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**SANITARY SEWER SPECIFICATIONS
FOR
MONROE COUNTY OPERATED SYSTEMS
THE MONROE COUNTY DRAIN COMMISSIONER
MONROE COUNTY, MICHIGAN**

March 2012 Revision

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GENERAL CONDITIONS

SANITARY SEWERS

1. Definition of term as used in these standard specifications.
 - a) Owner: Monroe County, Monroe County Drain Commissioner.
 - b) Engineer: The Engineer on the staff of the Owner or the Engineering firm or company hired by the Owner to provide on site inspection and/or consultation for the project.
 - c) Project: The proposed sanitary sewer improvements which when built and accepted will become part of a public system.
 - d) Developer: That person, firm or company who has employed the contractor to build the project. The project is owned by the developer until it is accepted by the Owner.
 - e) Contractor: The individual firm or corporation who is awarded the contract to construct the sanitary sewer improvements by the developer.
2. A preconstruction conference shall be set up by the Developer and Contractor with the Owner at least one week prior to commencing construction.
3. A construction schedule shall be furnished to the Owner at the preconstruction meeting.
4. All sanitary sewers installed as a part of the Owner's operated system shall have the installation and acceptance testing inspected and witnessed by the Engineer and / or Bedford Wastewater Plant in accordance with these specifications. The contractor shall provide the Bedford Wastewater Plant Superintendent and the Owner with 48 hours notice prior to initiating construction or scheduling acceptance testing procedures.

5. The Contractor shall receive an approval letter from the Owner, required state permits, agreements, financing and have held a preconstruction meeting before commencing construction.
6. Any requirements of the following specifications which may be in conflict with the manufacturer's recommendations; the manufacturer's recommendation shall govern to the extent of the conflict.
7. Roof drains, foundation drains and/or any other clear water connections to the sanitary sewer are prohibited.
8. To protect underground utilities, the Contractor shall contact "Miss Dig" by calling 1-800-482-7171 at least 72 hours before commencing construction. The Contractor shall specifically contact the South County Water System.
9. AS – BUILT PLANS – Unless approved otherwise by the Owner, the Agency providing the design sanitary sewer construction plans shall be responsible to provide AS – Built Construction plans within 45 days after the completion of the sanitary sewer construction. To facilitate this process, the contractor in cooperation with the construction inspector shall maintain and furnish to the design agency one set of construction plans that have been marked up with As - Built conditions. The Design Agency shall prepare and furnish one Mylar set and two sets of bond As – Built Construction Plans, all sets signed and sealed by the design engineer, along with the contractor's As – Built marked up set of plans. If satisfactory inspection reports are on file at the Owner's office, the contractor's As – Built Marked up plan set do not need to be furnished with the designer's As – Built Mylar and bond plan sets. The Design Agency shall also furnish one electronic file of the AS – Built construction plans in PDF and Auto-CAD format. The As – Built Plans shall be prepared and

furnished with appropriate control points included in the plans that are tied into the Michigan State Plane North American Datum 1983 Harn adjusted (SP NAD83 Harn).

10. The Contractor shall so conduct his work that inconvenience to residents and the traveling public is minimized. Pavement crossing shall be constructed so that one lane of traffic is maintained at all times on any street or highway.

Prior to the start of construction, the Contractor shall meet with and obtain the permission of the Monroe County Road Commission for the closing of any street to traffic or modifying traffic on any street and to establish requirements for signing, flashers, flagmen, etc. Work area protection and work area lighting both within and outside the work limits shall be the responsibility of the contractor involved.

Traffic shall either be maintained or detoured as appropriate by the use of signs, lights, barricades, etc., in accordance with the current edition of the Michigan Manual of Uniform Traffic Control Devices. The Contractor's plan for traffic control shall be submitted to the Road Commission for approval prior to being put into operation. The Contractor shall notify the Road Commission at least forty-eight (48) hours in advance of any approved closure. The Road Commission will notify the appropriate local agencies. All road closures are to be kept to the absolute minimum.

All materials, labor and equipment necessary to provide traffic control, shall be furnished by the Contractor at his sole expense.

Prior to working in the right-of-way of any county road, the Contractor shall provide proof of adequate insurance and secure a permit from the Monroe County Road Commission for such work.

11. Maintenance of Flow - During construction, where an existing sewer is encountered and is interfered with, flow shall be maintained in the existing sewer. Sewage or other liquid must

be handled by the Contractor, with the approval of the Owner or Wastewater Treatment Plant Superintendent by temporarily pumping to a satisfactory outlet; and shall not be pumped, bailed or flumed over the street or ground surface; or by providing a temporary conduit to maintain flow through the trench or other excavation.

SECTION 1

PIPE SEWERS

1.1 SCOPE & DESIGN CRITERIA - This item shall include the furnishing and installation of all pipe sewers of the types and sizes installed in open trench, or otherwise, at the various depths shown on the drawings. Also included are provisions for new service connections. Plan and profile plan sheets shall be provided for all proposed sanitary sewers with all potential utility crossings and clearances shown in the profiles. All plans and specification shall be reviewed and approved by the Bedford Wastewater Treatment Plant and Owner. The sanitary sewer shall be noted on the plan and profiles with stationing that is based upon the centerline of road.

1.1a All 6 through 15-inch diameter sewers shall be of PVC or ABS pipe. Sanitary sewer pipe sizes 18" or larger will be considered when justified by design calculations. The pipe material specified for 18" or larger sewer pipe will be established at the time pipe diameters larger than 15" diameters are approved for use.

1.1b Public sanitary sewer main pipe diameter size shall be $D \geq 8"$ and with the pipe diameter being justified by design calculations that are prepared and provided in accordance with MDEQ and the "Recommended Standards for Wastewater Facilities" (Ten States Standards) requirements. It shall not be acceptable to increase the pipe diameter above the pipe size justified by the design calculations to achieve flatter slopes. The pipe diameter, slope and actual design flow volume shall satisfy the design calculation requirement to provide a pipe flow velocity $V \geq 2.0$ fps. All pipe slopes shall be in accordance with the requirements of the "Ten States Standards" and shall have a minimum depth of cover over the sanitary sewer of 48-inches. Within dead end sections of sanitary sewers that will have no possibility of being

extended and will have less than five service lead connections, the main line sewer shall be installed at a grade of 0.60%.

1.1c An MDEQ Part 41 permit application is required for public sanitary sewer installations. The permit application form shall be filled out by the designer and submitted to the Owner who will forward the application to MDEQ upon approval of the plans and basis of design calculations.

