

**SANITARY SEWER
STANDARDS FOR
THE CONSTITUENT MUNICIPALITIES
OF THE
SOUTHERN CLINTON COUNTY
MUNICIPAL UTILITIES AUTHORITY**

First Printing April 1990
First Revision February 1993
Second Revision November 1994
Third Revision March 1997
Fourth Revision May 2001
Fifth Revision January 2002
Sixth Revision September 2006
Seventh Revision August 2009
Eighth Revision September 2013
Ninth Revision August 2015

TABLE OF CONTENTS

SANITARY SEWER STANDARDS

CHAPTER 1 -GENERAL INFORMATION	Pg. 3
Introduction	3
Definitions	3
Regulatory Constraints	5
State Construction Permits, Part 41	5
Utility Location within Street Right-of-Way	5
Administrative Procedures for Utility Projects	5
Administrative Procedures and Fees	7
Administrative Variances for Utility Projects	8
CHAPTER 2 - STANDARDS OF CONSTRUCTION FOR UTILITY	Pg. 9
Utility Construction within Municipal Street Rights-of-Way	9
Construction Operations	9
CHAPTER 3 - STANDARDS OF DESIGN	Pg. 10
Plans and Specifications	10
Sanitary Sewers	11
Site Grading	17
Table of Standard Materials	19
CHAPTER 4 - GENERAL CONSTRUCTION REQUIREMENTS	Pg. 20
CHAPTER 5 - TECHNICAL SPECIFICATIONS	Pg. 24
Index Special Provisions	24
Special Controls	24
Traffic Control & Maintenance	25
Sanitary Sewer	26
Sanitary Sewer Force Main	36
Concrete Utility Manhole	42
Polymer Concrete Sanitary Manhole	45
Sub-grade Undercutting	48
Slope Restoration	49
Flow Meter	50
APPENDIX A - Sanitary Sewer Standard Details	51
APPENDIX B - Lift Station Details	51
APPENDIX C – Plan Submittals & Approval Process Matrix	52
BIBLIOGRAPHY	54

CHAPTER 1

GENERAL INFORMATION

INTRODUCTION

The design and construction standards for subdivision and land development contained in this publication are intended as guidelines to be used by the Developer to produce residential and commercial developments which conform to the Municipality's requirements. Where reference is made to specifications and standards, it is understood to mean the latest revision.

DEFINITIONS

- (1) **AUTHORITY** or SCCMUA – Southern Clinton County Municipal Utilities Authority
- (2) **CONTRACTOR** – The person, firm, or corporation engaged by the developer for construction services in conjunction with the proposed land development
- (3) **DESIGN ENGINEER** – The engineer engaged by the Owner or Developer to prepare platting documents and plans/specifications in non-platted land developments.
- (4) **ENGINEER OR MUNICIPAL ENGINEER** – The person, firm, or corporation empowered by the Municipality to provide the required engineering review and inspection services
- (5) **MDEQ** – Michigan Department of Environmental Quality
- (6) **MDOT** – Michigan Department of Transportation
- (7) **MIOSHA** – Michigan Occupational Safety and Health Act
- (8) **MISSDIG** – A one-call notification system (Dig Notice), established by the Michigan Underground Facility Damage Prevention and Safety Act 174 of 2013, as a means for individuals to communicate the intent to excavate in a given area, as required by law.
- (9) **CCDC** – Clinton County Drain Commission
- (10) **MUNICIPALITY** – Watertown Township, DeWitt Township, Bath Township, and/or the City of DeWitt
- (11) **NASSCO** – The National Association of Sewer Service Companies – the association that has set standards for televising sewer lines that has been adopted by the Authority
- (12) **OWNER or DEVELOPER** – A natural person, firm, corporation, association, partnership, or other entity who proposes subdivision or other land development and/or municipal improvements, and who either has an ownership interest therein or is authorized to act as an agent with respect thereto for an entity having such ownership interest

(13) SANITARY SEWER STANDARDS – “Municipal Standards” hereafter, the minimum standards for design, repair and construction of sanitary sewers for all work related to subdivisions and land development

(14) SESC - SOIL EROSION AND SEDIMENTATION CONTROL ACT. Part 91, of the Soil Erosion and Sedimentation Control, of the Natural Resources and Environmental Protection Act (NREPA) (Part 91) provides for the control of soil erosion and protects adjacent properties and the waters of the state from sedimentation. A permit is generally required for any earth change activity which disturbs one or more acres of land or which is within 500 feet of a lake or stream. Permits are issued by the County or Municipality having jurisdiction over the project.

(15) XCU - EXPLOSION COLLAPSE & UNDERGROUND HAZARDS, which refers to insurance coverage for property damage liability arising out of explosion or blasting (designated by X), collapse or structural damage to any building or structure (designated by C), and underground damage caused and occurring during the use of mechanical equipment (designated by U).

(16) RECORD DRAWING - A complete clean set of drawings that reflect how the project was built - folding the as-built revisions into the design documents, including addenda, post bid bulletins and design revisions. These are compiled by the designer from the as-built drawings submitted by the contractor, as a record of the work. Since these are not confirmed in the field by the designer they are not "as-built" but a compiled record.

Record drawings are ~~expected~~ required to represent a complete drawing set, not just the sheets that changed. These drawings will not be signed, but will be stamped or otherwise marked by the design team as “record drawings”

(17) STATE PLANE COORDINATE SYSTEM of 1983 – The State of Michigan is divided into three zones (North, Central, South). Clinton County falls within the South Zone using an origin of: 84 deg 22' W by 41 deg 30' N, and standard parallels of: 42 deg 06' N by 43 deg 40' N.

(18) NAD 83 – North American Datum of 1983 is a spheroid (GRS 80), which is an earth-centered (or geocentric) datum having no initial point or initial direction. NAD 83 is defined to remain essentially constant over time for points on the North American Plate.

(19) NAVD88 – North American Vertical Datum of 1988 (NAVD 88) is the vertical control datum established in 1991 by the minimum-constraint adjustment of the Canadian-Mexican-United States leveling observations. It held fixed, the height of the primary tidal bench mark, referenced to the new International Great Lakes Datum of 1985 local mean sea level height value, at Father Point/Rimouski, Quebec, Canada. Additional tidal bench mark elevations were not used due to the demonstrated variations in sea surface topography, i.e., the fact that mean sea level is not the same equipotential surface at all tidal bench marks. NAVD 88 replaced the National Geodetic Vertical Datum of 1929 (NGVD29).

REGULATORY CONSTRAINTS

The Contractor shall give all notices required by, and comply with, and be responsible for knowledge of all current applicable ordinances and codes, of local, State and Federal Governments.

STATE CONSTRUCTION PERMITS - Upon receipt of approved sanitary sewer plans and specifications from the developer, the Municipality will make applications to the Michigan Department of Environmental Quality for Wastewater System permit under the authority of Part 41 of Act 451, PA 1994 as amended. All Michigan Department of Environmental Quality permits for submerged stream crossings and culvert and bridge construction shall be obtained by the Developer. All other required permits shall also be secured by the Developer prior to construction.

UTILITY LOCATION WITHIN STREET RIGHT-OF-WAY

The utilities listed below shall be constructed in the designated location within the right-of-way of two-lane streets unless existing utility locations preclude conformance to the standard locations. Utility locations for streets with a width greater than two lanes will be reviewed on a case by case basis.

- Sanitary Sewers south or west side, 7 feet from the centerline of the road.
- Storm Sewers north or east side, 7 feet from the centerline of the road.
- Water Mains north or east side, 22 feet from the centerline of the road.
- Gas Mains south or west side, 22 feet from the centerline of the road.
- Other Utilities as approved by the Municipal Engineer. Requirements of the Clinton County Road Commission and the City of DeWitt shall be considered in locating utilities.

ADMINISTRATIVE PROCEDURES FOR UTILITY PROJECTS:

I. PRELIMINARY PLAT/SITE PLAN APPROVAL:

- A. Building & Zoning, Municipal Engineer
- B. Formal request for an agreement
- C. Agreement Executed
 1. Reviewed by of the Municipal Attorney
 2. Municipal Board approval

II. COSTS:

- A. Developer is responsible for Lift Station design cost.
- B. Developer provides estimate of cost of utility construction
- C. Developer issuance of letter to notify the Authority of "Project" intent
- D. Design Engineer verifies estimated costs
Date: _____
Amount: _____

III. CONSTRUCTION PLAN REVIEW:

- A. 2% of construction cost deposited with Municipality (May vary by Municipality)
Date: _____

- Amount: _____
- B. Performance Surety placed in Clerk's file
 Date: _____
 Amount: _____
 Bond #: _____
 Expiration Date: _____

IV. APPROVAL/PERMIT PROCEDURES:

- A. Developer delivers preliminary plans to the Municipality and then the municipal Engineer. The Municipality should issue any and all plans to concerned parties to ensure everyone is working on the same prints.
- B. Preliminary plans forwarded to the Authority
- C. Municipal Engineer reviews plans and provides comments to the Municipality and the Authority. The Authority shall review and return plans to the Municipal Engineer to incorporate any needed changes or omissions.
- D. Developer submits copies of the final sealed plans as determined by the municipality, and at least one (1) copy of a completed Part 41 Construction Permit, including a basis of design and Notice of Coverage.
- E. Municipal Engineer submits permit package to MDEQ for permit issuance.
- F. Municipal Clerk & Municipal Engineer receive State approval of proposed project

V. DEPOSIT FOR CONSTRUCTION ADMINISTRATION:

- A. Municipal Treasurer receives 7% inspection deposit by developer (May vary by Municipality)
 Date: _____
 Amount: _____
- B. Municipal Treasurer places bond in Trust and Agency
- C. Municipality notifies the Authority by letter, for inspection of development

VI. Construction

- A. Pre-Construction meeting
 - 1. Verification of Insurance Certificate
 - 2. Verification of Permits
 - MDEQ
 - Part 91 Soil Erosion to be obtained from the responsible agency
 - MDOT/Clinton County Road Commission/Authority/Municipality. (The City of DeWitt has its own Storm Sewers within its boundaries along with their own Road Permits).
 - 3. Miss Dig notification
- B. Actual construction begins
- C. Authority's inspects project construction
- D. Authority's submits finalization of project inspection report and inspection reimbursement request to the Municipality.
- E. Authority submits letter to Municipal Engineer of completion of Inspection Services
- F. Municipality accepts Utility Extensions.

VII. PERMITS:

- A. Building permits may be issued at time of final plat
- B. Building Sanitary Sewer & Water Permits for the connections to the utilities may be issued after:
 - 1. All testing requirements satisfied
 - 2. Developer has insured clean-up of construction site within the road right-of-way

VIII. FINALIZATION BY MUNICIPALITY:

- A. Deed of Grants, Waiver of Lien, Easement Grants
- B. Authority certifies completion of sanitary sewer construction in accordance with standards. Authority notifies Municipality of maintenance fees if required.
- C. Municipal Engineer certifies completion of project & forwards to the Municipality
- D. Resolution of acceptance drafted by the Municipality's Attorney
- E. Final Acceptance by the Municipal Board or authorized designee
 - 1. Deed Grant, Waiver Lien, Easements, & Warranties
 - 2. Municipal Clerk places on permanent file.
 - 3. Municipal Clerk or designee notifies Authority in writing of acceptance and addition of accepted sanitary sewer and appurtenances to the Operation & maintenance contract.

IX. OCCUPANCY:

- A. Notification to Building & Zoning, and the Authority by copy of minutes recorded by Municipal Clerk for legal connections
- B. Authority inspects connections to the systems
- C. Building & Zoning Department issues occupancy permits
- D. Developer/Contractor shall request return of escrow money

ADMINISTRATIVE PROCEDURES AND FEES

GENERAL - All correspondence, verbal requests, submission of plans, and related information exchanges shall be directed to the municipal clerk during normal business hours or by mail. Appropriate distribution of information, plans, etc. shall be made by the Municipality. This applies to information received from developers for the engineer and information from the engineer for the developer. The intent of this section is to maintain, in the appropriate municipal office, a copy of all correspondence and related information for municipal use.

FEES - Each Municipality has fees covering review of plans and inspection of construction. Contact the local municipal clerk for the fee schedule.

INSPECTION SERVICES NOTIFICATION - **A minimum of 48-hour advance notice for sanitary sewer connection inspections is required.** The Authority inspects sanitary sewer connections for: the City of DeWitt and DeWitt, Bath, and Watertown Townships. The Authority also inspects the residential storm connections where it has an agreement with the Municipality.

ADMINISTRATIVE VARIANCES FOR UTILITY PROJECTS

GENERAL - The appropriate municipality manager shall have the power to resolve upon appeal, specific variances from the requirements listed within these "Sanitary Sewer Standards".

CHAPTER 2 STANDARDS OF CONSTRUCTION

CONSTRUCTION WITHIN MUNICIPAL STREET RIGHTS-OF-WAY

GENERAL

This specification covers the requirements of all sanitary sewer main, water main, storm sewers, natural gas, telephone, cable television, or other public utilities, and private persons or corporations in connection with construction operations within Municipal Street rights-of-way.

All work shall be carried on in a neat and professional workmanship manner with minimum interference to the flow of traffic. No street may be closed without prior permission from the governmental entity having jurisdiction. The Contractor shall be responsible for providing, installing, and maintaining traffic control signs, lights, and barricades as required by the MDOT Manual of Uniform Traffic Control Devices.

