shock to valve.
    - b. Plumb over operating nut.
    - c. Set cover to finished grade.
    - d. Witness.
  - 3. Tapping sleeve and valve:
    - a. Set at the direction of tapping Subcontractor.
    - b. Set and remove tapping machine.
  
- E. Interrupting water service:
  - 1. Scheduling: Obtain CITY's approval prior to interruption of service.
  - 2. Provide notice of 8 hours to affected occupants and 24 hours to Fire Department of time and duration.

3. Provide stand-by service as required; outage not to exceed 4 hours.
4. Existing valve operation shall be by CITY's employees only.
5. Prevent contamination of existing water mains.

F. Service leads:

1. Taps at 45 degrees above center.
2. 1-inch: Direct tap
3. 1-1/2 or over: Service saddle.
4. Install tap after pressure and bacteriological testing on water main is accepted.
5. Minimum depth: 5'-0".
6. Basement wall penetration:
  - a. Core drill hole 1" larger diameter than pipe.
  - b. Seal solid wall with Linkseal.
  - c. Seal block wall with Fosrock, Preco Plug.

G. Meter Inside Building:

1. Locate in accessible area in basement, or above floor of building.
2. Support from floor or wall.
3. Install AMR unit on floor joist above meter.
4. Protect pipe from freezing in unheated areas.

H. Meter Pit:

1. Locate in accessible area:
  - a. Area not subject to flooding.
  - b. Area not used for driveway or parking.
2. Set plumb on 4 inches of pea stone.
3. Set cover to finished grade.
4. Install AMR unit on bracket above meter near cover.

I. Clean up promptly following pipe installation within maximum of 600 feet behind pipe laying operation.

J. Electrical continuity:

1. Test pipeline, including hydrants, for continuity.
2. Repair breaks in continuity.

**3.02 THRUST CONTROL:**

A. Allowable methods:

1. Restrained joints.

B. Restrained joints:

1. Restrain pipe joints within following distance from each fitting and valve (all directions):

Length of Restrained Pipe Required

<u>Pipe Diameter</u>	<u>22-1/2 Degree Bends &amp; Less</u>	<u>45 Degree Bends</u>	<u>90 Degree Bends, Plugs, Valves</u>	<u>Tee Run</u>	<u>Tee Branch</u>
6 inch	5 foot	10 foot	15 foot	10 foot	5 foot
8 inch	5 foot	10 foot	20 foot	10 foot	5 foot
10 inch	5 foot	15 foot	25 foot	10 foot	10 foot
12 inch	10 foot	15 foot	30 foot	10 foot	15 foot
16 inch	10 foot	20 foot	40 foot	10 foot	25 foot

**3.03 PRESSURE TESTING**

A. General:

1. Observation: By ENGINEER.
2. Notification: Arrange with ENGINEER following successful pretesting.
3. Repair visible leaks.
4. Maximum Length: 1 mile per test.

B. Equipment and manpower: Provide everything required for testing, disinfection and flushing.

C. Pressure testing:

1. AWWA C600, Section 4.
2. Duration: 2 hours and until completion of inspection.
3. Test pressure: 150 psi at lowest point in test section.
4. Procedure: Fill system slowly, expel air through corporation stop at high points and apply pressure.
5. Make-up water: From measurable source.
6. Maximum allowable leakage:

$$L = \frac{SDP^{0.5}}{133,200}$$

Where:

- L = Leakage in gallons per hour.
- S = Length of pipe tested in feet.
- D = Pipe diameter in inches.
- P = Test pressure in psi.

7. Perform test against tapped cap or plug with a standpipe and not against existing valve if water on opposite side of valve is in service.
8. Repair leaks and repeat tests until acceptable results are achieved.

**3.04 DISINFECTION**

A. General:

1. Observation: By ENGINEER.

2. Notification: Arrange with ENGINEER following successful pressure test.
  3. Maximum Length: 1 mile per test.
- B. Disinfection:
1. In accordance with AWWA C651.
    - a. Sodium hypochlorite.
    - b. Continuous-feed method.
    - c. Minimum residual 25 parts per million (ppm) initial concentration.
    - d. Minimum residual 10 ppm after 24 hours.
- C. Flushing:
1. In accordance with AWWA C651.
  2. Water:
    - a. Supplied by OWNER.
    - b. Notify City of South Haven Water Treatment Plant 24 hours in advance of filling or flushing lines.
    - c. Schedule must be approved by CITY before use.
    - d. Limit to one mile per day, unless approved by CITY.
  3. Velocity: Minimum 2-1/2 feet per second.
  4. Duration:
    - a. Initial: Until entire volume of water in pipeline has been replaced.
    - b. Final: Until residual chlorine equals that of adjoining system.
  5. Apply reducing agent to destroy chlorine residual in water flushed to the ground or street.
  6. Disposal location to be inspected by ENGINEER.
- D. Bacteriological testing:
1. In accordance with AWWA C651 and MDEQ.
  2. Two consecutive bacteriologically safe samples must be taken at 24-hour intervals for each section of pipe tested.
  3. Repeat disinfection if bacteriological test fails.
  4. Collect samples from each branch of pipe, and at a maximum spacing of 1,000 feet.
  5. Transport samples to City of South Haven Water Treatment Plant for testing.
  6. Bacteriological lab test costs are the responsibility of CONTRACTOR if initial test fails.
- E. Sequence:
1. Pressure test.
  2. Flush.
  3. Chlorinate.
  4. Wait 24 hours.
  5. Flush.
  6. Bacteriological sample.
  7. Wait 24 hours.
  8. Bacteriological sample.
  9. Place in service.

### **3.05 SERVICE LINES**

- A. Flushing and Testing:

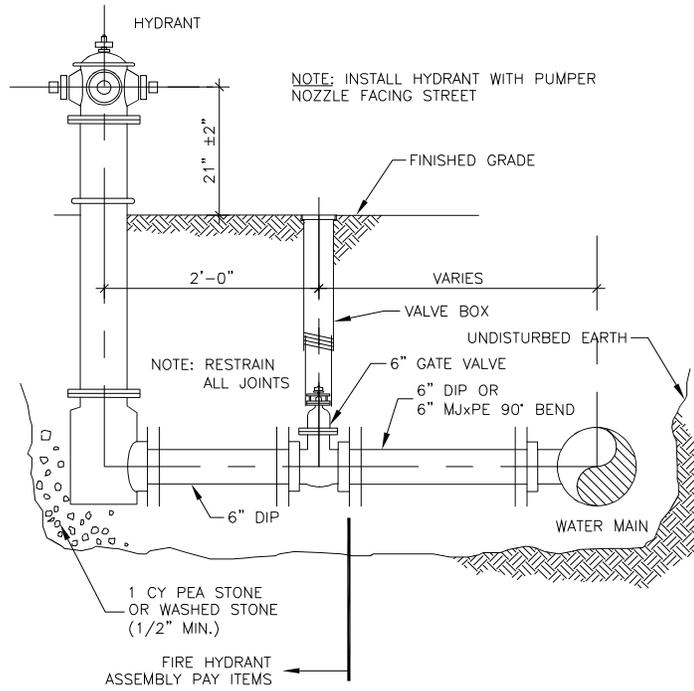
1. Before connection to plumbing.
  2. Flush line.
  3. Pressure test.
  4. Disinfect.
  5. Bacteria test.
- B. Connection to House Plumbing:
1. Obtain meter from CITY.
  2. Inspection by CITY required before connection to building plumbing.