1.1d Sanitary sewer pipelines shall be located within the road right of way and shall be placed 18' to 20' from the centerline of the road right of way on the opposite side of the road from water main locations. Where sanitary sewers are approved to be located outside of road right of ways, a 20' sanitary sewer easements shall be provided on prescribed forms of the applicable unit of government or dedicated within approved plat and condominium documents.

1.1e All sanitary sewer pipes shall be designed and installed to provide 18-inch vertical and 10 feet horizontal separation from any water main.

1.1f All sewer pipe and appurtenances shall conform to the latest revision of the appropriate American Society for Testing and Materials (ASTM) Designation.

1.2 **POLYVINYL CHLORIDE (PVC) PLASTIC PIPE** - Polyvinyl chloride (PVC) plastic pipe shall meet the requirements of ASTM D3034 latest revision and shall be Type PSM SDR-35. The pipe shall be of the elastomeric gasket joint (integral bell) type. Joints shall provide a watertight seal and shall be made in strict accordance with the manufacturer's recommendations. Joints shall be of the push-on type meeting the requirements of ASTM D3212 latest revision, and, in addition, the bell shall be designed to retain the gasket to prevent pullout during the making of the joint.

1.2a Provide manufacturer's fittings and stubs designed specifically for air testing as required

to complete the leakage tests subsequently specified in this item.

1.2b The pipe shall be installed in accordance with ASTM D2321 latest revision, and with the requirements of these specifications. Any requirements in these specifications which may be in conflict or inconsistent with the requirements of ASTM D2321 latest revision shall be void to the extent of such conflict or inconsistency.

1.2c The Contractor shall use extreme care when installing or handling the pipe in anyway when the outside air temperature is below 50 degrees F.

1.2d For the purpose of establishing limits for the payment of items based upon trench widths, the maximum allowable trench widths at the top of the pipe for the various sizes of pipe shall be as follows:

PIPE SIZE (Inches)	MAXIMUM ALLOWABLE TRENCH WIDTH
6"	2' – 3"
8"	2' – 3"
10"	2' – 6"
12"	2' – 9"
15"	3' – 0"

The actual trench widths used for installation may be in accordance with ASTM D2321 latest revision.

1.2e All 8-inch diameter and larger PVC plastic pipe shall be tested for deflection as subsequently specified.

1.3 **ACRYLONITRILE - BUTADIENE - STYRENE (ABS) PIPE** - All 8-inch diameters and larger pipe shall be ABS composite pipe meeting the requirements of ASTM D2680 latest revision. All 6-inch diameter pipe used for service connections shall be ABS solid wall extra

strength (ES), SDR 23.5. Solid wall pipe shall be tested in accordance with ASTM D2680 latest revision; shall have a minimum deflection of 5% and shall have a minimum stiffness of 150 psi. All other requirements shall be as specified in ASTM D2751 latest revision.

1.3a Joints shall be of the solvent-welded cemented type ASTM D2235, and, at the time the joints are made, the exposed pipe ends shall be fully coated with solvent cement. Joints shall provide a watertight seal and shall be made in accordance with the manufacturer's recommendations.

1.3b For the purpose of establishing limits for payment, the maximum allowable trench width at the top of the pipe shall be as follows:

MAXIMUM ALLOWABLE	
<u>PIPE SIZE</u>	<u>TRENCH WIDTH</u>
6"	2' – 3"
8"	2' – 3"
10"	2' – 6"
12"	2' – 9"
15"	3' - 0"

1.3c ABS pipe shall be installed in accordance with ASTM D2321 latest revision, which for composite pipe shall be as amended by the Appendix to ASTM D2680 latest revision, and the requirements of these specifications. Any requirements in these specifications which may be in conflict or inconsistent with the requirements of ASTM D2321 latest revision, shall be void to the extent of such conflict or inconsistency. ABS composite pipe 8-inches in diameter and larger shall be tested for deflection as subsequently specified.

1.4 MANUFACTURER'S AFFIDAVIT - The pipe manufacturer shall furnish an affidavit indicating that the pipe, fittings and appurtenances have been manufactured and tested in accordance with all requirements of the applicable referenced standards. A copy of the affidavit, indicating the project on which the material is to be used, shall be forwarded to the Owner and the Engineer prior to construction.

1.5 INSPECTION AND REJECTION - All pipes, fittings and appurtenances shall be appropriately marked for purposes of identification. The materials and methods of manufacture shall be subject to inspection at all times, and the completed pipes, fittings and appurtenances shall be subject to inspection and rejection at the factory, trench or other point of delivery. The Owner and / or Engineer have the right to make said inspection.

1.6 TRENCHES - Except when otherwise specifically required or permitted by the Engineer, sewers shall be laid in open trench; shall be started at the lowest point; and shall have spigot ends pointing in the direction of flow.

1.6a The width of trenches below the level of the top of the pipe shall not exceed the dimensions previously specified and shall not be less than 12-inches greater in width than the outside diameter of the pipe barrel. Whenever the maximum allowable trench width (below the level of the top of the pipe) is exceeded for any reason, the Engineer reserves the right to direct the Contractor to utilize pipe of greater strength, to modify the type of backfill, to embed the pipe in concrete, or to utilize a combination of these procedures, all at the expense of the Contractor.

1.6b Trenches shall be excavated to a depth of not less than four inches below the outside bottom of the pipe barrel (and bell) for pipes 6" diameter through 12" diameter nor more than six inches below the outside bottom of the pipe barrel (and bell) for pipe diameters greater than 12"

diameter when the pipe is laid on its final grade. Trenches shall be kept sufficiently free of water during pipe laying and jointing to prevent damage to the joints. When water exists in the trenches at the time of pipe laying, the Contractor shall, at his expense, de-water the trench in a manner approved by the Engineer.

1.7 **PROTECTION OF EXISTING UTILITIES** - Existing utilities and obstructions along the route of construction shall be located and their elevations determined at least 400 feet in advance of pipe laying.

1.7a All utilities, when encountered, shall be adequately supported, shored up or otherwise protected whenever exposed in the excavation to the satisfaction of the Engineer and at the Contractor's expense. Timber supports shall be a minimum of 4-inches square. Supports shall extend into undisturbed earth each side of the trench and the pipe shall be banded or tied to the bridging for its full length. Where timber bridging cannot be supported by a firm foundation, the Contractor shall provide vertical support for the bridging, including any lateral bracing necessary to provide a firm and substantial support for the pipe, all to the satisfaction of the Engineer.