Unless as otherwise specified, all work shall conform, meet or exceed applicable provisions of the "2012 Standard Specifications for Construction" of the Michigan Department of Transportation (MDOT), or the latest version thereof.

The Contractor shall notify the Municipality and Miss Dig (800-482-7171) at least 72 hours prior to commencing construction operations, unless extenuating circumstances warrants immediate action.

Where applicable, construction plans shall be submitted to the Municipality for approval at least 30 days in advance of the proposed initiation of construction operations.

CONSTRUCTION OPERATIONS

In general, construction operations shall be in accordance with the applicable sections of these following "MUNICIPAL STANDARDS"

1. Pavement Crossings. Unless otherwise specified, where a utility line crosses the entire width of a permanent pavement, the Contractor will be required to bore, bore and jack, or tunnel in accordance with the requirements of the Clinton County Road Commission or the City of DeWitt. If open cutting of the permanent pavement is allowed, the pavement shall be saw cut prior to excavation and backfilled and compacted in accordance with the requirements of the Clinton County Road Commission or the City of DeWitt.
2. Pavement Replacement. Where weather conditions allow, pavement shall be replaced upon completion of construction operations. Pavement replacement materials shall be of the same material as the existing pavement. During freezing weather, cold patch shall be used until permanent pavement can be replaced. The utility, private persons or corporations shall be responsible for maintaining the cold patch until the permanent pavement can be replaced.

CHAPTER 3 STANDARDS OF DESIGN

PLANS AND SPECIFICATIONS

1. The plans and specifications shall be prepared by a professional engineer registered in the State of Michigan.
2. Plans shall consist of a cover sheet showing a location map and site plan of the proposed project, plan and profile sheets covering all the proposed sanitary sewer construction, i.e. gravity lines, force mains, and lift stations, and a standard detail sheet. Plan sheet size shall be 24" x 36". Plan scale shall be 1 inch = 40 feet and profile at 1 inch = 4 feet vertically. Alternatively, plan scale shall be 1 inch = 50 feet horizontally and profile at 1 inch = 5 feet vertically.
3. Elevations shall be based upon on the North American Vertical Datum of 1988 (NAVD88), which shall be noted on the plans with the appropriate conversion to the National Geodetic Vertical Datum of 1929 (NGVD29). Elevations based upon an assumed datum will not be approved. All bench marks will be shown on the final record drawings.
4. Plan profiles shall indicate existing and proposed ground levels, U.S.G.S. elevations, and stationing.
5. Copies of plans and specifications shall be submitted by the developer to the Municipality for preliminary approval in accordance with Appendix C. All plans and specifications submitted for approval shall be sealed by the registered engineer in charge of design. Modifications required to meet the Municipal Standards, if any, will be noted on 2 sets, with 1 such set returned to the developer for final corrections within 90 days of receipt.
6. Copies of final plans and specifications shall be submitted by the developer to the Municipality for approval in accordance with Appendix C. All plans and specifications submitted for approval shall be sealed by the registered engineer in charge of design.
7. The Municipality will secure the sanitary sewer construction permit from the MDEQ. The Developer will provide the Basis of Design and pertinent information required for the permit application. Copies of plans and specifications sealed by the registered engineer in charge of design to accompany the permit application shall be provided in accordance with Appendix C. The Developer will be responsible for securing all other permits required for the sanitary sewer construction.
8. In accordance with Appendix C, two (2) sets of record blue line prints and two (2) computer discs or an electronic memory storage equivalent as approved by SCCMUA with the same, having each drawing saved as a separate file shall be submitted to the Authority upon completion of the construction project in both AutoCad & PDF formatting. Utility information for record drawings shall be provided in the following format:

SCCMUA UTILITY MAPS - AUTOCAD FILE INFORMATION

Version: AutoCAD as approved by SCCMUA
File: Single file showing all as-built sections
Orientation: North up or to the left
Units: AutoCAD Engineering
Layers:

Information Name Line Type Color Text Height

- right-of-way(s) ROAD continuous 3
- road name ROADNAME continuous 2 15' - 0"
- water main WM hidden 9
- water main text WMTEXT continuous 4 20' - 0"
- sewer main SEWER hidden 9
- sewer main text SWRTEXT continuous 4 20' - 0"
- river banks RIVER continuous 5
- section SECTION center 8

The location of wyes, manholes and the intersection of the service lateral and the respective property line shall be witnessed from at least two (2) permanent topographic features. Record drawings information shall include survey elevations at finished grade above the utility pipe to document that depth of cover conforms to approved design. Record drawings information shall include the manhole numbering scheme as provided by the Authority. Record drawings information shall be provided on separate drawings, and shall not be provided as corrections, cross-outs, changes, or other alterations to design plans.

9. All required easements must be secured, and a copy must be filed with the Clinton County Clerk's Office, other applicable appropriate municipal office, and a copy submitted to the SCCMUA.

SANITARY SEWERS

SCOPE

These standards establish the minimum requirements for the design of sanitary sewers in the Municipality. All plans shall conform to the Recommended Standards for Wastewater Facilities – 2014 Edition, Great Lakes-Upper Mississippi River Board, commonly known as the "10 States Standards".

1. LOCATION. The location of the sanitary sewer within the street right-of-way shall be 7 feet south or 7 feet west of the centerline of the road for two lane streets. Sanitary Sewer locations for streets with a width greater than two lanes will be reviewed on a case by case basis. All cross-country sanitary sewers shall be installed with a service road designed for year-round access to each manhole by the Authority's cleaning equipment.

2. EASEMENTS. The minimum easement width for sanitary sewer located outside of the public right-of-way shall be set at 30 feet or a width of two times the maximum depth of the sanitary sewer, whichever is greater. The easement shall be located and recorded in

GPS coordinate format using current North American Datum 1983 (NAD83) or Michigan State Plane Coordinate System of 1983, South Zone for this region. All manholes, forcemains, and lift stations shall be located using this same method.

3. MINIMUM GRADES AND VELOCITIES. Sanitary sewers shall be designed to maintain a minimum velocity of 2 feet per second: maximum velocity shall not exceed 10 feet per second.

Required minimum grades for various size sanitary sewers shall be as listed below:

- 6" (lateral) 1.00%
- 8" 0.50 with a minimum 0.60% grade on dead end runs
- 10" 0.28%
- 12" 0.22%
- 15" 0.15%
- 18" 0.12%
- 24" 0.08%

The developer is responsible for utilizing competent contractors that have sufficient experience in the use of in-line lasers and experienced in the use of a level transit for certifying that the laser grade is correct. Sanitary sewers and manholes installed at less than the minimum grades and elevations will be subject to rejection or fees as outlined in the Construction Specifications.

4. MINIMUM DIAMETER. The minimum diameter of collection sewers shall be 8 inches and the minimum diameter of the service lateral shall be 6 inches.

5. MANHOLES. Shall be constructed at all changes in grade, size, and alignment of the sanitary sewer. The minimum depth of a manhole shall be 42 inches from the surface of the final grade to the invert elevation of the manhole. The maximum run between manholes shall be 400 feet. All manholes shall be precast concrete with rubber "O" rings at joints. All pipe openings shall be cast in the precast section or cored in the finished wall. Manhole pipe connections shall be furnished with an integrally cast seal system, equal to "Press Wedge 11", "Kor-N-Seal", "Lock Joint Flexible Manhole Sleeve", or equivalent. Sanitary manholes shall have integral concrete manhole bottoms. The Authority's manhole numbering shall be placed on all sanitary sewer manholes. The Authority will provide the developer/design engineer with the manhole number sequence to be used on the project. These manhole numbers must be utilized on all references to testing and televising before final acceptance. All manholes shall be located and recorded in GPS coordinate format, using current North American Datum 1983 (NAD83) or Michigan State Plane Coordinate System of 1983, South Zone referencing for this region. No precast flow channels will be accepted.

The minimum inside diameter of a sanitary sewer manhole for sewers up to 21 inches in diameter shall be 48 inches. For sanitary sewer 24 to 36 inches in diameter, the minimum inside diameter of the sanitary manholes shall be 60 inches. A larger diameter manhole may be required for right angle installation of sewers at the upper limit (i.e. 60 inch diameter manhole for 21 inch sewers at a right angle). Manholes shall be upsized to

accommodate multiple pipes and maintain the structural integrity of the manhole between cored openings. Internal drops shall be provided on newly constructed manholes. The minimum inside diameter for manholes containing inside drop pipes shall be 60 inches. Diameters for manholes containing multiple internal drops shall be approved by the Municipal Engineer and the Authority. In general, a four foot diameter clear opening should be provided in manholes containing internal drop structures. External drops may be required for connections to existing manholes and shall be approved by the Municipal Engineer and the Authority.

All adjustments to manholes shall be made with LADtech HDPE manhole adjustment rings, UGT adjusting rings with Veil Wrap, or equivalent as approved by SCCMUA. Any slope adjustments will be made using the appropriate sized rings to match the correct height and angle. Any adjustments to existing manhole structures shall be made by either using the HDPE adjustment rings as noted above; with a maximum adjustment of 12 inches on top of the precast cone section. All adjustments shall be externally sealed with a waterproof flexible sealant approved by SCCMUA and/or the Municipal Engineer. Invert elevations of all sanitary sewer pipes entering the manholes shall be shown on all construction and final record plans. These inverts shall be taken before the cone section of the manhole is set in place. The minimum requirement for invert drops through manhole structures shall be 0.10 feet. Manhole structures with horizontal alignment deflections (from straight through) of greater than 45 degrees but less than 90 degrees shall include a 0.2 foot drop between inlet and outlet. For changes in pipe diameters, additional drop through the manhole is required based on matching at 0.8 times the diameter of the inlet and outlet pipes. Flow channels shall be a minimum ID same as the largest pipe on the downstream side of the manhole. Preformed flow channels on concrete manholes shall not be allowed. New sanitary sewer connections into existing manhole structures shall not compromise the integrity of the structure. The existing structure shall be reconditioned or replaced at the discretion of the Authority and the Municipal Engineer at the cost of the Developer.

Existing manholes and concrete pipes that are designated to receive discharges from sewage force mains shall be lined to protect the structures from corrosion. Linings shall be approved by the Municipal Engineer and the Authority. The linings shall be completed through the entire stretch of pipe, including the downstream manhole for a distance of 1000 feet or three stretches of sewer between manholes, whichever is greater or as directed by the Municipal Engineer and the Authority. For force main discharges into manholes of new construction, the manholes shall be constructed from materials resistant to hydrogen sulfide related corrosion as approved by the Municipal Engineer and the Authority

Access to manholes will not be restricted. Changes in grade for any purpose shall require the adjustment of the manhole to grade at the cost of the organization or individual causing such change to grade. Structures, fences, and plantings shall not obscure, block or in any manner restrict access to the manhole.

All industrial users or commercial users designated by the Authority shall provide a sanitary sewer manhole for sampling purposes at the site's property line/right-of-way or other location approved by the Authority. Access easements shall be

provided to the municipality when the sampling manhole is located on private property. Appropriate sand / oil / grease interceptors as approved by the Municipal Engineer and the Authority shall be provided and maintained as required.

6. VORTEX MANHOLE INSERT. Shall be installed per the Factory Representative and Municipal Engineers recommendations only. If in the roadways, two castings and covers shall be installed, one over the Vortex and the second over the discharge invert. Minimum manhole diameter for a Vortex installation is 6 foot.

7. MANHOLE CASTING. The standard sanitary manhole casting shall have a 24 inch clear opening. Refer to the table of standard castings and valves for the municipalities' standard manhole castings. Final record drawings shall show final "Top of Casting" elevation. The specific cover design for the Municipalities is supplied by East Jordan Iron Works (104429).

8. SERVICE LATERALS. Connection of the service laterals to the collection sewer shall be by means of a sanitary sewer pipe wye. The service lateral shall be constructed to a point fifteen (15) feet inside the property line of all lots and marked in accordance with the sanitary sewer standards of construction included herein. In addition; the Developer shall be required to furnish, to the Municipality, a map indicating the precise location of all sanitary sewer laterals at the property line intersection. Laterals shall be located from the downstream manhole. The location shall be witnessed from 2 recoverable reference points. For service laterals of extended length, clean-outs shall be constructed at 90 feet intervals. Where sanitary sewers are deeper than 15 feet, 6 inch diameter risers shall be constructed as such that the service lateral is a maximum of 11 feet below finish grade at the property line. PVC fittings shall be encased with crushed limestone or crushed clean concrete (without reinforcing steel), no larger than one-inch in size and installed with the branch connection tilted 45° from the vertical. These "deep laterals" shall follow the specifications for proper installation.

9. SUBSURFACE SOIL CONDITIONS. The Developer shall provide sufficient soil borings along the sanitary sewer route to accurately describe the prevailing soil conditions. The soil borings shall be reviewed and classifications provided by a Professional Engineer registered in the State of Michigan. Auger sampling is not allowed. Samples shall be obtained following the Split-Barrel Sampling Procedure and n-values provided. Continuous Geoprobe samples may be accepted if conditions warrant and prior approval is granted by the Municipal Engineer. The borings shall be constructed to a minimum depth of five (5) feet below the proposed invert elevation of the sanitary sewer and, in general, shall be spaced no more than 400 feet on center along the proposed sanitary sewer route. However, where unstable soils are present, the Municipal Engineer shall indicate additional locations and depths for soil borings to help delineate suspected areas of unsuitable soils. Additional measures may be required to support the sanitary sewer and manhole structures if unsuitable soils exist.