### **3.06 CLEANING**

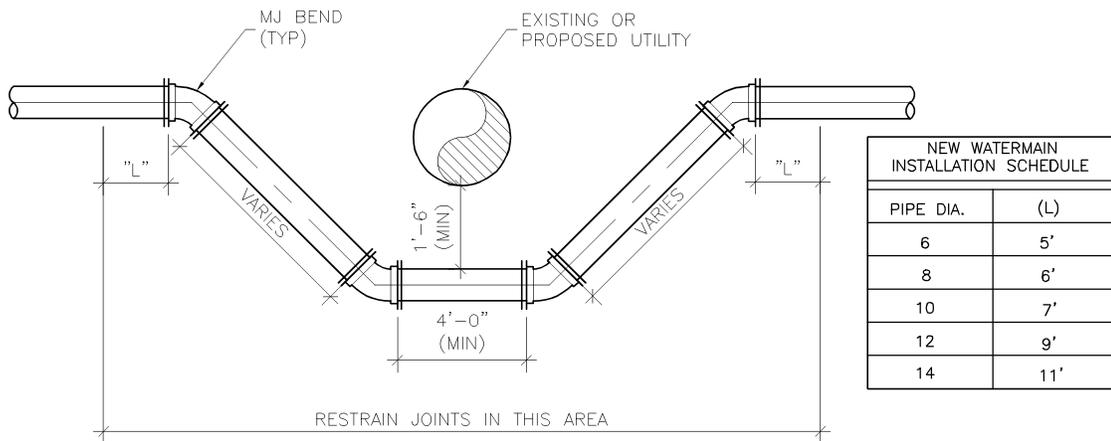
- A. Prior to acceptance of the work of this Section, thoroughly clean all installed materials and products and related areas in accordance with Section 01562 - Cleaning.

### **3.07 SCHEDULES**

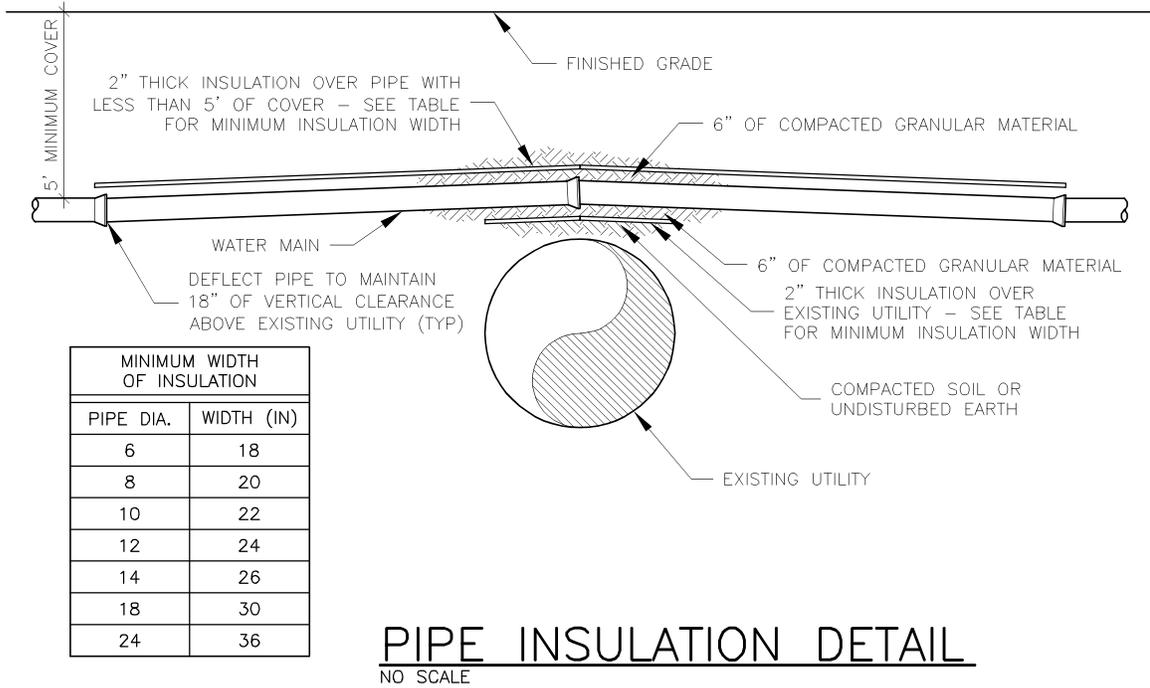
- A. Water System Details
1. Fire Hydrant Assembly Detail.
  2. Water Main Lowering Detail.
  3. Pipe Insulation Detail.
  4. Service Line Detail.



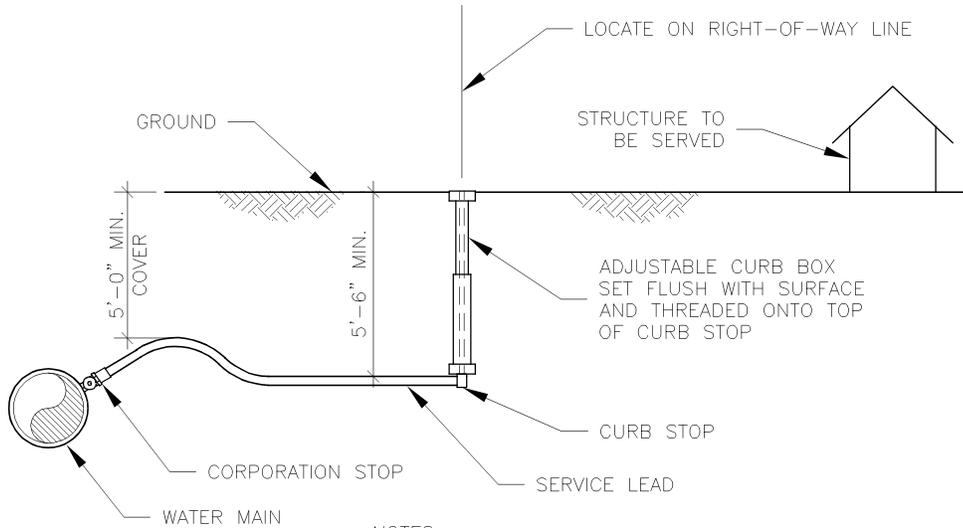
FIRE HYDRANT ASSEMBLY DETAIL  
 NO SCALE



WATER MAIN LOWERING DETAIL  
 NO SCALE



MINIMUM WIDTH OF INSULATION	
PIPE DIA.	WIDTH (IN)
6	18
8	20
10	22
12	24
14	26
18	30
24	36



- NOTES:
1. NO TAP SHALL BE CLOSER THAN 18" TO ANY COUPLING OR JOINT IN THE PIPE.
  2. SERVICE LINES SHALL BE OWNER LOCATED.

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, the work required for sanitary force mains, structures, and appurtenant work, as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.

**1.02 SUBMITTALS**

- A. Submit the following in accordance with Section 01300 - Submittals:
  - 1. Product data on isolation valves and air release valves.
  - 2. Proposed equipment and method for pressure and leakage testing.
- B. Report witness measurements on fittings.
  - 1. Provide measurements from three permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.
- C. Provide certifications on pipe and fittings indicating conformance to specifications prior to installation.

**1.03 JOB CONDITIONS**

- A. Activating new system: Notify ENGINEER after completing tests.
- B. Clean-up promptly following pipe installation.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURED PRODUCTS**

- A. Manufactured in the United States of America.

**2.02 PIPE AND FITTINGS**

- A. Ductile-Iron Pipe (DIP)
  - 1. Required for:
    - a. Submersible pump discharge.
    - b. Pipe diameters 4 inches and larger.
  - 2. Pipe: AWWA C151, thickness class 52.
  - 3. Joints:
    - a. Mechanical joint with ductile-iron glands.