1.7b While the drawings indicate the location of existing utilities, in accordance with the best information presently available, neither the Owner nor the Engineer assumes any responsibility for the accuracy of their location or that all utilities are shown.

1.8 **PIPE EMBEDMENT** - Pipe embedment shall include the material placed beneath the pipe to the depths of excavation previously specified and around and over the pipe for a distance of 2-feet above the top of the pipe barrel.

1.8a The material shall consist of crushed stone equivalent to Michigan Department of Transportation Series 25A, and shall be provided at the expense of the Contractor.

1.8b The bedding material shall be shaped to conform to the bottom quadrant of the pipe barrel. The Engineer reserves the privilege of altering the type of bedding material and regulating the exact grading of the bedding material depending upon the water characteristics of the trench. At least the minimum of bedding shall be provided under pipe bells as previously specified.

1.8c After the pipe is laid, the bedding material shall be shovel placed and tamped to fill all voids. When passing through manhole excavations, the bedding material beneath and up to the centerline of the pipe shall be placed in 6-inch layers, loose measurement, and compacted by hand or mechanical tamping to the satisfaction of the Engineer.

1.8d All embedment material shall be carefully placed so as not to damage the joints or displace the pipe and no material shall be dropped directly on the pipe.

1.8e If the material found at the specified depths of excavation below the elevation of the outside bottom of the pipe barrel is not suitable to provide adequate foundation for the pipe, a further depth shall be excavated and filled with granular bedding material to be selected and approved by the Engineer.

1.9 **PIPE LAYING** - Pipes laid in open trench shall be laid with their full lengths true to line and grade as called out in the plans with the aid of laser beam equipment or other method approved by the Engineer, and shall rest on the bedding material provided.

1.9a The laser beam equipment shall be checked a minimum of twice daily, once in the A.M. and once in the P.M., in the presence of the Engineer to verify that the equipment is maintaining the established line and grade.

1.9b Regardless of the method used, the Engineer shall be immediately notified of any misalignment of the pipe when laid in accordance with established cuts or elevations.

1.10 BACKFILLING - Backfill shall include the material placed above the pipe embedment material previously specified. No heavy or large quantities of backfill material shall be placed over the pipe until backfilling has progressed to a depth of at least 3-feet over the top of the pipe barrel. All backfill material shall be carefully placed so as not to damage the joints or displace the pipe and shall be in accordance with ASTM-2321.

1.10a Trenches located within the public right of way shall be backfilled in accordance with the requirements of the Monroe County Road Commission.

1.10b Trenches coming within paved or stoned streets, alleys, driveways and parking areas shall be backfilled for their full depth with MDOT 21A dense graded aggregate. The material shall have a Standard Proctor density of at least 125 pounds per cubic foot, and shall be placed and compacted to minimum density of 95% of the Standard Proctor density in a manner acceptable to the Engineer.

1.10c Where sewers are installed along and across paved or stoned streets, alleys, driveways and parking areas, compacted granular backfill material shall also be provided for any portion of the trenches falling within that area below a line drawn at 45 degrees to the horizontal from one foot outside the edge of the pavement or back of curb and above the horizontal plane of the pipe embedment material.

1.10d The Engineer may check compaction of the backfill at any time.

1.10e The Monroe County Road Commission reserves the right to require additional compacted granular backfill and/or to request the use of control density backfill material in lieu of compacted granular backfill as necessary for adequate support of road shoulder and/or pavement. Control density backfill material shall consist of a mix of Portland cement, fly ash, and selected granular materials, with a minimum density of 130 pounds per cubic foot and a

minimum compressive strength of 50 PSI at 3 days and 75 to 150 PSI at 28 days.

1.10f Where trenches are backfilled with granular material, the excess excavated material must be removed at the expense of the Contractor.

1.10g For backfilling the remainder of the trenches, as much of the excavated material as possible shall be replaced. Until backfilling has progressed to a depth of at least 3-feet over the top of the pipe barrel, the material shall be finely divided, free of large stones, boulders of other harmful debris, and shall be placed in 6-inch layers, loose measurement, and compacted by hand or mechanical tamping to the satisfaction of the Engineer. The remainder of the backfill shall be rolled in over the pipe from the end of the trench.

1.10h Trench surfaces along weed or unsodded areas the material shall be neatly graded to conform to the original ground profile. In fields used for farming, all topsoil that was removed during excavation shall be stockpiled at the site and shall be replaced and neatly graded to conform to the original ground profile. In lawns or other areas where grass exists, as determined by the Engineer, topsoil shall be provided and the areas shall be seeded as subsequently specified in this item.

1.10i Special care shall be taken in backfilling any trenches under sidewalks to compact the backfill material such that it shall be equal to the degree of compaction of the adjacent undisturbed earth; however, in no case shall the compaction be less than 90% as determined by the Standard Proctor Test.

1.10j The Contractor shall be required to regrade and reshape all road shoulders and all ditches or swales from existing high points to existing drainage structures or other outlets, and replace all drive connections which are disturbed during construction at his expense. If proposed ditch grades are not included in the plans, prior to construction the Contractor shall contact the Monroe County Road Commission who will establish grades for all roadside ditches.

Ditches, which are reshaped, shall have reasonable side slopes. Vertical or steep slopes will not be permitted and side slopes shall not be greater than 2 to 1.

1.11 TRENCH BRACING - Where necessary to prevent caving of the trench and other excavation, and for protection of workmen and nearby structures, adequate sheeting and bracing shall be provided at the expense of the Contractor.

1.12 STREAM CROSSING – At locations where the sanitary sewer must be installed across creeks, streams and or rivers, the water main shall be installed in a casing pipe as subsequently specified in these specifications. The casing pipe may be installed using open cut excavation or bore and jacking as detailed in the plans. A concrete cap shall be placed over the sleeve as detailed in the plans. The end of the casing pipe shall be plugged and sealed such that the plug can be removed in the event of inserting a new sanitary sewer in the future.

1.13 BORE AND JACK CASING PIPE - Where specifically called out on the plans, the contractor shall install the sanitary sewer by the method of bore and jacking steel casing pipe and inserting the sanitary sewer within the casing pipe. The carrier pipe inserted into the casing pipe shall be the pipe material as previously specified.