10. LIFT STATIONS.

- a. General: Lift station site plans shall be reviewed and approved by the Authority for site-specific concerns that may impact facility operation and maintenance. Municipalities will review designs for general aesthetics, compatibility with the

environment and incorporation of low-maintenance landscaping. Access roads to lift stations shall be designed as a paved bituminous, concrete, or surface approved by SCCMUA and the municipal engineer. The access road shall be designed to allow concurrent access to the wet well of the lift station for a crane truck and "vactor". No grades in excess of 8 percent shall be permitted. The access shall be optimally located to provide equipment access for lift station operation and maintenance.

b. Design: The design of sewage lift stations shall be completed by the Municipal Engineer on behalf of the Authority and shall be site specific. The Developer shall provide the basis of design for the wastewater flows tributary to the lift station to the Municipal Engineer. Specifications and detailed drawings shall be provided to the Developer for inclusion of the construction drawings. The Developer shall be responsible for the cost associated with the design of lift stations. The Developer shall be responsible for providing record drawings of the lift stations. Record drawings shall include location and elevations of all underground piping, conduit, wiring, ducts, and appurtenances. If the Developer elects to have the Municipal Engineer provide the record drawings of lift stations, the Developer shall be responsible for the Municipal Engineer's cost.

- In general, stations will consist of submersible pump lift station with concrete wet well chamber, flow meter chamber (where required by Municipal Engineer) and an exterior valve chamber. Flow meter type shall be specified by the SCCMUA or the municipal engineer. Lift Stations designed for peak hourly flows of 350 GPM or greater shall have flow meters installed, unless such installation is not approved by the municipality/s having ownership. The concrete wet well shall have precast sections or poured sections with polycrrete resistant to hydrogen sulfide related corrosion. Exterior wet well joints and through the wall intrusions shall be externally sealed with an approved water resistant coating, such as a cretex wrap, infishield seal wrap, or equal. The subsurface exterior of valve and flow meter chambers shall be coated with an approved water resistant coating. A sump pump or gravity water removal system as approved by SCCMUA and/or the Municipal Engineer shall be provided for valve and flow meter chambers. The valve chamber shall include a force main bypass connection with an isolation valve.

Submersible pump lift stations shall be equipped with stainless steel slide rails & lift chains/cables to facilitate the removal of the pumps for repair. All hardware and appurtenances within the wet well shall be stainless steel. All lift stations shall be equipped with high & low level alarms. All pumping stations located in the Municipalities shall be equipped with a telemetry system compatible with that in current use by the Authority. Coordination with the telemetry installation will be through the Maintenance Department of the Authority.

Lift station design shall conform to the guidelines contained in the Recommended Standards for Wastewater Facilities, Great Lakes-Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers (Ten-States Standards) unless otherwise noted or approved. All submersible pump lift stations shall be provided with intrinsically safe electrical control systems, a transducer level

control system, along with a redundant "direct wired" configuration capable of operating a pump independent of the Programmable Logic Controller (PLC), for a high and low level alarm float. Lift station design shall be subject to the approval of the Municipality. Mechanical Aeration and/or chemical feed equipment as specified by the Municipal Engineer and the Authority may be required at pump stations due to extended force main length and/or long detention time for odor control and structural deterioration prevention.

There shall be three (3) sets of Lift Station operation and maintenance manuals supplied to the Authority upon completion of the project. The Developer shall be required to provide an electrical generator of sufficient capacity to operate the lift station and may be required to provide a flow measuring device approved by the Municipality Engineer. Lift station wetwells shall be constructed with gas tight access hatches, level with the top of the precast structure. Access hatches shall have hinged safety grating built as an integrated part of the fabricated batch assembly.

Service panels, generators and other equipment designated at the discretion of the Authority shall be protected from vehicular traffic by the placement of bollards. The Developer shall arrange for a technical representative of the pump manufacturer to inspect the equipment installation, supervise mechanical adjustments, conduct startup of the equipment, supervise testing and instruct Authority staff in the operation and maintenance of the lift station. Sixty (60) days after successful startup of the lift station, the Developer shall conduct a wet well drawdown test to verify the capacity and head conditions of the lift station installation. The Developer shall provide all required testing equipment and personnel and tests shall be conducted in the presence of Authority staff.

Service panels shall be constructed in a manner to protect all internal components from hazardous environments. Panels shall be designed to accommodate ease of maintenance and repair, as well as efficient ventilation for the cooling and heating of internal components. SCCMUA will specify the configuration for design build of the control panel to include components such as: Programmable Logic Controller (PLC), variable speed drives, motor starters, radios, rain gauges, number of pumps, and flow meters where required.

11. INVERTED SIPHONS. The use of inverted siphons will not be approved unless specific conditions warrant their use.
12. ILLEGAL CONNECTIONS. The connection of footing drains, roof-down spouts, basement sump pumps, or other similar discharges including storm water and surface waters shall not be connected directly or indirectly to any sanitary sewer lateral.
13. CONNECTION ELEVATIONS. Minimum cover over the service lateral shall be as set forth in the State Plumbing Code.
14. TRENCH LOADING DESIGN. All sanitary sewers shall be designed so as to resist all trench backfill and construction load or anticipated superimposed loadings utilizing a factor of safety of 2.

15. TELEMETRY SYSTEM. The telemetry system design shall be as specified in Appendix B. Costs associated with installation and connection with existing Authority systems shall be borne by the Developer.

16. RESIDENTIAL & COMMERCIAL CONNECTION REQUIREMENTS. All connections to the sanitary sewer system or service lead shall be inspected by the designated Authority staff.

a. All connections will follow the same test requirements as in the Special Provisions for Sanitary Sewer of these Municipal Standards.

b. Any sanitary sewer service within 50-feet of a private well head must comply with MDEQ regulations for well head protection.

c. All commercial grease or sand trap/interceptors must be designed and placed appropriately as per the Municipal Engineers direction.

d. Connections to the sanitary sewer system shall have an approved backflow preventer installed within the building drainage system as required by the State plumbing code or as directed by the Authority or the Municipal Engineer.

e. A sampling manhole will be required for designated commercial and all industrial connections.

f. Clean-out within 10-ft of building, at every 90-ft of straight run, and at each 90 degree change (two each 45 degree connectors).

17. PRETREATMENT. The requirements for sand, oil, and oil and grease interceptors shall conform to requirements of the Authority's Industrial Pretreatment Program.

18. FUTURE CONNECTION STUBS. The Developer shall be required to install sanitary sewer stubs to the limits of the development to provide for future service extensions to adjacent properties. Stubs for adjacent properties or future phases within the same Development shall terminate at the upstream end at a manhole unless otherwise approved by the Municipal Engineer and the Authority.

SITE GRADING

SCOPE

These standards establish the minimum requirements for the design of site grading.

PLANS AND SPECIFICATIONS

1. The plans and specifications shall be prepared by a professional engineer registered in the State of Michigan.

2. Plans shall consist of a cover sheet showing a location map and site plan of the proposed project, a plan sheet showing the street and lot drainage, and a standard

detail sheet. Plan sheet size shall be 24" x 36". Plan scale shall be 1 inch = 40 feet and profile at 1 inch = 4 feet vertically. Alternatively, plan scale shall be 1 inch = 50 feet horizontally and profile at 1 inch = 5 feet vertically.

3. Elevations shall be based upon on the North American Vertical Datum of 1988 (NAVD88), which shall be noted on the plans with the appropriate conversion to the National Geodetic Vertical Datum of 1929 (NGVD29). Elevations based upon an assumed datum will not be approved.

4. The site plan for street and lot layout shall indicate both existing and proposed contours at a 2 foot contour interval. Individual lot drainage patterns shall be indicated on the plan.

5. Plans and specifications shall be submitted by the developer to the Municipality for preliminary approval in accordance with Appendix C. All plans and specifications submitted for approval shall be sealed by the registered engineer in charge of design. Modifications required to meet the Municipal Standards, if any, will be noted on 2 sets, with 1 such set returned to the developer for final corrections.

6. Final plans and specifications shall be submitted by the developer to the Municipality for approval in accordance with Appendix C. All plans and specifications submitted for approval shall be sealed by the registered engineer in charge of design.

7. The developer will be responsible for securing all State and local construction permits. Standards of Design – Grading Site grading shall be designed to allow for drainage of storm water away from residential or commercial buildings. Grades shall be such as to minimize earth settlement problems, avoid concentrating runoff onto adjacent properties, prevent creation of water pockets or pools of standing water, and to minimize erosion. The grading design shall incorporate natural drainage courses where possible. In areas where natural drainage is not present, surface (ditches) or subsurface (storm sewers) drainage shall be provided for collection and disposal of storm runoff. It is the intent of these regulations that the grading design minimizes the need for banks, retaining walls, or terracing. Minimum grade away from structures shall be 2 percent. On slopes of 3.5 horizontal to 1 vertical or greater, Class A sod with pegs must be provided to minimize erosion. The maximum allowable slope shall be 3.5 horizontal to 1 vertical. Site grading shall conform to the applicable sections of the Soil Erosion and Sedimentation Control Act. Tree placement in areas of utility conflict will be by hand digging only and shall be coordinated with the Authority.

TABLE OF STANDARD MATERIALS – SANITARY SEWER SYSTEMS

Sanitary Manhole Castings	EJIW 1040A
Cover	104429EJIW
Sanitary Sewer Mainline	SDR-26 PVC ASTM D3034, PS46 PVC ASTM F679, DIP-CL52, RCP, GRP, or PCP in conformance with the Sanitary Sewers Special Provision
Sanitary Laterals to Property Line	SDR-26 PVC ASTM D3034
Residential & Commercial service leads	SCH40 PVC 4"-6" ASTM D1785, SDR-26 PVC 4"-6" ASTM D3034, Pressure Pipe Service Leads SCH80 PVC 1 1/2" to 2 1/2" ASTM D1785 (Grinder Pumps)

LIFT STATION EQUIPMENT

Check Valves:	Golden-Andersen Swing Check
Plug Valves:	DeZurik
Raw Sewage Submersible Pumps:	ABS, Flygt, Gorman-Rupp, or as approved by the Authority.

STORM SEWER SYSTEM

Storm service leads SCH 40 minimum 4" ASTM D1785 for Residential connections or SDR-35 or SDR-26 ASTM D3034

CHAPTER 4 GENERAL CONSTRUCTION REQUIREMENTS

1. INSURANCE. The Developer shall furnish a Municipality's Protective Policy for the Municipality affording limits of not less than \$1,000,000 per occurrence for personal injury liability property with an aggregate of \$2,000,000 or those minimum limits as required by the Municipality, whichever is greater. In addition, the Developer shall provide Explosion Collapse & Underground Hazards (XCU) coverage against loss due to perils of explosion, collapse, and underground hazards. These limits are minimum values, and may be higher depending upon the Municipality.

a. In the policies to be issued, the named insured shall include the Municipality and the Municipal Engineer. The original policy shall be given to the Municipality with a certificate copy to be given to the Municipal Engineer. The policy shall also provide that it shall not be cancelled unless the Municipality and the Municipal Engineer has been given thirty (30) days advance written notice of cancellation.

b. The Developer shall not commence work, nor shall he allow any contractor or subcontractor to commence work, under this contract until the above insurance requirement has been compiled with and approved by the Municipality.

2. SAFETY. The Contractor shall comply with, and be responsible for knowledge of, all current, applicable requirements of all Federal and State of Michigan Occupational Health and Safety regulations during construction of the proposed development.

3. ORAL AGREEMENTS. No oral order, objection, claim or notice by any party shall affect or modify any of the requirements of the Municipality's Subdivision and Land Development Standards, Subdivision Regulations, or other related ordinances and regulations.

4. SUPERINTENDENCE. The Developer shall give his personal superintendence to the work, or have a competent foreman or superintendent, satisfactory to the Municipal Engineer and the Authority, on the work site at all times.

5. COMPLIANCE WITH LAW. The Developer shall give all notices required by, and comply with, all applicable laws, ordinances, and codes of the local, State and Federal Governments. All disconnections and demolition shall comply with all applicable ordinances and codes, including all written waivers. Before beginning the work, the Contractor shall examine the Drawings and Technical Specifications for compliance with applicable ordinances and codes, and shall immediately report any discrepancy to the Municipality. Should the Contractor fail to observe the foregoing provisions and do work at variance with any applicable ordinances or code including any written waivers (notwithstanding the fact that such methods are in compliance with the Technical Specifications), the Contractor shall correct the methods of doing such work without cost to the Municipality.

6. CONSTRUCTION OBSERVATION. The Municipality and its representative shall have access to observe the work wherever it is in preparation or progress at all times. The Developer shall provide proper facilities for access and for observation. Such observation shall not relieve the Developer from any obligation to furnish materials and perform the work strictly in accordance with these specifications. The Municipality shall have the right to reject materials and workmanship which are defective, or require their correction. Rejected workmanship shall be satisfactorily corrected, and rejected materials shall be removed from the premises without charge to the Municipality. Should it be considered necessary or advisable by the Municipality, at any time before final acceptance of the entire work, to make an examination of work already completed, by removing or tearing out same, the Developer shall, on request, promptly furnish all necessary facilities, labor, and materials. If the work is found to be defective in any material respect, due to fault of the Developer or his contractor(s), the Developer shall defray all the expenses of such examination and of satisfactory reconstruction. If, however, the work is found to meet the requirements of the Municipality, the actual cost of labor and material necessarily involved in the examination and replacement, plus 15 percent, shall be allowed the Developer. The Developer shall cooperate with the Municipality and furnish such assistance as may be required in order to facilitate inspection and for the purpose of laying out principal reference lines or points. Any work which, during its progress and before its final acceptance, becomes damaged from any cause, the work shall be removed and replaced by good satisfactory work at the Developer's expense.