- b. Push-on joint.
  - c. Mechanical joint restraint:
    - 1) Ebaa Iron Sales, Inc.; Series 1100 Megalug.
    - 2) Ford Meter Box Company; Uni-Flange Series 1300 or 1400.
    - 3) Romac Industries, Incorporated; Grip Ring.
  - d. Push-on joint restraint: Ford Meter Box Company; Uni-Flange Series 1390.
  4. Lining: Cement - mortar, standard thickness.
  5. Outside coating: Asphaltic coating, pipe and fittings.
- B. High Density Polyethylene Pipe (HDPE)
1. Required for:
    - a. Grinder pump discharge.
    - b. Pipe diameters 3 inches and smaller.
  2. Pipe:
    - a. SDR-11
    - b. ASTM D-3350 and F-714.
    - c. Minimum 2%, well dispersed carbon black.
    - d. Contain no recycled compound except that generated in manufacturer's own plant from resin of the same specification and from the same raw material supplier.
    - e. Hydrostatic design stress: 800 psi minimum.
    - f. Marking:
      - 1) Spaced at intervals not exceeding 5-feet.
      - 2) Name and/or trademark of pipe manufacturer.
      - 3) Nominal pipe size.
      - 4) Letters PE followed by the polyethylene grade per ASTM D-3350 followed by hydrostatic design basis in 100's of psi.
      - 5) Production code by which date and place of manufacture can be determined.
  3. Joints:
    - a. Joined by thermal butt fusion wherever possible:
      - 1) In accordance with ASTM D-2657.
      - 2) In accordance with manufacturer's recommended procedure.
      - 3) Temperature of heater plate not to exceed 210° C.
      - 4) Joining pressure should not exceed 25 pounds per square inch of projected end area.
    - b. Joined by electrofusion.
    - c. Victaulic Style 995 coupling for HDPE pipe, or approved equal.
    - d. Adapted to other fittings as shown in the Drawings.
  4. Provide locating wire adjacent to pipe.
    - a. Copper, minimum size 14 AWG.
    - b. Wire must be continuous over length of forcemain.
    - c. Bring ends of wire to surface.
    - d. Provide junction box at ends adjacent to structures.
- C. Ductile-Iron Fittings:
1. AWWA C153.
  2. Mechanical joint with ductile-iron glands.
  3. Cement-mortar lining, standard thickness.

- D. Polyethylene Fittings:
  - 1. ASTM D-2513.
  - 2. Butt fusion wherever possible and available: ASTM D-3261.
  - 3. Socket fusion fittings: ASTM D-2683.

### **2.03 VALVES**

- A. Gate valves:
  - 1. 4-inch to 12-inch diameter:
    - a. Valves: AWWA C509.
    - b. Opening direction: Clockwise as viewed from the top.
    - c. Coating: Coat interior and exterior using fusion-bonded epoxy.
    - d. Valve actuators: 2-inch square nut for buried service.
    - e. Resilient seat attachment: Bonded method. Mechanical fastening not allowed.
    - f. Stem sealing: O-ring.
    - g. Manufacturers:
      - 1) Waterous Company.
      - 2) Traverse City Iron Works.
      - 3) East Jordon Iron Works.
      - 4) Or equal.
  - 2. Provide 2 sets of valve wrenches and extensions.

### **2.04 VALVE BOXES**

- A. Valves 12-inch diameter and smaller:
  - 1. Style: Buffalo style, 5/4 inch shaft, three section, designed to cover valve completely.
  - 2. Materials of construction: Cast iron.
  - 3. Height adjustment: Screw type.
  - 4. Cover: Non-locking.
  - 5. Base section:
    - a. No. 4 round base: Valves 8-inch and smaller.
    - b. No. 6 round base: Valves 12-inches and smaller.
    - c. No. 8 round base: Valves 16-inches and smaller.
- B. Lid marking: "SEWER".
- C. Coat inside and outside with bituminous varnish.
- D. Manufacturers:
  - 1. Tyler.
  - 2. Or equal.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. General:

1. Install pipe, fittings and appurtenances in strict accordance with Manufacturer's recommendations and as specified herein.
  2. Prevent entrance of foreign materials.
  3. Line and grade:
    - a. Lay pipe to grades and elevations indicated on the Drawings.
    - b. Where no grades are indicated, lay pipe with a minimum of 5 feet of cover below final grade.
  4. Take care in loading, transporting and unloading to prevent injury to the pipe or coatings. Do not drop pipe or fittings.
  5. Repair damage to coatings and linings as directed by ENGINEER.
- B. Placement of pipe:
1. Bearing: Support entire length of pipe barrel evenly with extra excavation at joints.
  2. Bell and spigot: Clean and lubricate immediately prior to assembly.
- C. Ductile iron pipe:
1. Install pipe and fittings in accordance with AWWA C600 except as otherwise provided herein.
  2. Provide fittings, in addition to those indicated on the Drawings, to cross utilities which may be encountered upon opening the trench.
  3. Cut pipe by machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel cut end for push-on joint 30 degrees by grinding or filing back at least one-eighth inch.
  4. If defective pipe is discovered after it has been laid, it shall be removed and replaced with a sound pipe in a satisfactory manner at no additional expense to OWNER.
- D. Valves and valve boxes:
1. DIP valve assemblies: Set plumb on 4 inches of compacted MDOT Class II granular material, or pea stone.
  2. HDPE valve assemblies: Place concrete pad on well compacted backfill or undisturbed ground.
  3. Valve boxes:
    - a. Shall not transmit shock to valve.
    - b. Plumb over operating nut.
    - c. Set cover to finished grade.
    - d. Witness.
- E. Clean up promptly following pipe installation within maximum of 600 feet behind pipe laying operation.

**3.02 THRUST CONTROL:**

- A. Allowable methods:
1. Restrained joints.
- B. Restrained joints:
1. Restrain pipe joints within following distance from each fitting and valve (all directions):

Length of Restrained Pipe Required

<u>Pipe Diameter</u>	<u>22½ Degree Bends &amp; Less</u>	<u>45 Degree Bends</u>	<u>90 Degree Bends, Plugs, Valves</u>	<u>Tee Run</u>	<u>Tee Branch</u>
3 inch	5 foot	10 foot	15 foot	10 foot	5 foot
6 inch	5 foot	10 foot	15 foot	10 foot	5 foot
8 inch	5 foot	10 foot	20 foot	10 foot	5 foot
10 inch	5 foot	15 foot	25 foot	10 foot	10 foot
12 inch	10 foot	15 foot	30 foot	10 foot	15 foot
16 inch	10 foot	20 foot	40 foot	10 foot	25 foot

**3.03 PRESSURE TESTING**

A. General:

1. Observation: By ENGINEER.
2. Completion: Before connection to pump station.
3. Notification: Arrange with ENGINEER following successful pretesting.
4. Repair visible leaks.
5. Required water: By CITY where available from municipal system.

B. Equipment and manpower: Provide everything required for testing and flushing.

C. DIP pressure testing:

1. Duration: 2 hours and until completion of inspection.
2. Test pressure: 150 psi at lowest point in test section.
3. Procedure: Fill system slowly, expel air through corporation stop at high points and apply pressure.
4. Make-up water: From measurable source.
5. Maximum allowable leakage:

$$L = \frac{SDP^{0.5}}{133,200}$$

Where:

L = Leakage in gallons per hour.

S = Length of pipe tested in feet.

D = Pipe diameter in inches.

P = Test pressure in psi.

6. Perform test against tapped cap or plug with a standpipe and not against existing valve if water on opposite side of valve is in service.
7. Repair leaks and repeat tests until acceptable results are achieved.