1.13a All pipe inserted into casing pipes shall have casing spacers strapped to the pipe in accordance with the manufacturer specifications. Casing spacers shall have a body of either Stainless Steel or Ductile Iron and runners made of Ultra High Molecular Weight Polymer Plastic as manufactured by Advanced Product Systems or approved equal or Be a Raci - High Density Polyethylene (HDPE) body and runner as manufactured by the Public Works Marketing, Inc. or approved equal.

1.13b Steel casing pipe shall be used for construction at railroad, roadway or highway crossings as shown on the plans. Steel casing pipe shall comply with the following minimum requirements or such minimum requirements as established by the authority having jurisdiction. Casing pipes at other locations shall also comply with the following minimum requirements unless otherwise indicated.

TABLE OF MINIMUM WALL THICKNESS FOR STEEL CASING PIPE
NOMINAL THICKNESS – INCHES

COATED OR CATHODICALLY PROTECTED	NOMINAL DIAMETER INCHES
0.188	Under 14
0.219	14 & 16
0.250	18
0.281	20
0.312	22
0.344	24
0.375	26
0.406	28 & 30
0.438	32
0.469	34 & 36

1.13c Smooth wall steel pipes with a nominal diameter of over 54 inches will not be permitted. Steel pipe shall have minimum yield strength of 35,000 PSI. All joints shall be fully welded completely around the circumference of the pipe. Welds shall be ground smooth inside and out to prevent conflict with the soil or pipe placement. If coated pipe is used, the coating shall be repaired following welding. The ends of all casing pipe shall be sealed and plugged in a manor that will allow future access for main replacement if required.

1.14 **SERVICE CONNECTIONS AND RISERS** - Service connections shall be 6-inches in diameter, unless otherwise shown and shall be installed for existing and future houses and

businesses. (Pipe material shall be PVC SDR35 or ABS solid wall extra strength SDR23.5 as previously specified.) Service connections shall be in accordance with the house lead detail.

Service leads may be connected to the main line sewer pipe using wye or tee fittings or may be connected to manhole structures using flexible manhole connectors. No more than three (3) service lead connections are permitted into any one manhole structure.

The approximate locations of service connections shall be shown on the plans and shall include the following information:

1. The lead station at the main line sewer based upon main sewer stationing (centerline of the road)
2. Main sewer invert elevation at service wye
3. Service wye invert elevation at the main sewer connection
4. Length of riser and invert at top of riser
5. Length of service lead from the main sewer or from the top of the riser to 5' beyond any utility easement and invert elevation of the lead at this location
6. Grade of the service lead to provide a service invert elevation at the building such that the lead will enter the building 18" above any basement floor
7. Station of the end of the lead based upon roadway centerline stationing.
8. A cleanout shall be provided within 5' to 10' of the building foundation.

1.14a Final locations of service connections will be established at the time of construction. "As constructed" plans shall locate all service connections in accordance with the service connection information detail and provide the preceding information.

1.14b All sewer pipe tees and wyes installed for service connections shall be bedded in compacted granular material in accordance with MDOT series 25A as shown on the service connection detail.

1.14c Service connections shall be installed to a location that is 5' beyond any utility easement located adjacent to the road right of way, on at least 1% grade and the pipe shall be laid in open cut, except where otherwise specifically required or permitted by the Engineer. No basement services are permitted and therefore the service lead must be designed with a grade from the main sewer to the building location such that the invert of the lead at the building will be at least 18" above a basement floor without providing a riser at the building location. The minimum depth of the service lead at the building shall be 48 inches. The requirements for construction shall, in all respects, comply with those specified in this item for the main sewers. The fittings required to construct service connections are included under Sewer Pipe Fittings subsequently specified.

1.14d All service connections shall be plugged with removable watertight and airtight stopper as recommended or supplied by the pipe and joint manufacturer. A **2"x 4"** location stake, **painted BROWN**, shall be placed vertically at the plug and extended to **3-feet above** grade.

1.14e In general, vertical risers will be required for service connections where depths to the sewer invert exceed 12-feet. The junction of the riser with the sewer pipe shall be as previously specified. Risers placed at the proposed building to maintain the service lead entry into the building at 18" above the basement floor will not be permitted.

1.14f Above the granular bedding, the trench shall be backfilled with compacted granular material, MDOT series 25A. Such fill shall extend for the full width of the trench, at least 12-inches in each direction from the center of the riser, and to the branch at the top of the riser. The fittings required to construct risers are included under Sewer Pipe Fittings.

1.14g The ends of the risers, where the service connections are not immediately installed, shall not be backfilled until the locations are referenced as previously specified. When the service

connection or riser is located within the public right-of-way, the trench shall be backfilled in accordance with the requirements of the Monroe County Road Commission.

1.14h Only County Agency approved Contractors are permitted to tap sanitary sewer service leads into existing sanitary manhole structures or existing main line sanitary sewers.

1.15 **CONNECTIONS TO STRUCTURES** - When required, the new sewers shall be connected to structures through stubs, wall castings wall sleeves, cored holes with flexible coupling such as Kor-N-Seal or equal. Any new sanitary sewer connection to a structure on an existing sanitary sewer system shall be plugged and bulk headed as directed by the Engineer until all assurance testing has been performed and approved by the Engineer. All connections shall be watertight and shall include flexible joints and caulking where shown. Where necessary the bottoms of existing manholes shall be reshaped to give a smooth flow in all directions.

1.15a Connections to stubs of an unlike type of pipe shall be accomplished using the proper adapter as manufactured by Fernco, Inc.; Flex-Seal: Joints, Inc.; or approved equal.

1.16 **MAINTAINING TRAFFIC** - The Contractor shall so conduct his work that inconvenience to residents and the traveling public is minimized. Pavement crossing shall be constructed so that one lane of traffic is maintained at all times on any street or highway.

1.16a Prior to the start of construction the Contractor shall meet with and obtain the permission of the Monroe County Road Commission for the closing of any street to traffic or for modifying traffic flow on any Street and to establish requirements for signing, flashers, flagmen, etc. Work area protection and work area lighting both within and outside the work limits shall be the responsibility of the Contractor.

1.16b Traffic shall either be maintained or detoured as appropriate by the use of signs, lights, barricades, etc. in accordance with the current edition of the Michigan Manual of Uniform Traffic Control Devices. The Contractor's plan for traffic control shall be submitted to the Road Commission for approval prior to being put into operation. The Contractor shall notify the Road Commission at least forty-eight (48) hours in advance of any approved road closure. The Road Commission will then notify the appropriate local agencies. All road closures are to be kept to the absolute minimum.