7. PROTECTION OF WORK. The Contractor shall continuously maintain adequate protection of all his work from damage and shall protect the Municipality's and adjacent property from injury arising in connection with his construction, and shall be responsible for all damage and/or injury caused by or arising out of his operations.

8. USE OF JOB SITE. The Contractor shall confine his equipment, apparatus, the storage of materials and operations of his workmen to limits indicated by law, ordinances, permits or directions of the Municipality and shall not encumber the premises with his materials.

9. PLANS AND SPECIFICATIONS. The Contractor shall keep on the work site a copy of the drawings and specifications. The drawings shall be the stamped approved from the MDEQ Part 41 Permit. A copy of the approved permit shall be laminated for weather protection and posted at the job site in clear view.

10. HOURS OF WORK. The Contractor shall commence and end daily work as specifically authorized or directed by Municipal ordinances.

11. SHOP DRAWINGS. After checking and verifying all field measurements, the Developer will submit to the Municipal Engineer, for approval, five (5) copies (or at the Engineer's option, one reproducible copy) of all shop drawings, which shall have been checked and approved by the Developer. The Developer shall be responsible for their submission at the proper time so as to prevent delays and delivery of materials. A minimum of ten (10) work days shall be allowed for checking and processing shop drawings. The data shown on the shop drawings shall be complete with respect to the

dimensions, design criteria, materials of construction, and the like to enable the Municipal Engineer to review the information as required. All details shall show clearly the relations of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted for approval.

All submissions shall be referenced properly to indicate clearly the locations, service, and function of each particular item. At the time of each submission, the Developer will, in writing on such drawings, call the Municipal Engineer's attention to any deviation that the shop drawing may have from the requirements of the contract documents. The Municipal Engineer will check such shop drawings with reasonable promptness, but this checking and approval shall be only for conformance with the design concept of the project and for compliance with the information given in the contract documents. The approval of shop drawings shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory.

Approval of such drawings will not relieve the Developer of the responsibility for any error which may exist. The Developer shall be responsible for the dimensions and design of adequate connections and details, and satisfactory construction. The Developer will make any corrections required by the Municipal Engineer and return the required number of corrected copies of shop drawings. The approval of a separate item, as such, will not indicate approval of the assembly in which the item functions. No work requiring a shop drawing shall be proceeded with until the submission has been approved by the Municipal Engineer. The Municipal Engineer's approval of shop drawings shall not relieve the Developer from his responsibility for any deviation from the requirements of the contract documents, unless the Developer has, in writing on such drawings, called the Municipal Engineer's attention to such deviation at the time of submission and the Municipal Engineer has given written approval to the specific deviation, nor shall it relieve the Developer from errors or omissions in the shop drawings.

12. BOUNDARY MARKER REPLACEMENT. The Developer shall have replaced by a Professional Surveyor, the Developer's own expense, all section corners, property corners or boundary markers of any type or material that may be damaged or destroyed by his operation.

13. HOLD HARMLESS AGREEMENT. The Developer shall indemnify and save harmless the Municipality, its officers, agents and employees, and all Additional Named Insured, for and from all claims, demands, payments, suits, actions, recoveries, and judgments of every kind and description brought or recovered against any or all of them for or on account of any injuries to or debt of any person or any other loss or damage to persons or property by reason of the performance of the work of the project, and for any liability or obligation imposed directly or indirectly upon the Municipality or any of the additional named insured by reason of any law of the State of Michigan or of the United States now existing or which shall hereafter be enacted, imposing any liability or obligation or providing for compensation to any person or persons on account of or arising from the death or injuries to any municipal employee or employee of the Developer, or any of its agents, contractors or subcontractors. Nothing in this paragraph shall be construed to apply whenever the damages arising out of bodily injury to persons or damage to

property are caused by or result from sole negligence of any promise or indemnity hereunder, its agents or employees.

14. BONDS AND OTHER SURETY GUARANTEES. All bonds, surety guarantees, escrow accounts, etc., shall be in effect for a period of one year after final acceptance of all construction by the Municipality.

15. CONFINED SPACE ENTRY INTO SANITARY SEWERS. Entry into any portion of the system for any reason shall be made in accordance with the MIOSHA Safety Standards. The Contractor shall contact the Authority prior to any confined space entry and submit a copy of their confined space entry plan for approval by authorized Authority personnel. After entry has been granted the following will be documented and a copy provided to the Authority to be kept on file. The following shall be documented: 1.) Initial air quality testing results 2.) Date & time of entry and exit 3.) Any hazards encountered 4.) Exiting air quality testing results 5.) Name of Entrant and Foreman/Supervisor.

16. MISS DIG UTILITY STAKING. Any Miss Dig utility staking requests generated prior to the Municipal acceptance of systems shall be the responsibility of the Developer.

CHAPTER 5 TECHNICAL SPECIFICATIONS

Projects shall be constructed in accordance with the 2012 Standard Specifications for Construction, Michigan Department of Transportation, or latest version thereof and the following Special Provisions and Supplemental Specifications, as included herein.

INDEX

Special Controls.....	26
Traffic Control & Maintenance.....	26
Sanitary Sewers	27
Sewage Sewer Force Mains.....	39
Concrete Utility Manholes.....	45
Polymer Concrete Sanitary Manholes.....	47
Sub-grade Undercutting.....	50
Slope Restoration.....	52
Flow Meter.....	52

SPECIAL CONTROLS

a. Environmental Protection. It is the responsibility of the Contractor to take such measures as may be necessary and comply with all federal, state, and local laws and regulations for the protection of the public health, safety, welfare, and environment in the performance of the work. The cost of such compliance represents a cost of doing business to be borne by the Contractor.

The following are specific requirements with regard to environmental protection matters:

1. Control of Air Pollution

A. Dust Control: During the construction of any project, adequate dust control measures shall be maintained by the Contractor so as not to cause detriment to the safety, health, welfare, or comfort of any person or cause damage to any property, residence or business. If not shown as a pay item, dust control will be at the Contractor's expense.

B. Open Burning: At the site of land clearing operations, the burning of trees, logs, brush, or stumps may be allowed, subject to compliance with local ordinances or State regulations.

2. Control of Water Pollution and Siltation: Construction operations shall be conducted in such a manner as to prevent damaging sedimentation of watercourses, streams, lakes or wetlands and in accordance with the Part 91 of Act 451, P.A. 1994, as amended, Permit issued for the Project.

3. Control of Hazardous Materials: All hazardous materials, hazardous waste, toxic materials, or polluting materials shall be used, stored, and disposed of according to applicable federal, state, and local laws and regulations.

4. Noise Pollution: The Contractor shall exercise judgment in the conduct of operations which by nature result in excessive noise. All such operations shall take place during reasonable daylight period, which are defined as 7:00 a.m. through 6:00 p.m. unless otherwise stated in the governing municipal ordinance, or authorized by the Owner.

5. Construction Debris: All construction debris shall be removed from the construction site(s) at regular intervals and disposed of at sanitary landfill(s) licensed by the Michigan Department of Environmental Quality. At no time shall construction debris to be placed into the new sanitary sewer trench.

6. Housekeeping: The project work area shall be maintained in a neat and clean condition and all debris and waste materials shall be removed from work areas on a daily basis.

7. Hauling on Local Roads and Streets: The Contractor is advised that the hauling of construction materials over local roads and streets must be with the approval of the respective County and Municipal authorities having jurisdiction over the proposed hauling routes. All loads shall be within legal limits established by the local governing authorities. The Contractor is responsible for preventing the tracking of material onto local roads and streets. If any material is tracked onto local roads or streets, it shall be removed. It shall be the Contractor's responsibility to make arrangements with local authorities for hauling routes.

8. At no time will storm water be allowed to discharge through the existing sanitary sewer system.

TRAFFIC CONTROL AND MAINTENANCE

Traffic shall be maintained by the Contractor throughout the project in accordance with Section 103.05, 103.06, 811 and 812 of the standard specifications, including supplemental specifications, and as herein specified. The Contractor shall coordinate this work with other Contractors performing work within the Construction Influence Area or adjoining areas to avoid conflicts in the maintenance of traffic, construction signing and to provide for the orderly progress of contract work. The Contractor shall notify the Clinton County Road Commission or the City of DeWitt, and the Authority a minimum of 72 business hours prior to closing of any public roads.

The lane closures shall remain in place only as long as required to complete the operation necessitating the closure. The lane closure shall not remain in place overnight and the Contractor will restore lanes of traffic at the end of each day's work. Access to drive approaches within the construction influence area (C.I.A.) shall be maintained at all times. The costs associated with maintaining access to drive approaches shall be included with Construction Signing pay item. No work shall be performed or lane closures allowed during the Thanksgiving Day, Christmas Day, Memorial Day, July 4th, or Labor Day holiday periods, as defined by the Authority. Elevation changes as a result of construction operations shall be restored to a one-on three slope from the edge of roadway at the end of each working period.

All traffic control devices and their placement shall be in accordance with provisions in the Michigan Manual of Uniform Traffic Control Devices (MUTCD), 2009 edition as revised, including the revised edition of Part 6, and as specified in the plans.

SANITARY SEWER

a. Description. The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, and materials in connection with installation of sanitary sewers, service laterals, and appurtenant work.

b. General

1. Requirements: All work shall be carried on in a neat and satisfactory manner and interference with flow of traffic shall be kept to a minimum.
2. Specifications by reference: Whenever reference is made to specifications other than those contained within this document, said specifications shall apply and be binding as if fully repeated herein. If a specification publication date is not listed herein, it shall be taken to be the most recent published edition.
3. Material Lists: The Contractor shall submit detailed material lists to the engineer for approval of all materials furnished under this specification. The material list shall be detailed for each reach of sewer and shall include the type and class of pipe, type of joint, type of bedding and names and addresses of manufacturers of pipe, fittings and specials.

c. Materials. All materials shall be new. Manufacturers' recommendations for storage, handling, and installation shall be strictly adhered to.

1. Pipe and Joints: Materials shall be of the type as listed herein meeting the specifications noted. Unless specifically shown on the plans to be a specific material, the Contractor may elect to utilize any of the following materials subject to specifications and size limitations herein except that sewer pipe materials may be changed only at manholes.
2. 4 Inch Diameter through 18 Inch Diameter Pipe: Shall be extra strength PVC or ductile iron sewer pipe.
3. 21 Inch Diameter Pipe and Larger: Shall be Ductile iron pipe, PVC sewer pipe, Reinforced concrete sewer pipe, Glass-fiber-reinforced Polymer Pipe, or Polymer Concrete Pipe.
4. Bedding: Shall conform to MDOT Standard Specifications as applicable to sanitary sewers wherein pipe class and bedding requirements are given for various depths of cover.

5. Pipe:

A. Polyvinyl Chloride (PVC): (Main Line Sewers and Service Laterals to property Line) shall meet the requirements of ASTM D3034 or F679. Minimum pipe wall thickness shall be SDR-26 for 15 inches and smaller and PS46 for 18 inch through 27 inch. All pipes shall have a "home" mark. Joints shall be of the elastomeric gasket push-on type meeting all requirements of ASTM D3212.

B. Polyvinyl Chloride (PVC): (Service Laterals from Property Line to Structure) shall meet the requirements of ASTM D1785 or D3034. Pipe wall thickness shall be SDR 26, or SCH 40 for 8 inches and smaller. All pipes shall have a "home" mark. Joints for SDR 26 pipe shall be of the elastomeric gasket push-on type meeting all requirements of ASTM D3212. Small diameter pressure pipe from grinder pump services shall be SCH 80.

C. Vitrified Clay Pipe (VCP): (For repairs to existing pipe only). Shall be extra strength vitrified clay pipe meeting ASTM C-700 except as upgraded by the National Clay Pipe Institute specification NCPI-ER-4 for extra strength pipe. Pipe bells shall be clay, fiberglass (FIBURLOC) as manufactured by UNICON, PVC meeting ASTM D-1784, class 12454-B (NO BELL) as manufactured by CLOW, or approved equal. All joints shall meet the requirements of ASTM C-425.

D. Ductile Iron (D.I.): Shall meet the requirements of ANSI A 21.51. Pipe wall thickness class shall be Class 52 at the discretion of the Authority, pipe shall be provided with Polybond Lined, 40 mil thicknesses, ASTM D1248; or Polythane lined 40 mil thickness ASTMD16 or Protecto 401 interior coatings. Pipe joints shall be mechanical joints or push-on joints meeting ANSI A 21.11.

E. Reinforced Concrete Pipe (RCP): Shall meet the requirements of ASTM C76. Pipe class will vary with depth of cover and type of bedding and shall conform to MDOT Standard Plan IV-83H. Pipe joints shall meet the requirements of ASTM C-443 for rubber gasket joints. Pipe shall have an interior coating, Protecto 401 or equal approved by the Authority.