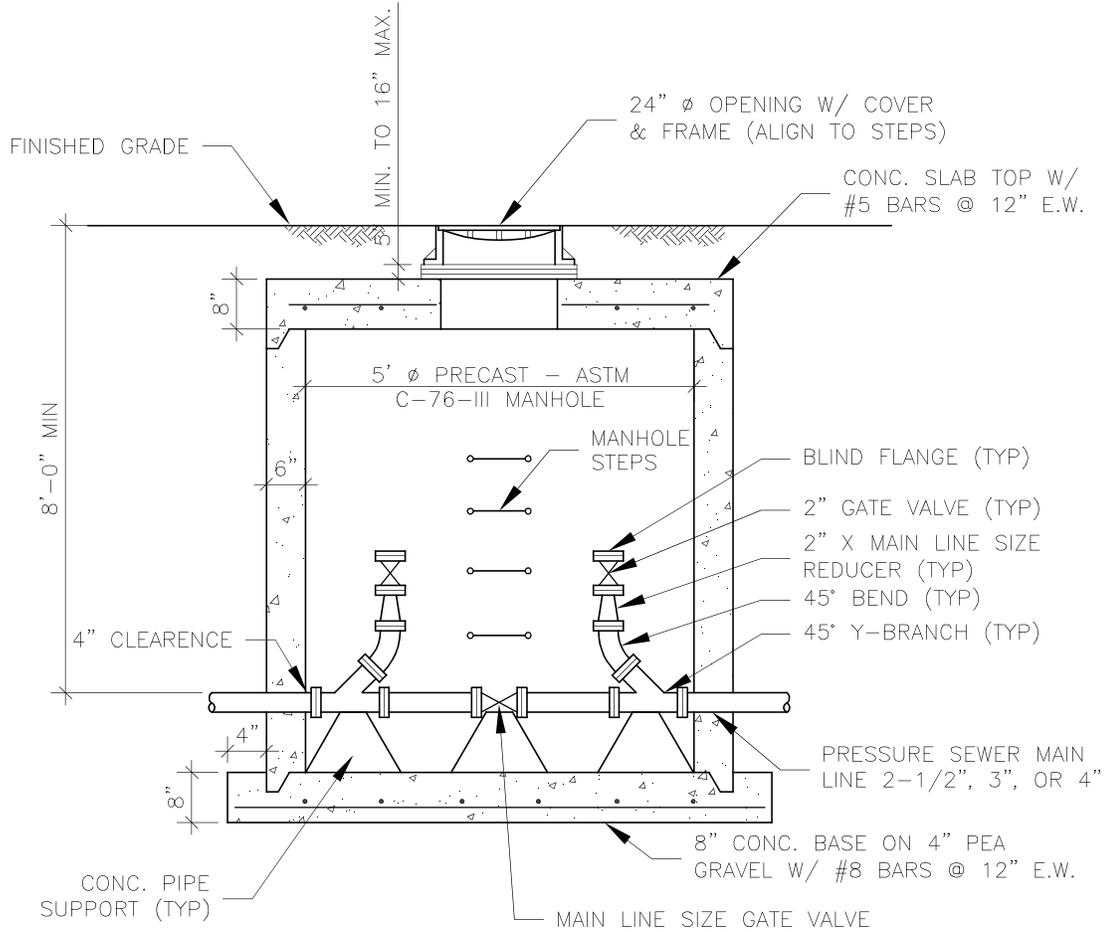
D. HDPE pressure testing:

1. Fill pipeline with water taking care to bleed off trapped air.
2. Pressurize pipe to 150 psi at lowest point in the section to be tested for a minimum of 4 hours giving pipe time to expand.
  - a. During initial 4 hours, add make-up water as needed to maintain pressure within 5 psi.

3. After initial 4 hours, pressurize pipe to 150 psi at the lowest point in the section to be tested and commence test.
4. Maintain pipeline under test pressure for continuous period of between 1 and 3 hours as determined by ENGINEER by adding water into the line as needed.
5. Volume of water added to maintain pressure within 5 psi of specified pressure shall be measured and considered to represent leakage during test interval.
6. Allowable leakage for HDPE pipeline shall not exceed the following for 3-inch HDPE:
  - a. 1-hour test: 0.10 gallons per 100 feet of pipe.
  - b. 2-hour test: 0.15 gallons per 100 feet of pipe.
  - c. 3-hour test: 0.25 gallons per 100 feet of pipe.
7. It is understood that pipe will continue to expand after initial 4 hours under pressure and throughout the 1-3 hour test period. Allowable leakage presented above accounts for this expansion and no additional allowable leakage will be considered.
8. Under no circumstances shall total time under specified test pressure exceed 8 hours:
  - a. If test is not completed for any reason, the test shall be terminated and the pipeline de-pressurized for a minimum of 8 hours prior to next testing sequence.
9. If there are no visual leaks or significant pressure drops during final test period and measured leakage is less than allowable, the pipeline passes the hydrostatic test.
10. In the event that leakage, as determined by the ENGINEER, exceeds the allowable amount specified above, CONTRACTOR shall be responsible to repair or replace the pipeline until the pipeline passes the hydrostatic test at no additional cost to OWNER.

### **3.04 SCHEDULES**

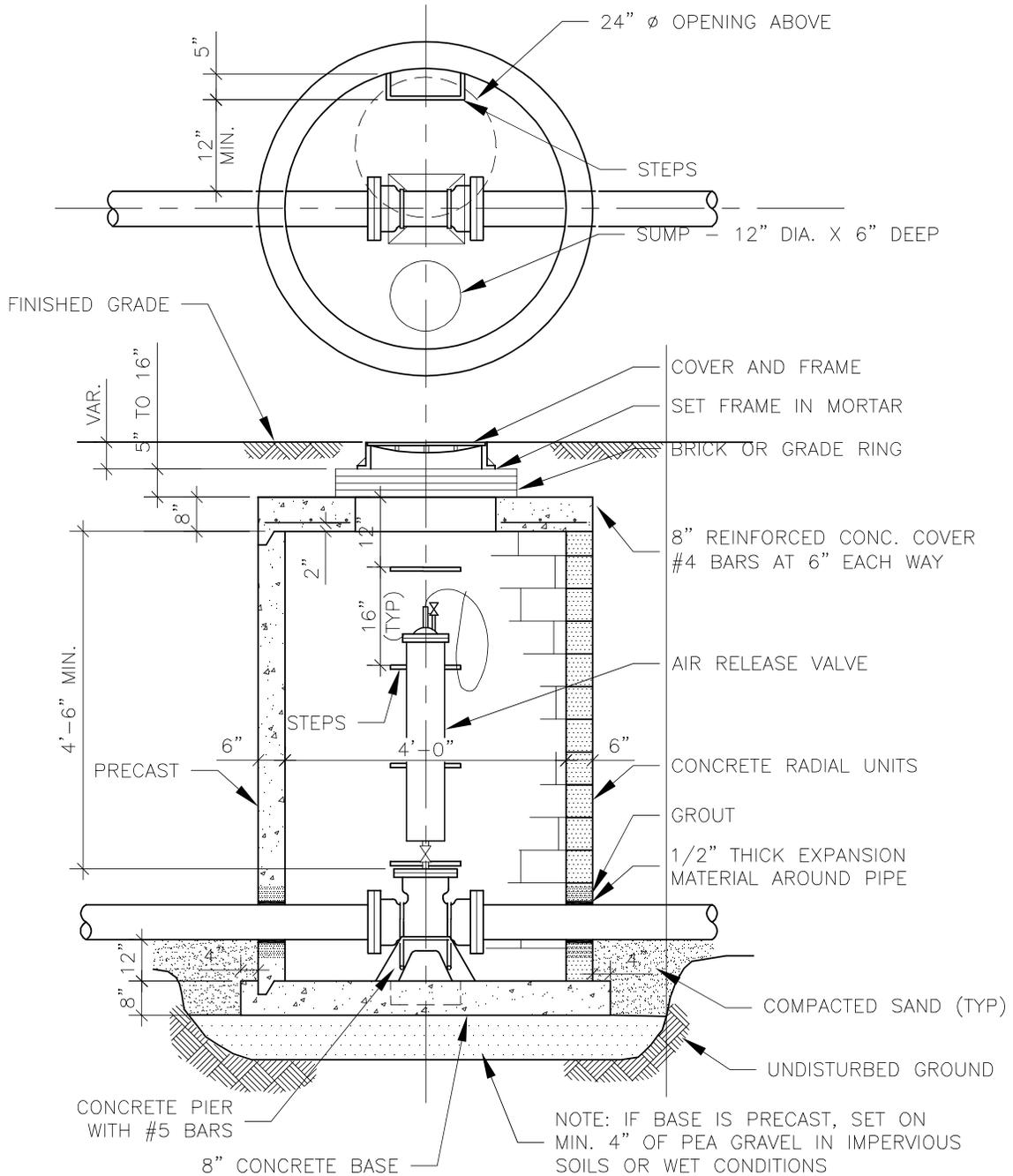
- A. Forceman Details:
  1. Cleanout.
  2. Air/Vacuum Release.
  3. Drop Connection.