1.16c All materials, labor and equipment necessary to do the work, including traffic control, shall be furnished by the Contractor at his sole expense. Payment for any item of work not specifically set forth in the proposal shall be considered incidental to the project and no additional payment will be made.

1.16d Prior to working within the right-of-way of any county road, the Contractor shall provide proof of adequate insurance and secure a Permit from the Monroe County Road Commission for such work.

1.17 **REPLACEMENTS** - Where any pavements, driveways, parking areas, curbs, gutters, berm stone, sidewalks, water lines, gas lines, sewers, catch basins, headwalls, drains, field tile, conduit pipes, cables or other existing facilities are removed or otherwise disturbed, they shall be replaced in as good a condition as found at the expense of the Contractor and to the approval of the Owner. Any such material broken or disturbed to such an extent as to require replacement shall be replaced with new material at the expense of the Contractor.

1.17a Berm stone shall be replaced in accordance with applicable Monroe County Road Commission requirements.

1.17b In any event, the Contractor shall be liable for any damage to public or private property

cause by movement of equipment or by other operations and he shall repair or replace, to the condition existent prior to his operations.

1.18 TESTING FOR DEFLECTION - PVC and ABS pipe 8-inches in diameter and larger shall be tested for a maximum deflection of 5% not less than **90 days** after final full backfill has been placed, as determined by the Engineer. Pipe with a stiffness of 200 psi or greater need not be tested for deflection if all pipe between two consecutive manholes is less than 12 feet below final grade.

1.18a Such tests shall be conducted by a testing agency approved by the Owner and the Engineer and with a representative of the Engineer present. All pipes exceeding a deflection of five percent (5%) shall be repaired or replaced and then retested until satisfactory test results are obtained. The Contractor shall pay all costs for the tests.

1.18b The tests shall be conducted using electronic equipment specifically designed for measuring and recording deflection in flexible pipe or by the use of an approved deflection probe, having a diameter equal to 95% of the I.D. of the pipe being tested, pulled through the sewer line. If the deflection probe is used, tests shall be performed without mechanical pulling devices, and a proving ring, having an I.D. equal to the O.D. of the probe, shall be available at the time the probe is used to verify that the probe has the proper diameter by inserting the probe into the ring.

1.18c The deflection probe shall be as available from Wortco, Inc.; Burke Concrete Accessories, Inc.; or equal, and shall be designed specifically for testing the deflection of the type of pipe specified. The probe shall incorporate an odd number (no less than 9) of 1/2" x 3/16" bar stock runners equally spaced on edge around and welded to the circumference of two minimum 1/4" thick circular steel plates. The distance between plates, out-to-out, shall not be

less than 2" smaller than the nominal diameter of the pipe to be tested. The runners shall extend approximately 1 1/2" beyond each plate, being bent inward for this distance at approximately 30 degrees. A Continuous 3/4" threaded rod shall be provided through the center of the plates, having a hex nut drawn tight against the inside face of each plate, and extending each side as required for providing 1 3/4" ferrule loop insert or similar piece for attaching the pulling medium.

1.19 TESTING FOR LEAKAGE - SANITARY SEWERS

A. GENERAL - The contractor shall include in his bid all costs for labor and materials, including any water and all equipment, necessary to complete the leakage tests specified herein. All such tests shall be conducted with a representative of the Owner present and his judgment shall be final as to the acceptance of all tests. Leakage tests shall be conducted on the entire length of the project and shall include all manholes.

A1. Each section of pipe shall be tested for obstructions prior to testing for leakage. Mandrels, solid cylinders, or balls with diameters of 95% of the pipe diameter may be used to test for obstructions. All obstructions shall be removed.

A2. Also, prior to conducting leakage tests, the Contractor shall make a determination of ground water level by installing ground water gauges in manholes as selected by the Engineer. These gauges shall consist of a rigid section of 1/2 inch diameter pipe, approximately 10-inch long, inserted horizontally through the manhole wall as near as possible to the crown of the pipe, with any opening around the pipe sealed so as to be water- tight, and a clear plastic tube attached to the pipe within the manhole and extended vertically to the top of the manhole. Prior to connecting the tube, air shall be blown through the pipe with sufficient pressure to clear the line. Upon satisfactory completion of the tests, the ground water gauges shall be removed and the openings in the manhole walls neatly and permanently closed with a non-shrink and non-

metallic grout.

A3. When the crown of the pipe is covered with two feet or more of water at the highest point in the test section, an infiltration test shall be conducted.

A4. Where the surface of the ground water is less than two feet above the crown of the pipe, exfiltration tests or, for sewers 8-inches through 21 inches in diameter, air tests shall be conducted.

A5. Air tests shall not be used when the crown of the pipe is covered with more than two feet of water.

A6. In all cases, for any test section failing to meet the limits of the specifications, the Contractor shall be required to locate and remedy the defects causing the failure and the section shall be retested and repairs or replacement continued until the limits of the specifications are satisfied. For sewers not accessible and not having connections of existing service connections, should a test fail due to other than a leaking plug, a TV inspection of the test section shall be conducted at the expense of the Contractor to determine the cause of the failure.

A7. All manholes shall be subjected to a vacuum test or an exfiltration test.

A8. All visible leakage in sewers and manholes shall be repaired, even though tests may have been satisfactory.

A9. All plugs used during leakage tests shall be of a length at least equal to the diameter of the pipe being tested to assure a watertight seal. Pneumatic plugs for air testing shall be able to resist internal test pressures without requiring external blocking.

B. INFILTRATION TESTS - Infiltration tests shall be conducted after backfilling is completed to a sufficient height to prevent flotation of the pipe. The length of sewer subject to

each test shall be the distance between two adjacent manholes as a minimum, but shall be left to the discretion of the Engineer. The test section shall be isolated and all service connections and stubs within the section shall be capped or plugged to prevent the entry of ground water. The infiltration shall be measured by a V-notch weir located in the downstream manhole. The test head shall be maintained for not less than 24 hours before a weir measurement is made. The maximum allowable leakage, including manholes, shall be 100 gallons per inch of diameter per mile of pipe per day.

C. EXFILTRATION TESTS - The length of sewer subject to an exfiltration test shall be the distance between two adjacent manholes as a minimum, but shall be left to the discretion of the Engineer. The inlets of the upstream and downstream manholes shall be closed with watertight plugs and the test section filled with water until the elevation of the water in the upstream manhole is two feet above the crown pipe in the line being tested, or two feet above the existing ground water in the trench, whichever is higher. A standpipe may be used instead of the upstream manhole for providing the pressure head when approved by the Engineer. Exfiltration shall be measured by determining the amount of water required to maintain the initial water elevation for one hour from the start of the test. The one-hour period shall begin after allowing a time for absorption as previously stated. The maximum allowable leakage, including manholes, shall be 100 gallons per inch of diameter per mile of pipe per day; however, if the average head in the section being tested exceeds two feet, the allowable leakage can be increased by 5% for each additional foot of head.