F. Glass-fiber-reinforced Polymer Pipe (GRP): Shall meet the requirements of ASTM D3262. Pipe class will vary with depth of cover and type of bedding. Pipe joints shall be fiberglass reinforced couplings utilizing elastomeric gasket seals. Gaskets shall meet the requirement of ASTM F477. Joints shall meet the performance requirements of ASTM D4161. GRP shall be as manufactured by HOBAS Pipe USA, Inc., Amitech USA (Flowtite), or approved equal.

G. Polymer Concrete Pipe (PCP): Shall meet the requirements of ASTM D6783. Pipe joints shall be fiberglass reinforced couplings utilizing elastomeric gasket seals. Gaskets shall meet the requirement of ASTM F477. Joints shall meet the performance requirements of ASTM D4161. PCP shall be as manufactured by Amitech USA, Ltd (Meyer Polycrrete).

6. Fittings: All piping connections and pipe size and/or direction changes shall be made with standard manufactured fittings conforming to the following:

A. Polyvinyl Chloride Fittings: (Main Line Sewers and Service Laterals to Property Line). Shall be full fittings meeting the requirements of ASTM 3034 for pipe wall thickness of SDR 26. Joints shall meet ASTM D3212. Service lateral connections shall be made with standard wye fittings. Tees or tee-wyes shall not be used. Saddles shall not be used. Wye fittings shall be Multi-Plane Reinforced (MPR) fittings as manufactured by Vassallo, or approved equal. Riser adapter fittings used on deep sewer vertical risers shall be as manufactured by Vassallo, or approved equal.

B. Polyvinyl Chloride Fittings: (Service Laterals from Property Line to Structure.) Shall be full fittings meeting the requirements of ASTM D3034 for pipe wall thickness of SDR 26 joints shall meet ASTM D3212. SCH 40 or SCH 80 PVC fittings conforming to ASTM D2466 or ASTM D2467 shall be used with SCH 40 pipe. SCH 40 fittings shall be solvent welded in conformance with ASTM D2564. Fittings for pressure pipe from grinder pump services shall be SCH 80 PVC. Purple primer conforming to ASTM F656 shall be used for all solvent welded joints.

C. Vitrified Clay Pipe Fittings: (For repairs to existing pipe only.) Service laterals connections shall be made with the use of a standard manufactured extra-strength tee fittings meeting ASTM C-700. Wyes shall not be used. Changes in service lateral line or grade shall be made with standard manufactured extra-strength fittings meeting ASTM C-700. Plugs shall be plastic suitable for air testing.

D. Ductile Iron Fittings: Shall be standard manufactured fittings of ductile iron or cast iron meeting the requirements of ANSI A 21.10 for mechanical joints and push-on joints. At the discretion of the Authority, fittings shall be provided with Polybond Lined, 40-mil thickness, ASTM D1248; or Polythane lined 40 mil thickness ASTM D16 or Protecto 401 interior coatings and shall have the standard exterior bituminous coating. Service lateral fittings shall be wyes with appropriate fitting or a tee rolled as required. Plugs shall be iron or plastic suitable for air testing.

E. Reinforced Concrete Pipe Fittings: Service lateral connections shall be made using standard manufactured components. Holes in the pipe barrel shall be cored. The connection shall be made utilizing a system of 300 series stainless steel bands and an elastomeric molded boot meeting ASTM C443. Epoxy coated aluminum bands may be used in lieu of stainless steel upon written approval of the engineer.

F. Glass-fiber-reinforced Polymer Pipe Fittings: All fittings shall be fabricated from pipe meeting the requirements for GRP. Ductile iron, stainless steel or fusion bonded epoxy coated steel fittings may also be used

G. Polymer Concrete Pipe Fittings: Service lateral connections shall be made using standard manufactured components. Holes in the pipe barrel shall be cored. The connection shall be made utilizing a system of 300 series stainless steel bands and an elastomeric molded boot meeting ASTM C443. Epoxy coated aluminum bands may be used in lieu of stainless steel upon written approval of the engineer.

7. Connections of Dissimilar Pipe Materials: Shall not be made using donuts, oversize gaskets, etc. Connections shall be made utilizing one of the following methods:

A. Standard Adapters: Shall be a manufacturer's standard adapter with joints conforming to the above specifications.

B. Couplings: Shall be an elastomeric coupling complete with 300 series stainless steel tension bands, all meeting the requirements of ASTM C425. Couplings shall be Clow Band- Seal Couplings, Fernco Flexible Couplings or equal.

8. Changes in Pipe Sizes: Shall be made only with the approval of the municipal engineer using standard smooth flow increasers or reducers.

9. Lubricants: All lubricants for the making of pipe joints shall strictly conform to the recommendations of the pipe manufacturer.

10. Polyethylene Encasement: Shall be provided for ductile iron pipe and shall meet the requirements of ANSI A 21.5.

11. Sanitary Sewer Manholes: Sanitary sewer manholes shall be precast concrete and shall conform to the applicable requirements of the Special Provision for CONCRETE UTILITY MANHOLES.

12. Chemical Grout: For sealing minor joint leaks shall be an EPA approved type and approved by the municipal engineer.

13. Marking: All pipe, fittings and appurtenant items furnished to the job site shall be marked in accordance with the applicable specification. Any unmarked materials are subject to rejection by the Authority or the Municipal Engineer.

14. Materials Certification and Testing:

A. Certification of Materials: When requested, the Contractor shall furnish certification that all materials meet the requirements set forth in the plans and specifications. Source of the certification shall be determined by the engineer.

B. Material Testing and Inspection: Shall be performed by an independent testing laboratory selected by the engineer. The engineer may select random pipe lengths for testing by the approved laboratory. Test procedures shall be the

applicable ASTM specification for the particular material tested. The Owner shall pay for all laboratory tests of material which comply with the specifications. Any material rejected by the engineer shall be removed immediately from the site of the work.

15. Bedding and Backfill Materials: Shall be as specified in by MDOT and outlined in MDOT Standard Plan R-83R (Series), Utility Trenches.

d. Installation

1. General: Handling, storage, installation, and the making of joints shall strictly follow the manufacturer's recommendations. Plastic and rubber materials affected by ultraviolet rays including all PVC products shall be protected from direct sunlight. Material handling during cold weather shall take into account increased brittleness of plastic materials. Pipe which is warped or bowed due to temperature variations such that the deviation from straightness is greater than one inch shall not be installed.

2. Grade and Alignment: All sewer pipes shall be installed utilizing an "in-line" laser for vertical and horizontal control from manhole to manhole structure. Vertical and horizontal alignment of the invert shall, at any point, be within plus or minus 0.04 feet (1/2 inch) of plan elevation and line. Record drawing grade shots of the manhole pipe inverts shall be surveyed and recorded upon completion of the pipe bedding and prior to the installation of the manhole cone section.

3. Cutting of Pipe: Full lengths of pipe shall be used whenever feasible. Multiple use of "previously cut" pipe sections to finish a sewer run in place of full lengths of pipe is prohibited. Cutting of pipe where required shall be done only using methods as recommended by the manufacturer, utilizing tools and equipment as required providing a neat, perpendicular cut without damage to the pipe or coatings. All burrs shall be removed. Spigot ends of cut pipe shall be beveled similar to factory beveling. If field cutting or coring of pipes exposes any bare metal surface, the surface shall be covered with an epoxy coating.

4. Laying of Sewer: Each pipe shall be inspected for possible defects before being placed in the trench. Joint surfaces shall be free of earth or frozen matter. All pipes shall be laid with bell ends upgrade to line and grade as called for on the plans and each pipe as laid shall be checked by the Contractor. Pipe shall be laid from the low end of sewer upgrade. The use of brick, lumps of clay, wood, etc., to bring the pipe to grade will not be permitted.

A. Joints: Shall be made in strict accordance with the manufacturer's recommendations utilizing the recommended lubricant. Wood blocks or other approved materials shall be used to protect the pipe and fitting ends from pry bars, chains, etc. with particular care taken with plastic materials. Pipes shall be pushed closed to the "home" position and if joints do not remain tightly closed, the pipes shall be replaced.

B. Final Line and Grade: After the pipe is laid, care in backfilling and other operations shall be taken so as not to disturb its line, grade, or joint. Misalignment shall be cause for rejection of the sewer.

5. Pipe Bedding and Backfill: Shall conform to MDOT Standard Plan R-83(Series), Utility Trenches. Ductile iron pipe, bedded in an area of aggressive soil such as peat, shall be encased in a polyethylene encasement.

6. Connections to Live Sewers: When connections are made with sewers carrying sewage or water, special care must be taken that no part of the work is built underwater; a flume or dam must be installed; pumping maintained, if necessary; the new work kept dry until completed; and any concrete or mortar has set. All connections made with existing sewers shall be made at existing manholes or newly constructed manholes. All connections shall be bulk headed until they have met the approval of the municipal engineer. Any damages or expenses incurred with the connections to existing sanitary sewer systems shall be paid for by the Developer.

7. Service Laterals: The location of the service laterals shall be field determined by the Contractor, based upon the approved plans. Each lateral shall be marked with a stake at the property line. Wyes shall be encased in crushed limestone. The Contractor shall install a lateral fitting opposite the stake and construct the 6 inch service lateral to a point fifteen (15) feet inside the property line. The Contractor shall cap, block, and mark the end of the service lateral. The blocking of the service lateral cap shall be sufficient to withstand all tests. For existing homes to be served by new sanitary sewer, the Design Engineer and the Contractor shall contact the homeowner to determine the proper placement of the lateral stub. Instructions given by the homeowner shall be documented in writing and copied to the homeowner, the Municipal Engineer, and the Authority.

A. Marking: The Contractor shall mark the end of the service lateral with a 2 x 4 of sufficient length to extend from the service lateral to 3 inches below final grade. A locating magnet shall be buried 24 inches deep next to the 2 x 4 marker for every sanitary sewer lateral. At the option of the Developer or Contractor, the 2 x 4 markers may be extended above final grade, provided the above procedures were followed.

B. Record of Locations: The Contractor shall record and submit to the Owner and the engineer a location sketch of the service lateral fitting measured upstream from the nearest manhole and shall record the location of the service lateral at the features, witnessed to two permanent features/structure. Any services not readily located within one year after date of final payment due to inaccurate as-built measurements shall be field located by the Contractor. Only lead sheets as provided by the AUTHORITY will be permitted for submission.

C. Risers: Where sanitary sewers are constructed deeper than 15 feet, service risers shall be constructed as shown in the standard detail. PVC wyes shall be encased in crushed limestone or crushed clean concrete (without reinforcing

steel), no larger than one-inch in size. Risers shall be constructed such that the service lateral is between 9 & 11 feet deep at the property line. When main sanitary sewers are less than 15 feet deep, no riser is required and the lateral shall be constructed at a slope such that the service lead is between 9 & 11 feet deep at the property line, if feasible. Deep sanitary sewers shall follow the detailed drawings as shown in the Appendix A. The design engineer is responsible to verify that all service leads are at the correct elevations for all serviceable lots. The 6 inch service laterals shall be constructed at a minimum slope of 1.00%. Lateral fittings shall be installed with the branch connection tilted 45 degrees up. Risers will be shown on lead sheets.

D. Service Lateral Inspection: All service lateral pipes shall be left with at least the top of the pipe exposed until inspected by the Owner or his representative and any authorization for backfill maybe given. All service lateral connections up to 5 feet of a building will be inspected by the municipal inspector prior to any backfilling.

8. Removal of Unsuitable Material: Whenever any pipe section, fitting, or appurtenance is found to be unsuitable for installation due to specification non-conformance, poor workmanship, damage, or any other reason, it shall be removed from the construction site during that working day by the Contractor. Any material not so removed shall be painted or otherwise marked by the engineer to prevent its subsequent use.

9. Restoration and Clean-up: Shall conform to the Slope Restoration Special Provision of the specifications.

10. Abandonment of Public Sewer: In the event a public sanitary sewer must be abandoned, for example, due to condemnation, catastrophe or otherwise, and in the event said abandonment is otherwise permitted by law, the Owner(s) of the premises previously served thereby shall cause the construction of a 4 foot inside diameter manhole at location to be selected by the Municipal Engineer. The construction specifications relating to said manhole shall be equal to those required of such structures on the existing system and shall be inspected and approved by the Authority. Abandoned sewer segments shall be filled completely with flowable fill. All costs of said construction shall be borne by the Owner(s) of the premises previously served by said sewer.

11. Inspection of Main Sewer Prior to Backfill: Main line sewer bedding and cover shall be inspected prior to backfilling of the trench as is practical.

12. Cap-off Sewer Leads: As directed by the Authority or the Municipal Engineer.

e. Sanitary Sewer Testing.

In general, all sanitary sewers and all building connections shall be tested by applying an air pressure test described in the following paragraphs. The Contractor shall be responsible for furnishing all equipment and labor for the air

testing. The Municipal Engineer may, as an alternative to or in addition to air testing, require an infiltration test of the sanitary sewers in certain instances.

1. Air Testing: The following described air test is required to be performed on all sanitary sewers.

A. General: The following described test procedure shall be used to determine the adequacy of the pipe joint to hold water and to check for structural defects (such as bell cracks, broken pipe) after completion of backfilling operations. Final air testing shall not be performed until all storm sewer and water main utilities are constructed.