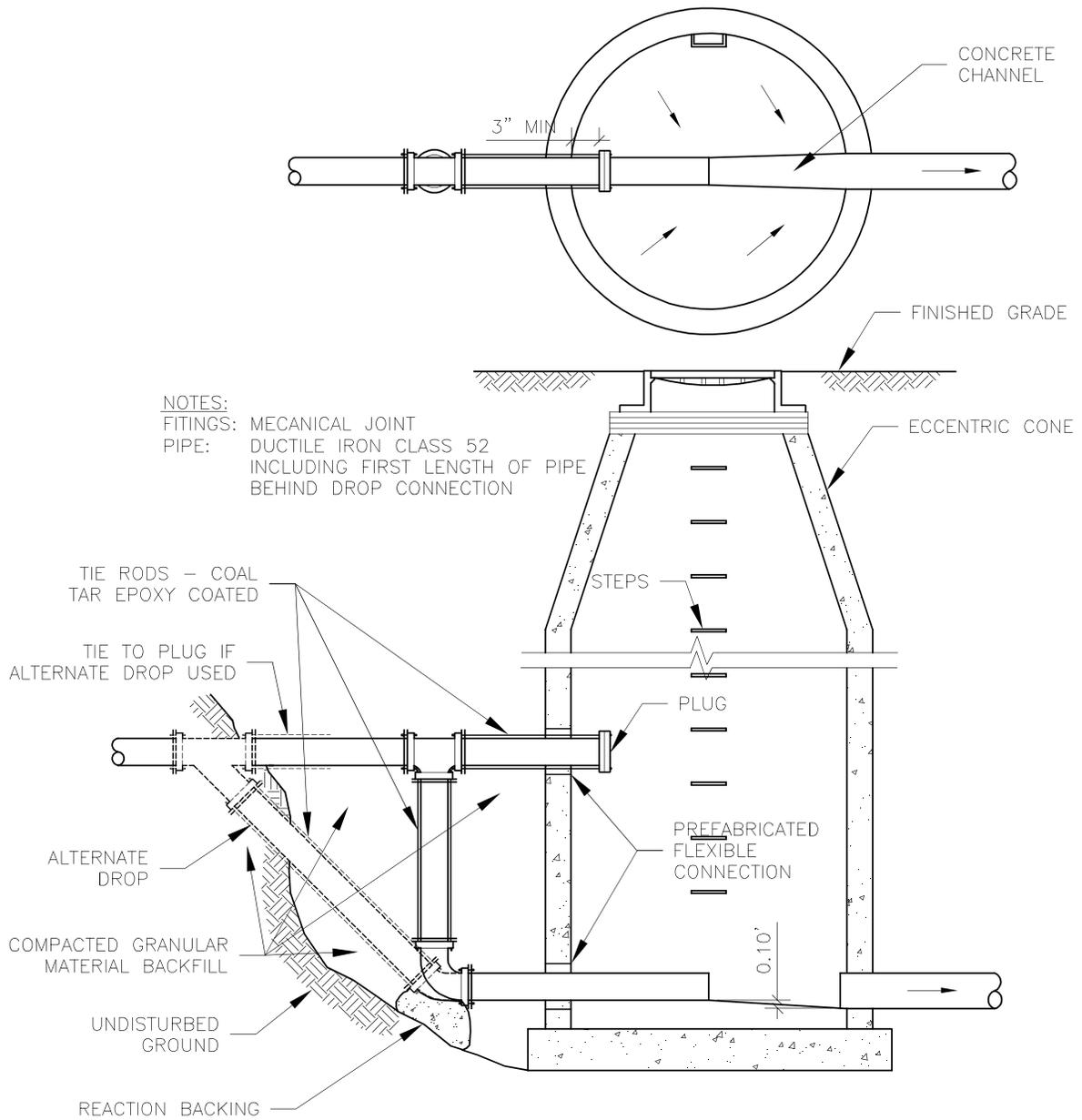
NOTE:  
FITTINGS WITHIN  
MANHOLE TO BE CAST  
IRON FLANGED 125 LB.

## ISOLATION CLEANOUT DETAIL (ICO)

NO SCALE



STANDARD AIR RELEASE  
VALVE OR CLEANOUT CHAMBER  
NO SCALE



**DROP CONNECTION DETAIL**  
**(END MANHOLE CONNECTION)**  
 NO SCALE

\*\*\* END OF SECTION \*\*\*

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes:
  - 1. This Section includes, but is not necessarily limited to, the furnishing and installation of a new sanitary sewer system and the conversion of the existing sanitary sewer system into a groundwater sewer system as indicated on the Drawings, as specified herein, and as necessary for the proper and complete performance of the Work.
  
- B. Related Sections:
  - 1. Documents affecting work of this Section include, but are not necessarily limited to:
    - a. General Conditions, Supplementary Conditions and Sections in Division 1 of these Specifications.
    - b. Section 02222 - Excavating, Backfilling and Compaction for Utilities.

**1.02 REFERENCES**

- A. Except as herein specified or as indicated on the Drawings, the work of this Section Shall comply with the following:
  - 1. ASTM Standard Specifications:
    - a. C 139 - Concrete Masonry Units for Construction of Catch Basins and Manholes.
    - b. C 270 - Mortar for Unit Masonry.
    - c. C 443 - Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
    - d. C 478 - Precast Reinforced Concrete Manhole Sections.
    - e. C 923 Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals.
    - f. D 449 - Asphalt Used in Dampproofing and Waterproofing.
    - g. D 3034 - Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
    - h. D 3212 - Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
  - 2. ASTM Standard Test Methods:
    - a. C 828 - Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines.
    - b. F 1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air
  - 3. ASTM Standard Practice:
    - a. C 924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
    - b. C 969 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.
    - c. D 2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for sewers and other Gravity-Flow Applications.

**1.03 SUBMITTALS**

- A. Submit in accordance with Section 01300 - Submittals.
  
- B. Shop Drawings:
  - 1. Submit for structures.

2. Required information:
  - a. General:
    - 1) Dimensions.
    - 2) Details of construction and installation.
    - 3) Name of Manufacturer.
    - 4) Model.
- C. Manufacturer's literature:
  1. Submit for sanitary sewer materials.
  2. Required information:
    - a. General:
      - 1) Dimensions.
      - 2) Details of construction and installation.
      - 3) Name of Manufacturer.
      - 4) Model.
- D. Leakage testing method and equipment information.
- E. Go, no-go gauge and proving ring for plastic pipe.