D. AIR TESTS - After backfilling, air tests shall be conducted between two consecutive manholes in accordance with ASTM F 1417 latest revision, except as modified by these

specifications. Prior to conducting air tests on air permeable pipe, the walls of the pipe shall be dampened. Dampening of the pipe walls and obstruction testing may be accomplished at the same time by propelling a snug-fitting inflated ball or other approved device through the pipe with water.

D1. Each end of the section to be tested and all pipe outlets in the section shall be plugged with suitable test plugs. One plug used at a manhole shall have an inlet tap or other provision for connecting an air hose from the air supply equipment. The equipment shall include valves to control the rate at which air flows into the test section and pressure gauges with minimum graduations of 0.1 psi and an accuracy of + 0.04 psi to monitor the air pressure within the test section.

D2. Air pressure shall be applied slowly to the test section until the pressure reaches 4.0 psi, plus an adjustment of 0.433 psi for each foot of ground water above the crown of the pipe being tested. Internal air pressure, including adjustment for ground water, should never exceed 5.0 psi.

D3. When the pressure reaches 4.0 psi, plus adjustment for ground water, the air supply shall be throttled so that the internal pressure is maintained between 4.0 and 3.5 psi, plus adjustment for ground water, for at least two minutes to permit temperature stabilization. When the pressure has stabilized and is at or above 3.5 psi, plus adjustment for ground water, the air supply shall be disconnected and a stop watch started and allowed to run until the pressure has dropped 1.0 psi.

D4. The permissible time allocated for the 1.0 psi pressure drop shall be calculated on the basis of the diameter and length of main sewer tested and no adjustment shall be made for service connections included in the test section. The air test for a section shall be considered

acceptable if the time elapsed for the 1.0 psi pressure drop is equal to or greater than the time indicated in the following table:

MINIMUM HOLDING TIME IN MINUTES AND SECONDS REQUIRED FOR
1.0 PSI PRESSURE DROP
LENGTH OF MAIN LINE TESTED*

Pipe <u>Dia.</u>	100'	150'	200'	250'	300'	350'	400'	450'
8"	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10"	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12"	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15"	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18"	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41

*Time for intermediate lengths shall be interpolated.

D5. The Contractor may air test sections before backfilling the trenches as a check for defects and workmanship. Such tests are at the option of the Contractor and are not a substitute for tests required after backfilling has been completed.

E. **VACUUM TESTS** - Vacuum test shall be performed by County Agency personnel and the Contractor shall pay the established testing rate per manhole structure to be tested. Any manhole tested by Vacuum method shall be tested at five inches (5") Hg for 5 minutes with zero loss of Hg during the test period.

E.1 Manholes subjected to Exfiltration testing shall require plugging the sewers at the manhole walls and lift holes then completely filling the structure with water. When filling with water, the water shall stand for one hour to allow saturation of the manhole. The manhole shall then be refilled to the original level and, after an additional two hours, the difference in water

surface elevation from original to final level measured and converted to gallons per hour lost. The allowable leakage in manholes shall be 100 gallons per inch of diameter per mile of pipe per day. Should the ground water table be at or above a level of one-half the depth of the manhole, an infiltration test may be conducted by including the manhole in the section of sewer being tested, following approval of the Engineer.

1.20 SEEDING - The Contractor shall seed the backfilled trenches, other excavations and any other areas disturbed in the performance of his work in which, as determined by the Engineer, lawns or grass existed prior to construction in accordance with Section 816, 917, Tables 816-1 and 917-1 as specified in the 2003 Michigan Department of Transportation Standard Specifications for Construction. The Contractor shall take special care to insure that backfilling over trenches or other excavations are well compacted prior to seeding. If the trenches settle after the seeding is completed and during the duration of the term of the Contract, the Contractor shall fill the settled areas with approved topsoil, re-fertilize and reseed the areas as herein specified.

1.20a In all areas to be seeded, a 4-inch layer of approved topsoil shall be provided. All wheel marks or other evidence of damage shall be similarly carefully prepared for seeding.

1.20b After the topsoil has been applied and leveled as above specified, all areas to be seeded shall be given an application of an approved Class A chemical fertilizer nutrient, applied at the rate of 228 pounds per acre. Immediately prior to seeding, the area shall be raked sufficiently to thoroughly mix the fertilizer with the topsoil.

1.20c Unless called out differently in the plans, grass seed shall be THM mix as stipulated in Table 816-1, contain the seed mixtures proportions noted in Table 917-1 and shall be applied at the rate of 220 pounds per acre.

1.20d If certain disturbed lawns are of better quality than the specified seed will produce, as determined by the Engineer, the Contractor shall furnish seed for these specific lawns that will produce a lawn of equal quality.

1.20e The specified seed shall be uniformly sown at the rate noted above. Seed shall be sown dry or hydraulically. No seeding shall be done during windy weather or when the ground is frozen, muddy or otherwise non-tillable. After seeding, the ground shall be raked so as to cover the seed to a depth of approximately 1/4-inch and the area covered with a non-toxic mulching material. Mulching material meeting the requirements of Section 917.15 shall be placed over all seeded areas at the rate of approximately 2 tons per acre. All mulching material shall be securely anchored in accordance with Section 816 or otherwise kept in place by a method approved by the Engineer. In the event any mulching material is displaced, it shall be replaced, but only after the seeding. And other work preceding the mulching, damaged because of the displacement of the mulching material has been acceptably repaired.

1.20f The Contractor shall properly protect and care for all lawn areas until the grass is a well established dense uniform growth at least 4-inches high. At that time, all excess mulch shall be removed from seeded areas, and then all grass shall be mowed. The Contractor shall be responsible for the grass for two weeks after this mowing. If the grass shows a good growth and a dense stand at this time, the Contractor's obligations shall have been fulfilled except for the repair of future settlement.

1.20g For all seeded areas, any spots that do not show a prompt "catch" shall be re-seeded at intervals of 21 days, which shall continue until a good growth is established over the entire seeded area. The methods pursued in the renewal or replacement of lawn areas shall be as previously specified. Areas damaged due to acts of neglect by residents or vandalism shall be re-sown at the Owners/Contractors expense.