B. Equipment Required: Portable air compressor, standard air hose and connections, minimum of 50 feet of single and triple air hose, 1 single and 1 triple connection pneumatic sewer plug, 1 hand air pump, stopwatch, and 1 air gauge, range 0-30 psi graduated in 1/10's from 0 to 10 psi. All test gages shall be mounted above ground in a suitable test stand.

C. Preliminary Requirements: After all sewer, lateral, and manhole construction and backfilling operations have been completed, the sewer shall be cleaned by the Contractor as follows:

(1) Cleaning: The new sewer shall be cleaned prior to air testing. The Contractor shall clean the sewer by jet rodding and vactoring the debris.

(2) Preliminary Test: Before actual line testing starts, the pneumatic plugs shall pass the following qualifying test in the presence of the engineer and Contractor. One (1) length of sewer pipe shall be laid on the ground and sealed at both ends with the pneumatic plugs to be checked; air shall be introduced into the pipe until the pipe pressure reaches 15 psi. The pneumatic plugs being checked shall hold against this pressure without bracing being needed, and without movement of the plugs out of the pipe. All pneumatic plugs shall pass the aforementioned qualifications before being used to the actual installation.

(3) Sealing: All tees and lateral stubs shall be suitably capped, sealed and blocked to withstand the internal test pressures. The Municipal Engineer shall determine if additional test pressure is required over the standard 3 psi due to the presence of groundwater.

D. Test Procedures: Immediately following the pipe cleaning described, low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4.0 psi greater than the average back pressure of any groundwater pressure that may be over the pipe. At least two (2) minutes shall be allowed for the air pressure to stabilize. Adequate prior notification shall be given the engineer before running the air test procedure.

(1) Acceptance: The portion of the line being tested shall be accepted if the portion under the test meets or exceeds the requirements of UNI-BELL Specifications. This requirement shall be accomplished by performing the test as

follows: The time required in minutes for the pressure to decrease from 3.5 to 2.5 psi (greater than the average back pressure of any groundwater than may be over the pipe) shall not be less than the time shown for the given diameters in the table following this paragraph. If the system does not meet the foregoing requirements, the Contractor will be required to locate and repair the leaks and repeat the tests until the allowable leakage is obtained.

AIR TEST TABLE

NOTE: If the section of line to be tested includes more than 1 pipe size (i.e... lateral connections), calculate the test time for each size and add the test times to arrive at the total test time for the section.

UNI-BELL SPECIFICATIONS MINIMUM TEST TIME FOR VARIOUS PIPE SIZES

PIPE SIZE TIME-PER (INCHES)	100' MIN.SEC.	200' MIN.SEC.	300' MIN.SEC.	400' MIN.SEC.
4	3:46*	3:46	3:46	3:46
6	5:40*	5:40	5:40	5:00
8	7:34*	7:34	7:36	10:00
10	9:26*	9:26	11:52	15:00
12	11:20*	11:24	17:05	22:00
15	14: 10*	17:48	26:42	35:36
18	17: 00*	25:38	38:27	51:00

* denotes minimum test time for low air pressure requirements

E. Test Acceptance: The method of testing and measurement shall be approved by the Municipal Engineer.

2. Manhole Test: Vacuum manhole tests shall be used as the preferred test method as approved by the municipal engineer. This type test typically takes about an hour to perform by pulling a vacuum to 10-inches of mercury and holding to no less than 9-inches of mercury.

An exfiltration test may be performed as an alternate method, if conditions warrant such method. All pipes for this method shall be plugged and the manhole filled with water to the bottom of the casting. After a stabilization period, the fall of water will be measured to determine the exfiltration rate. The maximum allowable exfiltration shall not exceed 0.5 gallons per foot of depth per foot of diameter per 24 hour day. All materials, labor, and water shall be furnished by the Contractor. One or both test methods, as determined by the municipal engineer, shall be performed by the contractor at each manhole if conditions dictate.

3. PVC/GRP Deflection Tests: The completed installation of PVC or GRP sewers shall at no point have out-of-round pipe deflections greater than 5.0%. Deflectometer or go no-go gauging tests shall be performed prior to acceptance

on all PVC and GRP sewers. The test shall be conducted after the final backfill has been in place at least 30 days.

4. Post Construction Infiltration: Following complete construction and prior to connection of services to the sewer, the engineer shall have the option of requiring retesting of any section of sewer where excessive infiltration is observed or suspected. Any of the above tests may be utilized per the engineer's requirements.

5. Cleaning Pipe and Fittings: All lumps, blisters, and excess coal tar, or other material shall be removed from the bell and spigot end of each pipe and fitting. The outside of the spigot and the inside of the bell shall be brushed and wiped clean, dry, and free from oil or grease prior to laying. The inside of the pipe shall be brushed in order to remove all dirt and debris. Any damage to exterior pipe coating shall be repaired with an approved coating before the pipe is laid.

6. TV Inspection: A Closed Circuit Television (CCTV) inspection of all newly constructed sanitary sewer shall be completed a minimum of 30 days after completion of all backfill. This will be used for signs of structural damage, joint leaks, lead verifications or infiltration before final acceptance. Authority shall be contacted for any additional specific requirements prior to televising. In general, televising shall be in accordance with National Association of Sewer Service Companies (NASSCO) requirements. All televising shall be completed in an upstream direction using the correct SCCMUA manhole numbers for identification. All laterals shall be televised using a pan and tilt camera to verify any defects. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. All television inspection shall be recorded in digital format and provided on DVD or an alternate format accepted by the Authority. The recording must contain a continuous record of each sewer section, from manhole to manhole and include both video and audio inspection comments. All items noted in the inspections shall be documented utilizing the Pipeline Assessment and Certification Program (PACP) developed by NASSCO and based on the Water Research Center System (WRc) to standardize the coding of pipe defects in wastewater collections systems. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to document any defects, service connections, or other points of interest noted during the inspection. In no case shall the television camera be moved at a speed greater than 30 feet per minute. If the camera encounters a dip in the sewer such that water is standing above the spring line of the sewer pipe, and if the camera lens becomes submerged because of this condition, the camera rig shall be withdrawn from the sewer and inserted from the other end as far as possible. The camera shall be adjusted to a height such that it is above the level of the flow. Two copies of a complete bound report of the television inspection shall be provided. The report shall include written logs of each section of sewer televised, giving specific details as to service connections and any defects, or other points of interest noted during the inspection. All media recordings shall be

labeled to describe the reaches of sewer contained in the files, including street location and manhole numbers.

7. Correction of Defective Work: In the event that any of the above tests or inspections indicates defective material or installation, the Contractor shall repair and retest the section to the satisfaction of the Municipal Engineer. The use of chemical grouts shall be limited to the repair of minor joint leaks and shall not be used without the specific written approval of the engineer. Any pipe or fitting having structural damage shall be removed and replaced. Any PVC sewer with deflection in excess of the 5.0% limitation shall be re-excavated, inspected for structural damage, and then re-bedded, backfilled, and retested. The corrective work shall be done immediately after the defective work is discovered.

f. Project Acceptance

1. Acceptance of the sanitary sewer system is contingent upon but not limited to satisfactory completion of all work including pressure tests, infiltration/exfiltration tests, deflection tests, materials tests, CCTV inspections, service lead records, and Record Drawings. A review of the grade and alignment will be completed by the Municipal Engineer and the Authority based on the Record Drawings. Sewer grades and the drops between manhole inlets and outlets will be checked against the design grades and elevations. At the discretion of the Municipal Engineer and the Authority, pipe inverts may be independently surveyed for accuracy and billed back to the Developer. A tolerance for measurement of 0.04 vertical feet will be applied for each stretch of sewer between manholes. For sewer grades that are not within the design minimum grades, but are within ten percent of the minimums established in Chapter 3 of the Municipal Standards, the sewer may either be replaced or subject to a long term maintenance fee established by the Municipality. Grades that are outside of a ten percent difference are not acceptable and the sewer shall be replaced. For pipes with design flows requiring grades greater than the Municipal Standards, the ten percent difference will be applied to the minimum grade in the basis of design. The drops though manholes between inlet and outlet pipes shall also be checked. Manhole drops that are less than 50% of the minimum requirements and do not contain back fall may either be corrected or subject to a long term maintenance fee established by the Municipality. Manholes with back fall (opposite to the flow direction) are not acceptable and shall be replaced.

2. Maintenance Fees may be assessed the Developer when newly constructed sewer pipes and manholes not meeting minimum specifications would create extra maintenance for the owner. The Developer may have the option of reconstruction and/or replacement of structures not meeting specifications, or payment of the Maintenance Fee as determined by SCCMUA and written policy.

SANITARY SEWER FORCE MAINS

a. Scope. The work covered by this section of the specifications consist in furnishing all plant, labor, equipment, and materials in connection with installation of sewage force mains and appurtenant work.

b. General. All items herein specified shall be adjusted to be compatible with the standard units used by the Owner in his present system. The items shall be of a quality level specified herein, and may be modified as called for herein or on the plans.

1. Requirements: All work shall be carried on in a neat and satisfactory manner and interference with flow of traffic shall be kept to a minimum.

2. Specification by Reference: Whenever reference is made to specifications other than those contained within this document, said specifications shall apply and be binding as if fully repeated herein. If a specification publication date is not listed herein, it shall be taken to be the most recent published edition.

c. Material Approvals. The Contractor shall submit detailed material details and specifications to the Municipal Engineer for approval of all materials furnished under this specification. The materials shall include the type and class of pipe, type of joint, and type of bedding. Manufacturer's bulletins and records of performance shall be included.

d. Materials - Shall conform to the following requirements:

1. Pipes And Joints: Shall be of the type as listed herein meeting the specifications noted. Unless specifically shown on the plans to be a specific material, the Contractor may elect to utilize any of the following materials subject to specifications and size limitations herein specified. Unless specifically approved by the engineer, a single material shall be used for the total of each size main in the contract.

A. 4 Inch Diameter Through 12 Inch Diameter Pipe - Shall be HDPE, or ductile iron pipe.

B. Larger Than 12 Inch Diameter Pipe - Shall be ductile iron pipe or polyethylene pipe.

C. Ductile Iron Pipe shall be provided with a lining, Protecto 401 or equal, approved by the Municipal Engineer.

D. Bedding - Shall conform to MDOT Standard Plan R-83(Series), Utility Trenches.

E. Pipe - All pipe delivered to the job site shall bear the marks required by the AWWA specification.

(1) High Density Polyethylene (HDPE) Pipe and Fittings - Shall be manufactured from a high density, high molecular weight polyethylene base resin conforming to ASTM D1248 Type III, Class C, Category 5, Grade P34.

(a) Minimum Cell Classification Values - As referenced to ASTM D-3350 shall be 355434C with a minimum pipe wall thickness of SDR 11.0, rated at not less than 150 psi.

(b) Joints - Shall be made by thermal butt-fusion in accordance with ASTM D-2657.

(c) Joint and Equipment Testing - Prior to the installation of the pipe, a specimen of a butt-fusion pipe joint, made with the joining equipment to be used on the project, shall be submitted to an independent testing laboratory selected by the engineer and tested in accordance with ASTM D-638.

(2) Ductile Iron (D.I.) - Shall meet the requirements of ANSI A21.51 (AWWA C151). Unless otherwise noted on the plans, pipe wall thickness shall be a minimum of Class 52. Pipe shall have the polyethylene encasement and interior lining, subject to paragraph 1.c above.

(a) Flanged Joints - Shall conform to ASA Class 125.

(b) Mechanical Joints and Push-On Joints - Shall conform to ANSI A21.11 (AWWA C111). Bolts and nuts shall be of high strength corrosion resistant alloy with hex head nuts.

(c) Fittings and Specials - Shall conform to ANSI/AWWA C110, and may be either ductile or cast iron. Pipe shall be either Polybond Lined, 40 mil thickness, ASTM D1248; or Polythane lined, 40 mil thickness ASTM D16 or equal.

(3) Suitable Locating Magnets - Shall be shall be placed on top of all force mains at 25 foot intervals. In the case of directional drilling installation, locating magnets shall be placed a minimum of 24 inches deep directly above the pipe at 25 foot intervals.

2. Valves

A. Plug Valves - Shall be of the non-lubricated, eccentric seating type with bolted bonnet construction providing port areas of at least eighty (80) percent of the nominal pipe size area. Plug valves shall be DeZurik conforming to the following specifications:

(1) Valve Body and Bonnet Construction: Shall be ASTM A126, Class B cast iron. Valve body and connections shall conform to the following.

(a) Flanged: Shall conform to ANSI B16.1 Class 125 specification.

(b) Mechanical and Push-On Joint: Shall conform to ANSI/AWWA C111/A21.11 specification.

(2) Valve Plugs: Shall be ASTM A126, class B cast iron and shall have a cylindrical seating surface which is eccentrically offset from the centerline of the plug shaft. The interference between the plug face and the body seat, with the plug in the closed position, shall be externally adjustable in the field with the

valve in line and under pressure. The plugs shall have a resilient facing comprised of Neoprene or hycar bonded to the plug to provide a drip-tight shutoff up to the valve pressure rating in either direction.

(3) Valve Seats: Shall be 1/8 inch thick raised weld-in overlay, constructed of ninety (90) percent nickel and shall be provided on all body seat surfaces in contact with the plug face.