#### **1.04 QUALITY ASSURANCE**

- A. Qualifications:
  1. Fabrication and installation personnel:
    - a. Trained and experienced in the fabrication and installation of the materials and equipment.
    - b. Knowledgeable of the design and reviewed Shop Drawings.
- B. Manufacturer's services:
  1. Submit Manufacturer's sworn statements that the materials furnished comply with this specification.

### **PART 2 - PRODUCTS**

#### **2.01 PIPE MATERIALS**

- A. Sanitary and groundwater sewer pipe:
  1. General:
    - a. 15-inch diameter and smaller:
      - 1) One type for entire work.
      - 2) Except service leads or where a specific type is indicated on the Drawings.
  2. Types:
    - a. PVC (solid wall):
      - 1) ASTM D 3034 SDR-35.
        - a) Cell Classification: 12454-B or 12454-C.
      - 2) Joints: ASTM D 3212, elastomeric gasket, push-on.
    - b. PVC (perforated wall): Use on groundwater sewer only, where designated on the Drawings:

- 1) AASHTO M252.
  - 2) ASTM F 949
  - 3) Geotextile Sock: AASHTO M288, Class A.
- B. Sanitary service leads (laterals):
1. Material: Same as sanitary sewer pipe unless approved by OWNER.
  2. Wyes and tees:
    - a. Sanitary sewer 8-inch or 10-inch diameter: Wye.
    - b. Sanitary sewer 12-inch diameter or larger: Tee.
  3. Plugs or stoppers:
    - a. Air-tight seal.
    - b. Removable without damage to pipe bell.
    - c. Capable of holding 5 psig.

## **2.02 MANHOLES**

- A. Type of units:
1. Precast reinforced concrete:
    - a. Base section: ASTM C478, base riser section with integral floor.
    - b. Riser and cone sections: ASTM C 478.
      - 1) Watertight manholes: Provide four- 5/8-inch threaded anchor bolts in cone section.
    - c. Joints:
      - 1) Premium: ASTM C 443, O-ring gasket.
    - d. Connection between manhole and sewer:
      - 1) Resilient connector: ASTM C 923.
  2. Radial concrete block: (on existing sewer only)
    - a. Base slab: ASTM C 478, separate base slab.
    - b. Blocks:
      - 1) ASTM C 139.
      - 2) Curvature: Radius of 2 feet.
    - c. Joints:
      - 1) Mortar: ASTM C 270, Type M.
- B. General:
1. Steps:
    - a. General:
      - 1) 10-inches deep x 10-inches wide.
    - 2) Tread:
      - a) Depth: 5-inches.
      - b) Rail height: 2-inches.
  2. Manhole castings:
    - a. Manufacturers:
      - 1) Standard: EJIW, 620;
      - 2) Watertight: EJIW, 1040PT.
    - b. Solid covers; no vent holes, City of South Haven Standard with name, logo, and type of sewer.
  3. Mortar: ASTM C 270, Type M.
  4. Brick:

- a. Concrete: ASTM C 55, Type I, Grade N.
- b. Clay: ASTM C 62, Grade SW.
- 5. Grade rings: ASTM C 478.
- 6. Waterproofing:
  - a. Bituminous: ASTM D 449.
  - b. Cement: Masonry filler.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION**

- A. Alignment and grade:
  - 1. If there is a grade discrepancy or an obstruction which is not indicated on the Drawings, notify ENGINEER and obtain instructions prior to proceeding.
  - 2. Where sanitary sewer crosses water main:
    - a. Expose water main prior to laying sanitary sewer to verify existing depth.
    - b. Maintain minimum clearance of 18-inches unless otherwise indicated on the Drawings.
  - 3. Control:
    - a. Laser beam:
      - 1) Check line and grade at:
        - a) Set-up point, 25-feet, 50-feet, 100-feet and;
        - b) 200-foot intervals thereafter.
      - 2) Reset projector at each manhole with a 600-foot maximum.

#### **3.02 INSTALLATION**

- A. General:
  - 1. Install pipe, fittings and appurtenances in accordance with Manufacturer's recommendations except as herein specified or indicated on the Drawings.
  - 2. Prevent entrance of foreign material.
- B. Pipe laying:
  - 1. Bearing:
    - a. Support entire length of pipe barrel evenly.
    - b. Provide bell holes at joints.
  - 2. Direction: Commence at outlet and proceed up grade with spigot ends pointing in direction of flow.
  - 3. Method:
    - a. Clean socket, gasket groove, and spigot.
    - b. Set gasket.
    - c. Apply lubricant to spigot.
    - d. Center spigot end of pipe to be laid and push home against base of socket.
    - e. Center pipe to form a sewer with uniform invert.
- C. Jointing:
  - 1. Lubricants and gaskets: Furnished by pipe Manufacturer.
  - 2. Gaskets:
    - a. Surfaces of joint: Clean and dry before lubricant is applied.

- b. Take care in laying that the pipe does not shift and that gasket remains in a home position after assembly.

D. Manholes:

1. Base section placement: Full and even bearing.
2. Precast units: Mortar joints and lift holes.
3. Block units:
  - a. Block: Set in full bed of mortar with key slots filled.
  - b. Joints: Maximum 1/2-inch wide at inside face and wiped.
4. Top of casting elevation:
  - a. Final bituminous wearing surface:
    - 1) At finished grade.
    - 2) Adjustment of castings from base course grade to finished grade is incidental.
  - b. Ditches: 6-inches below ditch bottom or protruding not more than 6-inches above slope; as applicable.
  - c. Other areas: As directed by ENGINEER or as indicated on Drawings.
5. Waterproofing: Prevent visible leakage.

E. Service leads (sanitary sewer laterals):

1. Locations:
  - a. Service lead locations indicated on Drawings are schematic only to represent approximate locations and total number.
  - b. Confirm exact service lead location with property owner.
  - c. Unless otherwise directed, install service leads at center of vacant lots.
2. Alignment: Right angles to street centerline, except as indicated otherwise on the Drawings.
3. Grade: Uniform minimum of 1/8-inch per foot (1%).
4. Depth:
  - a. Elevations at property line indicated on Drawings.
  - b. If Drawings are not specific, depth shall be adequate to serve basement of existing building.
  - c. At property line of vacant lots, mobile homes or temporary structures, minimum depth shall be 10 feet or maximum depth possible.
5. Risers:
  - a. In the event of high groundwater, risers may be required, which decision shall be made by ENGINEER.
  - b. Required if sanitary sewer is more than 12-feet below finished grade.
6. Plugs: Plug ends air tight with standard disc.
7. Markers: Install 2-inch x 2-inch wood marking stick at end of each service lead extending vertically from end of lead to within 6 inches of ground surface.
8. Witnesses and measurements:
  - a. Wyes and tees: Measurement to center of nearest downstream manhole. Note manhole by number indicated on Drawings.
  - b. End of service leads: 3 measurements to permanent surface features or place a metal collar around the top of the wood marker.

F. Connections:

1. To existing structures:
  - a. Opening: No larger than needed for new pipe.

- b. Brick or block structure: Relay and repoint loose blocks and bricks.
- 2. For future use:
  - a. 4-inch through 21-inch diameter: Plug with standard disc.
  - b. 24-inch and larger:
    - 1) Bulkhead with 8-inch thick brick and mortar.
    - 2) 1/2-inch mortar plaster on outside of bulkhead.

### **3.03 CLEANING**

- A. Debris: Remove dirt and debris, including cemented or wedged material, from the inside of sewers and manholes.
- B. Final acceptance: Clean all sewers and manholes before requesting final acceptance.