1.20h The cost of seeding operations and the furnishing of all materials shall be included in the price bid per lineal foot for the pipe.

1.21 REMOVAL AND REPAIR OF TREES - Trees and bushes which are in the immediate vicinity of the route of construction and the complete destruction of which cannot be prevented, using open cut type construction, shall be tunneled under. Tunneling shall be required within that area described by drawing a circle centered on the tree having a diameter in feet equal to the tree diameter in inches.

1.21a Other trees, tree limbs and bushes that are so located that equipment of the Contractor will damage same during construction shall be carefully trimmed and shaped by workmen skilled in tree trimming. All limbs and branches shall be flush cut. All exposed surfaces in excess of 1-inch diameter shall be immediately painted with an approved pruning compound. Trees and bushes, which are destroyed or damaged to the extent that their continued life is impaired, shall be replaced by the Contractor at his expense and to the satisfaction of the Owner.

1.21b Prior to final payment of the work, the Contractor shall employ a competent arborist to inspect all trees and shrubs along the line of the work and to properly trim, prune, repair and protect any that have been damaged, and to designate those which have been so damaged as to require replacement.

1.22 REMOVAL OF EXCAVATED MATERIAL AND STORAGE OF MATERIALS - All excess excavated material, which has been stockpiled at the work site, and which will not be used for backfill or other fill purposes, must be removed from the project area within forty-eight (48) hours. In all cases, stockpiles of all excavated material and all construction materials shall

be of limited size and shall be neatly maintained in such a manner that they will not block existing drainage or be hazardous to pedestrian or vehicular traffic in any way. The Owner and the Engineer shall control the limitation relative to the stockpiling of all excavated material and all construction materials.

1.22a The Contractor shall assume all responsibility relating to placing excavated material, excess excavated material and construction materials on private property. Such responsibilities shall include but not necessarily be limited to securing written approval of the property owner, applicable property use permits and or fill permits from units of government of jurisdiction, maintaining property drainage, security, property restoration after construction is completed, leveling any excess excavated material and not adversely affecting adjacent properties.

1.22b The removal and disposal of surplus excavated material shall be the responsibility of the Contractor, but the location of disposal areas shall be subject to the approval of the Owner. The Owner shall be provided with any surplus material desired and the Contractor shall deliver same to the dump site(s) shown on the drawings. Haul routes to the dump sites shall be approved by the Owner. Any surplus material over and above that desired by the Owner shall become the property and responsibility of the Contractor.

1.22c The Owner will maintain the dumpsites noted on the plans; however, the Contractor shall be responsible for the condition of all haul routes, including dust prevention. The Contractor shall immediately remove and clean all materials spilled or tracked on the haul routes.

1.23 PREVENTION OF AIR AND WATER POLLUTION THROUGH DUST AND DIRT

CONTROL - It shall be the responsibility of the Contractor to prevent air and water pollution through dust and dirt control to the satisfaction of the Owner and the Engineer in the following areas:

1. In the streets, sidewalks and drives within the limits of the Contract.
2. Any haul roads leading to or away from the project that are used by the Contractor, his sub-contractors and his material suppliers.
3. Take all necessary steps to prevent soil from eroding onto all paved areas and into all natural watercourses, ditches and the public sewer system.

1.23a The following methods of control shall be used:

1. The streets and haul roads shall be swept by an automatic self-contained mechanical sweeper.
2. All excessive dirt that gets on the pavement shall be removed by means of hand shoveling or appropriate mechanical equipment and the area swept as in Method a. above.
3. Sidewalks and driveways shall be cleaned by means of shovels and hand brooms or approved mechanical equipment.
4. If authorized or directed by the Owner or the Engineer, any dust remaining shall be controlled in accordance with the Monroe County Road Commission.

1.23b The Contractor shall comply with the above requirements on a daily basis.

1.24 **PROGRESS** - The Contractor shall be required to complete backfilling operations and general cleanup within a reasonable distance of trenching and pipe laying operations, and other excavations. The specific limitations of this paragraph shall be at the discretion of the Engineer, but the general intent is to require the Contractor to minimize the inconvenience to nearby residents or businesses.

1.25 MAINTENANCE OF TRENCHES AND EXCAVATIONS - At all times during the progress of the work and until release of the Contractor from his guarantee by the Owner, the Contractor shall maintain the backfilled trenches and other excavations. In particular, those trenches or excavations which are within 15-feet of the edge of pavements or the edge of traveled roadways shall be kept filled up to the same level as the adjacent undisturbed ground. Any settlement, which occurs during this period, shall be immediately filled in to prevent the possibility of accidents.

SECTION 2

SEWER PIPE FITTINGS

2.1 **GENERAL** - This item covers the tees, wyes, bends, and stoppers necessary for service connections, to construct drop manholes or as otherwise required in connection with the construction of the sewers.

2.1a All sewer pipe fittings and appurtenances shall meet the requirements previously specified in Pipe Sewers for the corresponding type of pipe and, as applicable, the following supplemental requirements:

2.1b ABS composite and solid wall pipe fittings shall meet the requirements previously specified for ABS composite and solid wall pipe. Tees provided in the main lines for service connections shall be factory made in line type or saddle type fittings. Pipe saddle connections shall be solvent cemented, with the saddle position maintained during cementing by two cinching straps, which shall be left in place.

2.1c PVC plastic pipe fittings shall meet the requirements previously specified for PVC plastic pipe. Wyes provided in the main lines for service connections shall be factory made in line type fittings.

2.2 **INSTALLATION** - Fittings shall be located as approved by the Owner or Engineer and methods of laying and jointing shall be as previously specified in Pipe Sewers.

2.2a Service connections not immediately connected to an existing sewer shall be closed with a pipe stopper, as subsequently specified. A **2"x 4"** location stake, **PAINTED BROWN**, shall be placed vertically at the plug and extended to 1-foot **above** grade. Any connection into the new sewer shall be accomplished by the use of proper fittings.

2.3 PIPE STOPPERS - Pipe stoppers (or end caps) shall be provided to close service connections not immediately connected to an existing sewer and stubs provided for future sewers. Pipe stoppers shall be designed for use as a permanent or temporary plug and shall be watertight and airtight. Pipe stoppers, for 6-inch connections, shall be removable without damaging or cutting pipe. Any pipe damaged when installing or removing any pipe stopper shall be replaced at the expense of the Contractor.