(4) Body and Bonnet Bearings: Shall be of the replaceable sleeve type metal bearings of sintered, oil impregnated permanently lubricated type 316 ASTM A743 Grade CF-8M stainless steel.

(5) Valve Shaft Seals: A repackable stuffing box type shaft seal shall be provided. The stuffing box shall have sufficient depth to accept at least four (4) rings of V-shaped Buna packing. The packing follower shall be an adjustable bolted gland.

(6) Operators: Shall be manual with square nut.

B. Valve Boxes - Shall be cast iron, screw type, two or three piece (as noted in SD Section), consisting of the base and the top section. The length shall be adjusted by means of threads cast into the top and base sections. A cover shall be furnished. The base shall be 5 1/4 inch and have a range of extension of 51-82 inches.

C. Air Release Valves - Shall be designed to operate under pressure and open to vent entrapped air and gases from the sewage force main. After entrapped air and gases are vented, the valve shall close to prevent clogging of the valve mechanism. The body and cover shall be stainless steel or plastic with all internal parts of stainless steel or other acceptable material to prevent corrosion. The valve shall be complete with accessories necessary for installation including an inlet shut off valve, 1 inch clean out valve, and a 1/2 inch shut off valve for back flushing with quick disconnect couplings and back flushing hose. The inlet shall be 2 inches unless otherwise noted on the plans. Valves shall be rated for not less than 150 psi working pressure and shall be APCO, Val-Matic Corp., or equal, specifically designed for use on sewage force mains.

e. Installation

1. Grade and Alignment: All force mains shall be installed to provide an overall cover of 5 feet, unless otherwise indicated on the drawings. The location of the force main is indicated on the drawings. Special care shall be taken to avoid any air pockets within the force main.

2. Laying of Mains: Proper and suitable tools and appliances shall be used for the safe and careful handling, conveying, and laying of the pipe. Care shall be taken to prevent the coating of pipe from being damaged. Dropping material directly from a truck or platform will not be permitted. All pipes and castings

shall be carefully examined and tested for defects. If any materials are found to be defective, they shall be removed from the site.

3. Laying Pipe: Pipe shall be laid with the bell ends facing the direction of laying, unless otherwise directed by the engineer. Under no circumstances shall pipe be dropped directly into the trench. Precautions shall be taken to prevent foreign material from entering the pipe while it is being placed. After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home to correct line and grade. At all times, the open ends of the pipe shall be covered to prevent foreign matter from entering. If cuts of full lengths of pipe are required, the cut end shall be trimmed, beveled or otherwise prepared for jointing as recommended by the pipe manufacturer. Only lubricants recommended by the pipe manufacturer shall be used as recommended in joint assembly. After each joint is set brass wedges will be inserted per municipal engineer's recommendations.

4. Wet Trench Laying: Shall conform to current OSHA/MIOSHA standards. When the trench contains water, the open ends of pipe shall be closed by a watertight plug. This provision shall apply during the noon hour as well as overnight. If water is in the trench, the seal shall remain in place until the trench is pumped completely dry.

5. Pipe Bedding and Backfill: Shall be in accordance with MDOT Standard Plan R-83 (Series), Utility Trenches. Ductile iron pipe bedded in an area of aggressive soil such as peat shall be encased in a polyethylene encasement.

6. Pipe Deflection: Where curved lines, laid without fittings, are shown on the plans, or are necessary to avoid obstructions, the pipe may be deflected horizontally or vertically at each joint within the published recommended limits recommended by the pipe manufacturer. Deflections in excess of the allowable deflection shall be made by using standard fittings.

7. Joint Restraint: Where water to air pressure exerts a disjoining force, at all pipe deflections over 20 degrees, and all tees and dead ends, joints shall be restrained, tied or harnessed in a manner approved by the Municipal Engineer. The restraint shall be applied to joints in each direction from the deflection an adequate distance to resist the axial thrust of the test pressure as shown in Table 1: Pipe Restraint Schedule. Details of the proposed joint restraint, showing the type and location, shall be submitted to Municipal Engineer for approval. All pipe and fitting restrained joints shall be rated for a minimum of 250 psi.

TABLE 1: PIPE RESTRAINT SCHEDULE
GROUND BURIED PRESSURE PIPE DUCTILE IRON PIPE

Based upon: Internal Pressure: 180 psi
Pipe Depth: 5'
Bedding Class: Type 4
Soil Type: Good Sand
Safety Factor: 2

For pipe diameter not listed, use next largest pipe diameter.
For pressure other than 180 psi, increase or decrease values proportionally.
For a tee, length of pipe restraint is for the branch/stem direction.

1) Retainer Glands: Mechanical joint pipe shall be restrained with EBAA Iron "Mega Lug Series" retainers. Megalugs or Uni-Flange Block Buster 1400 retainers may also be used to restrain joints for unanticipated deflection points, or where connections require a mechanical joint. No other manufacturers or types of mechanical joint-retaining glands will be accepted. Push-on joint pipe shall be restrained with American Lok-Ring, Flexring or Fast-Grip Gaskets, U.S. Pipe TR Flex, Field Lok Gasket, or equal.

2) Thrust Blocks: Shall not be permitted.

8. Air Release and Clean-out Structures: The Contractor shall install air release and clean-out structures as indicated on the drawings. Structures shall be in accordance with the special provision CONCRETE UTILITY MANHOLES.

9. Restoration and Clean-up: Shall be in accordance with the Slope Restoration Special Provisions.

f. Pressure and Leakage Testing. The Contractor shall furnish all apparatus and

Pipe Diameter	Length (Ft) of Pipe Restraint for Each Direction from Fitting						
	Tee, 90° Bend	45° Bend	22-1/2° Bend	11-1/4° Bend	Dead End	Reducer (One Size Reduction)	Reducer (Two Size Reduction)
4"	11	5	2	1	28	--	--
6"	16	7	3	2	41	21	--
8"	21	9	4	2	52	21	49
12"	30	12	6	3	75	40	81
16"	38	16	8	4	97	41	96
20"	46	19	9	5	118	42	94
24"	54	22	11	5	139	42	92
30"	65	27	13	6	169	59	117
36"	75	31	15	7	197	59	132

water required to perform the pressure and leakage tests, and shall outline this equipment to the engineer for his approval prior to any testing.

1. Pre-test Procedures: The Contractor shall provide any temporary plugs and blockings as required for the test, and then completely fill the line with water with a special emphasis upon removing all air from the pipe.
2. Preliminary Test: Lines shall be given a preliminary pressure test by the Contractor to ascertain if there are any major leaks. After any leaks are corrected, the test shall be rerun until results are satisfactory.
3. Final Pressure Test: Shall be made in the presence of the engineer, who shall receive 24 hours notice prior to testing. The test pressure shall be at least 150 psi measured at the lowest point in the line. If it is necessary for the engineer to observe more than one test, the Contractor will be liable for the additional cost involved. Pressure shall not drop more than 5 psi in a period of 2 hours.
4. Leakage Test: Shall be conducted immediately following the pressure test. In no case shall the leakage exceed the following gallons of water in a 2 hour period:

Pipe Diameter.....	4"	6"	8"	10"	12"	14"	16"
Allowable leakage:							
per 100 L.F. (HDPE).....	0.25	0.60	1.0	1.3	2.5	2.8	3.3
(Ductile Iron).....	0.09	0.14	0.18	0.22	0.27	0.31	0.36
5. General: The Contractor shall provide all labor and materials, etc. as required to repair any leaks, or otherwise required to meet these tests. All visible leaks shall be repaired, regardless of the amount of leakage. Any excavation or construction required shall be done as previously required herein.
 - A. Water - For filling and testing will be supplied by the Contractor.

CONCRETE UTILITY MANHOLES

a. Scope - The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, and materials in connection with concrete utility manholes.

b. General

1. Requirements: All concrete utility manholes, including valve vaults, shall be installed in accordance with the details indicated on the drawings and these specifications.
2. Specifications by Reference: Whenever reference is made to specifications other than those contained within this document, said specifications shall apply and be binding as if fully repeated herein. If a specification publication date is not listed herein, it shall be taken to be the most recent published edition.
2. Material Lists: The Contractor shall submit detailed material lists to the Municipal Engineer for approval of all materials furnished under this specification.

c. Materials

1. Precast Sections:

A. Integral Base - Manholes shall consist of integral cast base and riser sections conforming to ASTM C478.

B. Pipe Connections- Manhole pipe connections shall be furnished with an integrally cast seal system, equal to "Press Wedge 11", "Kor-N-Seal" or "Lock Joint Flexible Manhole Sleeve", or equal. Pipes shall generally be flush with the interior manhole wall, but protruding no more than 2 inches.

C. Manhole section joints shall be of the O-ring rubber joint type. All pipe openings shall be cast in the precast section or cored in the finished wall. Broken and patched connections will not be accepted.

2. Manhole Adjusting Rings: All adjustments to manholes shall be made using either LADTech HDPE Adjusting Rings or UGT Adjusting Rings with Veil Wrap. Both of these products come with contoured rings to meet varying road grades. Grade rings shall be provided with a minimum of adjustment of 2 inches and a maximum of 12 inches. For all new projects, the manhole castings will be set at the road base surface, with the final adjustment to be made at the time of construction of the final course of bituminous surfacing. This is to conform to Clinton County Road Commission and/or the City of DeWitt Standards.

3. Exterior Joint Sealer: All joints between precast manhole sections shall be sealed with Cretex Wrap, Infi-Shield Seal Wrap, Wrapid Seal, or approved equal.

4. Exterior Chimney Seal: The exterior of the casting adjustment shall be sealed with Infi-Shield Uniband, Wrapid Seal, or approved equal. The seal shall extend from the precast cone section to the casting.

5. Manhole Steps: Shall not be supplied.

6. Cast Iron Frames And Covers: Shall conform to the castings noted on the plans or in the specifications. Standard Cover lettering shall be included.

7. Mortar and Grout: The mortar and grout shall be hydrogen sulfide resistant.

8. Concrete: Concrete shall meet the requirements of the Standard Specifications.

9. Flow Channel Concrete: Concrete for poured manhole flow channels shall be designed to resist hydrogen sulfide related corrosion and shall contain Type I Portland Cement (ASTM 150) supplemented with Fly Ash, Type F (ASTM C618). Limit the percentage, by weight, of Fly Ash to 25%. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement. The concrete shall have a minimum compressive strength of 3,000 psi and a

maximum water-cement ratio of 0.45. Alternate mix designs shall be approved by the Municipal Engineer.

d. Installation. Utility manholes shall be constructed of precast concrete sections including risers, grade rings, and precast tops of eccentric cone, or flat slab type, as indicated below.

1. Utility Manhole: Precast integral bases shall be set on uniform bedding of 8 inches of compacted sand or existing granular material as approved by the Authority. When water is encountered in the trench, bases shall be set on a minimum of 12 inches of crushed stone that meets the grading requirements of MDOT 6A.

2. Precast Concrete Risers: Shall be set plumb. Joints between manhole sections shall utilize rubber O-rings. Top sections shall be eccentric unless otherwise indicated on the drawings. External joint seals shall be installed on all joints.

3. Castings: Shall be installed as specified below:

A. Sanitary Sewer Manholes and Valve Vaults - Castings shall be set on HDPE adjustment rings with a minimum of adjustment of 2 inches and a maximum of 12 inches. Casting and HDPE rings shall be set with epoxy unless O-ring and bolts are called for on the drawings. Bolting and O-ring details shall be shown on the drawing's details.

B. Casting Elevations - Where castings are to be flush with permanent pavements, the Contractor shall adjust the frame to the proper grade. Where castings are on flat slab tops in non-paved areas, they shall extend approximately 1 inch above finish earth grade unless shown otherwise.

C. Inside Finish - The inside surface shall be flush to give a smooth surface. No additional finish is required for polyethylene grade rings.

4. Drop Pipes: Shall be constructed at sanitary manholes wherever the difference in elevation between any inlet and outlet sewer is more than 2 vertical feet or as noted in the plans. All external drop pipes shall be encased in concrete (external for connecting to existing manholes only) and shall conform to the drawing details as approved by SCCMUA. Inside drops will be constructed on new manholes containing drop pipes. Construction shall be in accordance with the attached details. A drop pipe shall be constructed for all sewers entering a manhole at a height of 24-inches or greater above the proposed manhole invert.

5. Flow Channels: Shall be constructed in manhole bottoms with mechanically mixed concrete. Precast flow channels shall not be used. Prior to placement of concrete, a bonding compound, Sealtight INTRALOK, Sika SIKABOND, ACRYL 60, or equal, herein shall be applied per manufacturers' recommendations to the manhole base. Flow channel depth shall not exceed 1/2 the pipe diameter and

concrete thickness shall be a minimum of 4 inches measured from the top of the base to the bottom of the flow channel. A minimum 0.1 foot drop between inlet and outlet pipe invert elevations shall be provided. Manhole structures with horizontal alignment deflections (from straight through) of greater than 45 degrees but less than 90 degrees shall include a 0.2 foot drop between inlet and outlet. For interior drops of 2-feet or less, a Beaver Slide shall be installed. For changes in pipe diameters, additional drop through the manhole is required based on matching at 0.8 times the diameter of the inlet and outlet pipes. Where the grade of sewer is continuous through the manhole, the Contractor may lay the pipe through the manhole, fill around the pipe with concrete, and carefully cut out the top of the sewer pipe.

e. Testing. Sanitary sewer manholes shall be tested in accordance with MANHOLE EXFILTRATION TEST of the Sanitary Sewer Special Provision. A vacuum test will be allowed when expressly permitted by the Municipal Engineer. Any manhole failing this test shall be repaired and retested by the Contractor to the satisfaction of the Municipal Engineer.