### **3.04 TESTING AND INSPECTION**

- A. Observation: By OWNER.
- B. Notification:
  - 1. Testing: Arrange with OWNER following backfill, cleaning and pretesting.
- C. Equipment and manpower: Provide everything required for testing.
- D. Alignment and grade tests:
  - 1. Visual:
    - a. Each manhole to manhole section.
    - b. Mirrors or lights: Adequate to illuminate the section.
  - 2. Laser beam:
    - a. Set laser beam and target:
      - 1) At respective manholes.
      - 2) Sequentially at 3/4-inch offset from:
        - a) Invert.
        - b) Crown.
        - c) Left 1/4 point.
        - d) Right 1/4 point.
    - b. One or more laser beam discontinuous:
      - 1) Remove and replace section.
      - 2) Undamaged pipe may be reused.
- E. Low pressure air test for leakage:
  - 1. Required for all types of pipe.
    - a. Concrete pipe: ASTM 924.
    - b. Clay or plastic pipe: ASTM C 828.
    - c. PVC pipe: ASTM F 1417.
  - 2. Test each manhole to manhole section following completion of service leads, risers and other appurtenances.
  - 3. Procedure:

- a. Add air slowly to the test section until the pressure inside the pipe reaches 4.0 psig. After the pressure of 4.0 psig is obtained, regulate the air supply so that the pressure is maintained between 3.5 to 4.0 psig for at least 2 minutes depending on air/ground temperature conditions. The air temperature should stabilize in equilibrium with the temperature of the pipe walls. The pressure will normally drop slightly until equilibrium is obtained; however, a minimum of 3.5 psig is required.
- b. Air test pressures must be increased to offset the depth of ground water over the sewer line. If the groundwater level is 2 feet or more above the top of the pipe at the upstream end, or if the air pressure required for the test is greater than 9-psi gage, the air test method should not be used. Before the air test method is used, the groundwater level should be lowered by pumping or dewatering.
- c. Disconnect the air supply and decrease the pressure to 3.5 psi before starting the test. Determine the time required for the pressure to drop from 3.5 psi to 2.5 psi, and compare this interval to the required time to decide if the rate of air loss is within the allowable. Minimum holding times required by pipe diameter are shown in Table 1.
- d. Minimum holding time for various PVC pipe sizes (ASTM F 1417):

**TABLE 1 - MINIMUM HOLD TIME FOR PVC PIPE**

<b>Nominal Pipe Size (inches)</b>	<b>Time, T (minutes/100 ft)</b>
6	5.67
8	7.57
10	9.43
12	11.33
15	14.17
18	17.00
21	19.50
24	22.78
27	28.85
30	35.62
36	51.28

- e. If the test section includes more than one pipe size, calculate the test time for each pipe size and add the times together to arrive at the total test time for the section.
  - f. For testing of long sections or sections of larger diameter pipes, or both, a timed-pressure drop of 0.5 psig shall be used in lieu of a 1.0 psig timed-pressure drop and the appropriate required test time shall be exactly one-half the values shown in Table 1.
4. Repair leaks and repeat tests until acceptable results are achieved.

- F. Other leakage tests: In lieu of low pressure air test (for special situations only).
- 1. Requires prior approval of ENGINEER.
  - 2. In accordance with ASTM C 969.

- G. Deflection test for plastic pipe:
- 1. Allowable maximum deflection: 5 percent of diameter.
  - 2. Pull go, no-go gauge through each section.

- a. At least 30 days after completion of backfill.
- b. Pulled by one person with no mechanical advantage.
3. Go, no-go gauge will not pass:
  - a. Remove and replace section.
  - b. Undamaged pipe may be reused.
4. Vibratory rerounding device:
  - a. Obtain ENGINEER's prior approval.
  - b. Submit pipe Manufacturer's written approval of equipment and method.

**3.05 SCHEDULES**

- A. Sanitary Sewer System Details:
  1. Standard Sanitary Manhole.
  2. Lateral Connection to Existing Concrete Sewer.
  3. Pipe Saddles.
  4. Support for Underground Utilities.
  5. Go, No-Go Gauge for Plastic Pipe.