POLYMER CONCRETE SANITARY MANHOLES

a. Description. The work of Polymer Concrete Sanitary Manholes shall consist of furnishing all plant, labor, equipment, and materials in connection with installation of polymer concrete manholes. Manufactured in accordance with ASTM D 6783 (latest edition).

b. References.

1. ASTM D 6783 Standard specification for polymer concrete pipe
2. ASTM F 477 Specification for elastomeric seals (gaskets) for joining plastic pipe
3. ASTM C 579 Standard test method for compressive strength of chemical resistant mortars, grouts, monolithic surfacing and polymer concretes
4. ASTM C 33 Standard specification for concrete aggregates

c. Materials

1. Resin: The manufacturer shall use only polyester resin systems designed for use with this particular application.
2. Filler: All aggregate, sand and quartz powder shall meet the requirements of ASTM C 33, where applicable.
3. Additives: Resin additives, such as curing agents, pigments, dyes, fillers and thixotropic agents, when used, shall not be detrimental to the manhole.

4. Elastomeric Gaskets: Gaskets shall be suitable for the service intended. All gaskets shall meet the requirement of ASTM F 477.

5. Manufacturing and Product Construction

A. Manholes: Manhole components shall be manufactured by the vibratory vertical casting process resulting in a dense, non-porous, corrosion-resistant, homogeneous, composite structure.

B. Joints: The manhole components shall be connected with a compatible epoxy bonding agent or an elastomeric sealing gasket as the sole means to maintain joint water tightness. Joints at pipe tie-ins may use flexible elastomeric couplings, fiberglass over lay or a compatible epoxy material for bonding manhole components directly to the adjoining pipe. Epoxy bonding shall require a flexible pipe joint within one pipe diameter from the manhole's external wall. Epoxy bonding material shall be approved by the manhole manufacturer.

C. Exterior Joint Sealer – All field joints between manhole sections shall be sealed with Cretex Wrap, Infi-Shield Seal Wrap, Wrapid Seal, or approved equal.

D. Exterior Chimney Seal – The exterior of the casting adjustment shall be sealed with Infi-Shield Uniband, Wrapid Seal, or approved equal. The seal shall extend from the precast cone section to the casting.

E. Fittings: Cones, reducer slabs, base slabs and adjusting rings shall be of the same material as adjoining riser sections. Fittings shall be manufactured elastomeric gaskets, epoxy bonding or fiberglass overlay.

F. Acceptable manufacturer: Manufacturer of pipe and fittings shall employ manufacturing methods and material formulations in use for a minimum of ten years. Manufacturer shall be Amitech America, Ltd., Meyer Rohr + Schacht GmbH, Fabri-Kast by United Polymer Technology, or equal.

6. Design: Manholes shall be designed to withstand all live loads and dead loads as described in project plans and specifications. Dead loads shall include overburden load, soil side pressure and hydrostatic loading conditions. Manholes shall also be designed to resist buoyancy for the project conditions.

7. Testing

A. Pipes: Pipe shall be manufactured in accordance with ASTM D 6783.

B. Joints: Joints shall meet the requirements of ASTM D 4161.

C. Three-edge bearing strength: Pipe shall be designed to meet D-load requirements of external soil and hydrostatic loads. Design strength shall be tested in accordance with the three-edge bearing test method of ASTM D 6783.

D. Compressive strength: Pipe shall have a minimum unconfined compressive strength of 13,000 psi when measured in accordance with ASTM C 579.

E. Manhole Leakage: Manhole shall be tested in accordance with ASTM C 1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

8. Customer Inspection: The Owner or other designated representative shall be entitled to inspect manholes and witness the manufacturing process.

9. Packaging, Handling and Shipping: Packaging, handling and shipping shall be performed in accordance with the Manufacturer's instructions.

d. Installation.

1. Installation: The installation of manholes shall be in accordance with the project plans and specifications and the manufacturer's recommended practices.

2. Pipe Handling: Textile slings, union anchor lifting devices or other suitable materials and/or a forklift are recommended.

3. Bedding: Manhole bedding shall be in accordance with the Special Provisions for Concrete Utility Manholes.

4. Castings: Manhole castings shall be in accordance with the Special Provisions for Concrete Utility Manholes.

5. Jointing:

A. Sealing surfaces and joint components shall be inspected for damage and cleaned of all debris.

B. Apply joint lubricant to elastomeric seals. Use only lubricants approved by the pipe manufacturer.

C. Use suitable equipment handle and set manholes.

D. Placement and compaction of surrounding backfill material shall be applied so as to provide sufficient and equal side pressure on the manhole.

6. Field Tests:

A. Vacuum Test: Sanitary sewer manholes shall be tested in accordance with a VACUUM MANHOLE TEST of the Sanitary Sewer Special Provision. An EXFILTRATION test will be allowed when expressly permitted by the Municipal Engineer. Any manhole failing this test shall be repaired and retested by the Contractor to the satisfaction of the Municipal Engineer.

SUB-GRADE UNDERCUTTING

a. Description. This work consists of subgrade undercutting, including backfilling. This work shall be performed to replace material susceptible to frost heaving or differential frost action and unstable soil conditions, as determined by the Engineer. The backfill shall consist of a Structural Geogrid with 12 inches of 21AA dense graded aggregate. This work shall be performed in accordance with Section 205 of the Standard Specifications unless modified by this Special Provision or otherwise directed by the Municipal Engineer.

1. Definitions: The following defines terms used herein:

Structural Geogrid - A structural Geogrid formed by regular network of integrally connected tensile elements with apertures of sufficient size to allow interlocking with surrounding soil, rock, earth, and function as reinforcement.

2. Reference Documents:

Geosynthetic Research Institute

GG1-87 Standard Test Method for Geogrid Rib Tensile Strength

GG2-87 Standard Test Method for Geogrid Junction Strength

b. Materials

1. Structural Geogrid

Furnish Tensar structural Geogrid reinforcement manufactured by Tensar Earth Technologies, Inc. of Morrow Georgia; or approved equal. Geogrid Reinforcement shall be BX1100 (Tensar SS1) or BX1120.

2. Backfill

Dense graded aggregate conforming to Michigan Class 21AA in accordance with Section 902 of the Standard Specification.

c. Methods of Construction. After the subgrade has been excavated to the approximate grade, the Engineer will promptly inspect the grade to determine if any subgrade undercutting is required and determine the limits of such undercutting. Subgrade undercutting shall be performed within the limits established by the Engineer, and the excavated material shall become the property of the Contractor. The subgrade shall be undercut a uniform 12 inches. The Contractor shall backfill the undercut by placing a dense graded aggregate, 21AA on top of the Structural Geogrid.

1. Geogrid Installation:

The Geogrid reinforcement shall be laid horizontally on the prepared subgrade. The Geogrid shall be pulled taut, and anchored prior to backfill placement on the Geogrid.

The Geogrid reinforcement shall be overlapped a minimum of 12 inches at the longitudinal and transverse edges.

2. Material Storage and Protection:

Geogrids shall be stored above -20 Degrees F (-29 Degrees C). Prevent excessive mud, wet cement, epoxy, and like materials from coming into contact with and affixing to the Geogrid material. Rolled Geogrid material may be laid flat or stood on end for storage.

3. Reinforced Backfill Placement:

Backfill shall be placed, spread, and compacted in such a manner that minimizes the development of slack in the Geogrid. Backfill shall be placed and compacted in accordance with Section 302 of the Standard Specifications.

4. General:

Track construction equipment shall not be operated directly upon the Structural Geogrid reinforcement. A minimum fill thickness of 6 inches is required prior to operation of tracked vehicles over the Structural Geogrid. Tracked vehicles turning should be kept to a minimum to prevent tracks from displacing the fill and damaging the Structural Geogrid. Rubber tire equipment may pass over the Structural Geogrid reinforcement at slow speeds, less than 10 MPH. Sudden braking and sharp turning shall be avoided.

SLOPE RESTORATION

a. Description. The work of slope restoration shall consist of preparing all areas designated for turf establishment on the plans or as directed by the Municipal Engineer, and applying topsoil, fertilizer, seed, and mulch to those areas.

b. Materials. The materials and application rates specified in Sections 816 and 917 of the standard specifications apply unless modified by this special provision or otherwise directed by the Municipal Engineer.

c. Methods of Construction. Begin this work as soon as possible after final grading of the areas designated for turf establishment but no later than the maximum time frames stated in Subsection 208.03 of the standard specifications. It may be necessary, as directed by the Municipal Engineer or the Authority, to place materials by hand.

Prior to placing topsoil, shape and compact all areas to be seeded. Place topsoil to the minimum depth indicated above, to meet proposed finished grade. If the area being restored requires more than the minimum depth of topsoil to meet finished grade, this additional depth must be filled using topsoil or, at the Contractor's option, embankment

If an area washes out after this work has been properly completed and approved by the Municipal Engineer and the Authority, make the required corrections to prevent future washouts and replace the topsoil, fertilizer, seed and mulch.

FLOW METER

Flow meters shall be installed in all new construction and renovated lift stations in accordance Ten State Standards, with specifications for a minimum design peak hourly flow of 350 gallons per minute or greater. However, flow meters recommended for installation by the SCCMUA or municipal engineer, which cite Ten State Standards or other considerations, must be approved by the municipality/s having ownership of the lift station.

Flow meters selected for installation shall be an electromagnetic type (Mag-meter), capable of operating at a 4 – 20 mA signal.

APPENDIX A
SANITARY SEWER STANDARD DETAILS (enclosure 1)

APPENDIX B
LIFT STATION DETAILS (enclosure 2)

As provided by the SCCMUA or Municipal Engineer

APPENDIX C
 PLAN SUBMITTALS & APPROVAL PROCESS MATRIX

Plan Submittals & Approval Process for New Sanitary Sewer

<u>City of DeWitt</u>	<u>Developer to Submit Plans for New Sanitary Sewers:</u>	<u>Sets of Plans Needed</u>
	Preliminary Plat Plans	4
	Final Preliminary Plat Plans	4
	Planning Commission	14
	City Council	11
	Construction / Permit	5
	Record Drawings – To SCCMUA	1 + CD with AutoCAD & PDF
	Record Drawings – To City of DeWitt	1 + CD with PDF
	Record Drawings – To City of DeWitt Municipal Engineer	1 + CD with AutoCAD & PDF

<u>DeWitt Township</u>	<u>Developer to Submit Plans for New Sanitary Sewers:</u>	<u>Sets of Plans Needed</u>
	Tentative Preliminary Platting Plans	25
	Final Preliminary Plat Plans	25
	Construction / Permit	6
	Buils Record Drawings – To SCCMUA	1 + CD with PDF
	Record Drawings – To DeWitt Twp.	1 + CD with AutoCAD & PDF
	Record Drawings – To DeWitt Twp. Municipal Engineer	1 + CD with AutoCAD & PDF

<u>Bath Township</u>	<u>Developer to Submit Plans for New Sanitary Sewers:</u>	<u>Sets of Plans Needed</u>
	Tentative Preliminary Platting Plans	25
	Final Preliminary Plat Plans	25
	Construction / Permit	6
	Record Drawings – To SCCMUA	1 + CD with AutoCAD & PDF
	Record Drawings – To Bath Twp.	1 + CD with PDF
	Record Drawings – To Bath Twp. Municipal Engineer	1 + CD with AutoCAD & PDF

<u>Watertown Twp.</u>	<u>Developer to Submit Plans for New Sanitary Sewers:</u>	<u>Sets of Plans Needed</u>
	Preliminary Plat Plans	10
	Final Preliminary Plat Plans	4 + (1) Mylar
	Construction / Permit	6
	Record Drawings – To SCCMUA	1 + CD with AutoCAD & PDF
	Record Drawings – To Watertown Twp.	1 + CD with PDF

	Record Drawings – To Watertown Twp. Municipal Engineer	1 + CD with AutoCAD & PDF
	Record Drawings – To Clinton County Road Commission	1 + CD with PDF
	Record Drawings – To Clinton County Drain Commission	1 + CD with PDF
	Record Drawings – To Mid-MI Public Health Department	1 + CD with PDF
	Record Drawings – To Capital City Regional Airport Authority	1 + CD with PDF

BIBLIOGRAPHY

2012 STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION. State of Michigan, Department of Transportation (MDOT)

MANUAL OF SEWER CONDITION CLASSIFICATION. Water Resource Council (WRCE), Fourth Edition.

RECOMMENDED STANDARDS FOR WASTEWATER FACILITIES. Great Lakes-Upper Mississippi River (Ten State Standards 2004) Board of State and Provincial Public Health and Environmental Managers, 2004 Edition

MICHIGAN BUILDING CODE. Michigan Department of Consumer & Industrial Services, Bureau of Construction Codes, 2009 Edition.

NATIONAL FIRE PROTECTION ASSOCIATION 70 (NFPA)/National Electric Code (NEC) 2011 edition

Manufacturers:

LADtech – 6704 Meadowlark Court, Lino Lakes, MN 55038
1-877-235-7464

UGT- (Underground Technologies) – 1811 Factory Street, Kalamazoo, MI 49001
1-248-765-8966