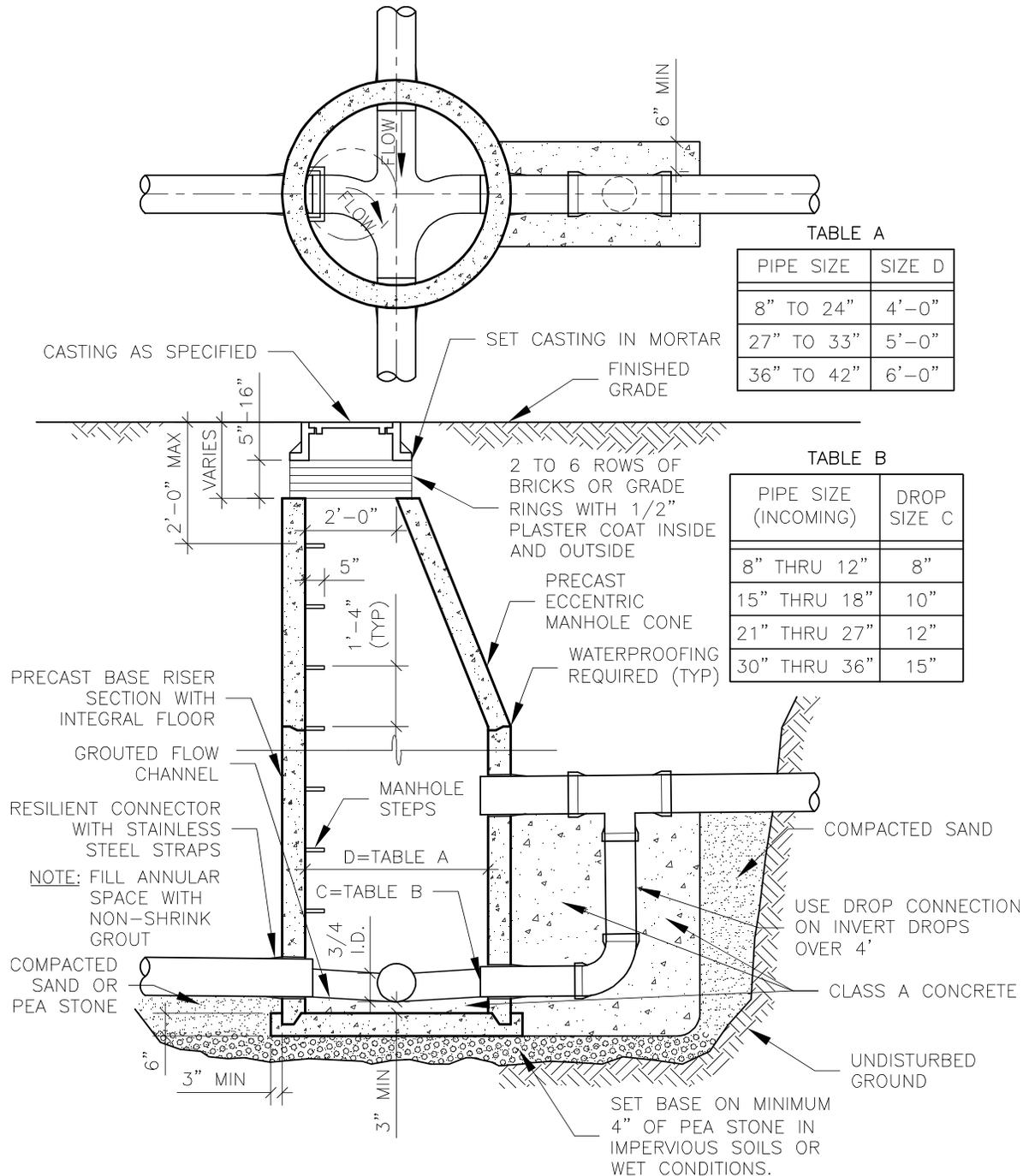


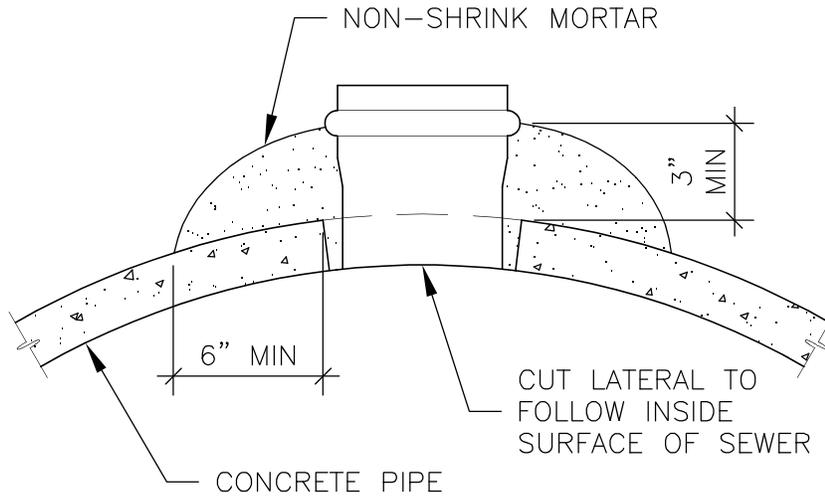
TABLE A

PIPE SIZE	SIZE D
8" TO 24"	4'-0"
27" TO 33"	5'-0"
36" TO 42"	6'-0"

TABLE B

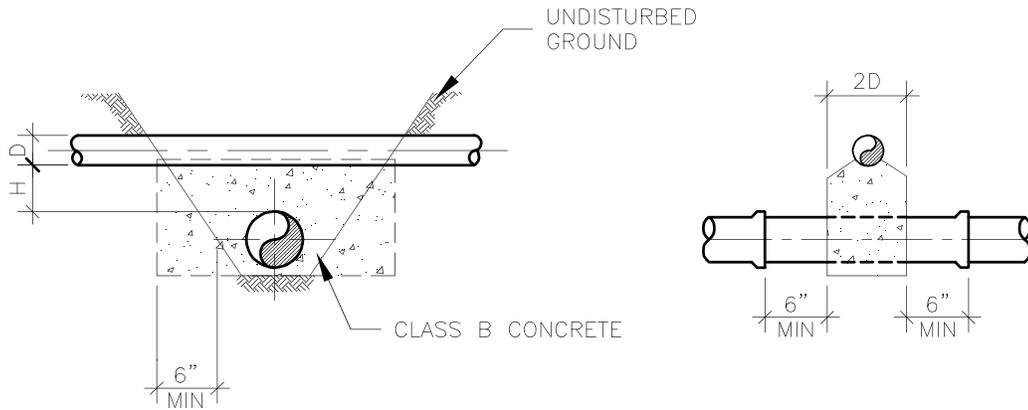
PIPE SIZE (INCOMING)	DROP SIZE C
8" THRU 12"	8"
15" THRU 18"	10"
21" THRU 27"	12"
30" THRU 36"	15"

**STANDARD SANITARY MANHOLE**  
NO SCALE



# LATERAL CONNECTION TO EXISTING CONCRETE SEWER

SCALE: NONE



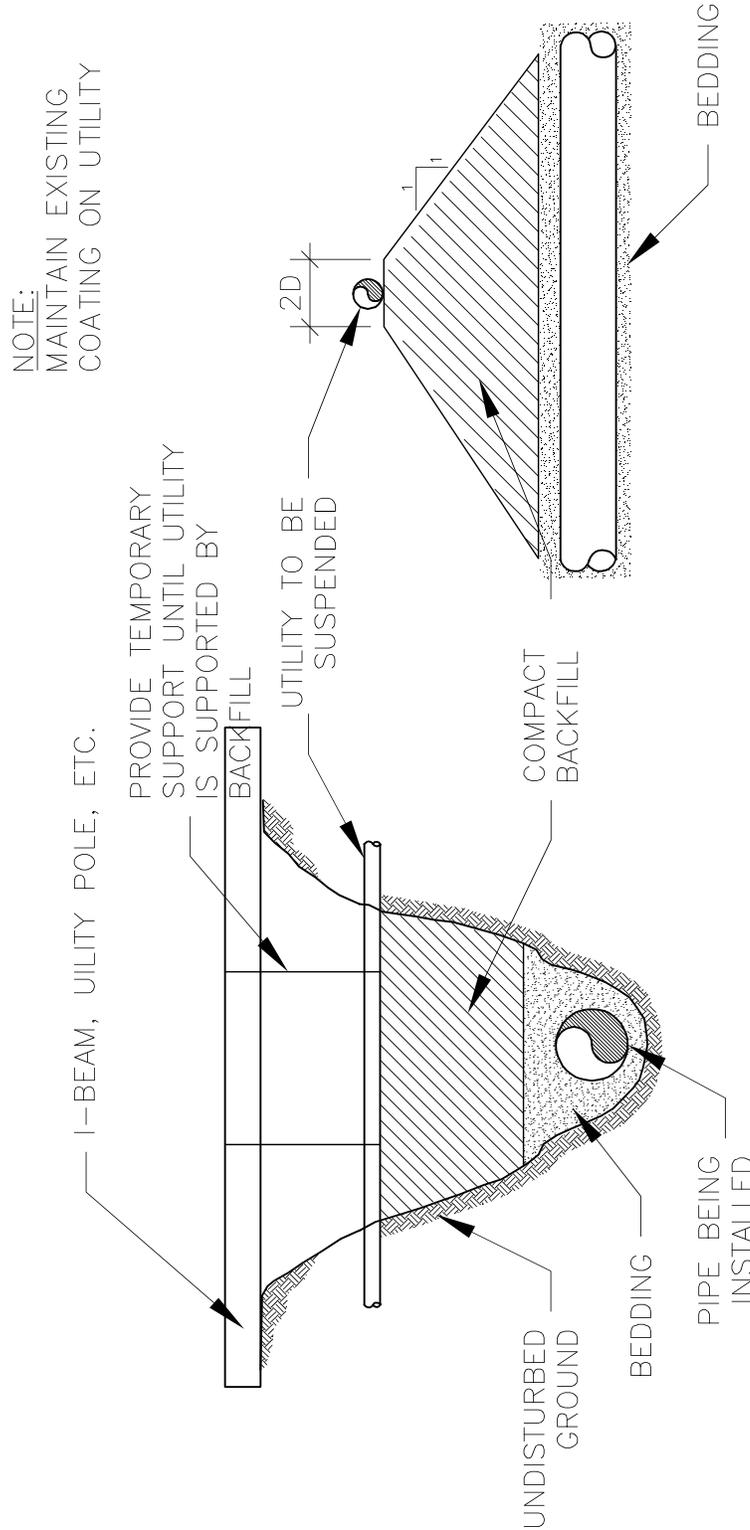
**NOTE:**  
 NOT REQUIRED FOR 2" OR  
 SMALLER PLASTIC, STEEL, LEAD  
 OR COPPER PIPE

**SADDLE REQUIREMENTS**

H	D
0"-3"	LESS THAN 15"
0"-6"	18" THRU 36"
0"-12"	42" AND OVER

# PIPE SADDLES

NO SCALE



SIMILAR SUPPORT METHODS APPLY TO  
UTILITIES PARALLELING AND ABOVE  
THE PIPE UNDER CONSTRUCTION

# SUPPORT FOR UNDERGROUND UTILITIES

NO SCALE