SECTION 3

MANHOLES

3.1 **SCOPE & DESIGN CRITERIA** - This item shall include the materials and construction of the manhole structures as shown on the drawings, the furnishing and installation of cast iron frames and covers, and drop manhole connections.

3.1a Manholes shall be located at all locations of change in alignment and changes in invert elevations. The spacing provided between manhole structures shall not exceed a distance 350 feet.

3.1b All manhole structures shall be appropriately and consecutively numbered on the plan and profile sections of the plan sheets. The numbering shall also be a different designation than used for storm drainage structures.

3.2 **BASES** - Bases for manholes shall be of the pre-cast reinforced concrete, with bottom integrally cast with the sides conforming to ASTM C-478 latest revision and C-443 latest revision. Bottom reinforcement shall be adequately tied to side reinforcement. Bases shall incorporate provisions for making a flexible joint between the pipe and the manhole. These flexible joints shall be Dura-Seal as manufactured by DuraTach, Inc.; Kor-N-Seal as manufactured by National Pollution Control Systems, Inc.' Pressure Wedge II as manufactured by Press Seal Gasket Corporation; Flexible Manhole Sleeve as manufactured by Interpace Corporation or equal. Joints shall be shock absorbent and shear resistant; shall be designed to prevent any direct contact between the pipe and manhole; and shall provide a tight, infiltration proof sewer connection with the pipe deflected up to 12 degrees in any direction.

3.2a Bases shall be approved by the Engineer prior to installation. Bases shall be set plumb and at proper elevation on a cushion of granular material as approved by the

Engineer. Should incorporation of the flexible joints require a base greater than 48-inch I.D., the Contractor shall furnish and install a transition section to go from the larger base to the 48-inch I.D. concrete ring walls subsequently specified. All joints between bases and manhole sections shall incorporate rubber 'O' ring gaskets. After installation of the pipes the Contractor shall provide a Class II concrete invert through the manhole. The invert shall have a depth through the manhole equal to the radius of the sewer pipe and shall slope upward toward the manhole walls from above the centerline of the sewer pipe approximately 3-inches. Concrete shall be troweled smooth and shall be placed so as not to interfere with the flexibility of the joint. The grade of the concrete channel provided in the manhole shall match the main line pipe grade unless the channel provides a 90° change in alignment whereby a 0.10-foot fall between the inlet and outlet invert within the manhole shall be provided.

3.3 CONCRETE RING WALLS - Manholes shall be constructed with vertical concrete ring walls having an I.D. of 48-inches, except for the top section which shall narrow down eccentrically to the proper diameter to receive the cast iron frame and cover.

3.3a Concrete rings shall be reinforced with steel wire mesh and shall meet the requirements of ASTM C478, except they shall not be less than 5-inches thick. Adjoining rings shall be firmly keyed together by means of tongue and groove joints with rubber O-ring gaskets meeting the requirements of ASTM C443. Concrete rings shall be appropriately marked for purposes of identification and shall be subject to inspection and rejection at the factory, trench or other point of delivery.

3.3b The cast iron manhole frame shall be set at the proper elevation by use of pre-cast concrete adjusting rings, furnished with bolt holes pre drilled for water tight casting

anchorage, placed on top of the eccentric conical section. The rings shall be held in place with a mastic sealer, Ram-Nek or approved equal. The adjusting rings shall be a minimum of 4-inches in height and shall not exceed 16-inches in height.

3.3c Cone sections shall be furnished with four threaded inserts “sure grip” or approved equal and 4 stainless steel 5/8” threaded studs, 3/4”x2”x1/16” thick flat washers and nuts to anchor the water tight frame and cover to the cone section. Adjusting rings shall be furnished with predrilled holes matching the location of the cone section threaded inserts.

3.4 **STEPS** - Steps shall be provided in all manholes. Steps shall meet the requirements of ASTM C478 and shall be of aluminum or of reinforced polypropylene.

3.4a Aluminum manhole steps shall be of the drop-front design, with non-skid grooves and a minimum 2-inch vertical hook on the embedded ends, and shall be made of aluminum alloy conforming to Federal Specification QQ-A-200/8, having a minimum tensile strength of 38,000 psi and minimum yield strength of 35,000 psi. Steps shall have an elongation of not less than 10% in 2-inches and shall carry a load in the center of the cross bar of 1,500 pounds when projected 4-inches from the wall without permanent deformation.

3.4b Reinforced polypropylene steps shall consist of 3/8-inch steel reinforcing rod/encapsulated in a copolymer polypropylene plastic and shall incorporate a notched tread ridge and retainer lugs on each side of the tread ridge. The steel rod shall be continuous through the entire length of legs and tread. Steps of the press fit type, driven into tapered hole in the cured concrete wall, shall have an average pullout resistance of 2,500 pound per leg, as evidenced by test data.

3.5 **DROP MANHOLES** - Drop manholes shall be constructed at all points where one sewer intersects another and the difference in invert elevations exceeds 18 - inches.

3.5a Manholes shall be of the materials and construction as previously specified and, in addition, an interior drop connection shall be provided. The interior drop connection piping shall be anchored to the manhole wall using stainless steel straps, nuts, bolts and washers. The location of the drop connection may require rotation of the top cone section of the manhole and manhole steps. The drop connection shall consist of a tee at the upper end connected into the manhole, a vertical section of pipe, and a 90-degree bend at the lower end angled to direct the flow to the manhole channel oriented in a downstream flow direction. Where called and approved, exterior drop connections shall have the whole exterior drop connection piping encased in concrete. Compacted granular backfill shall be used in place of concrete where approved plastic pipe is used. The pipe and the sewer pipe fittings shall be of the same material as used for the main sewer. The diameter of the pipe shall be two sizes smaller than the main sewer, but in no case shall it be less than 8-inches in diameter. The upstream end of the tee, when not immediately connected to a sewer, shall be provided with a pipe stopper as previously specified.

3.6 **BACKFILLING** - Upon completion of the manhole, the space between the walls and face of the excavation shall be backfilled in the same manner as specified for the appropriate method of sewer construction. Where manholes are located in existing ditches, ditches shall be reformed around the manholes.

3.6a Where manhole structures fall within the influence of public road pavement areas, the manhole shall be backfilled in accordance with the requirements previously specified for sewer pipe located within the influence of road pavements.

3.7 MANHOLE FRAMES AND COVERS - All manhole frames and covers shall be gray iron castings conforming to ASTM A48, and shall be East Jordan Iron Works 1040 ZPT water tight frame and bolted water tight solid cover, Neenah Foundry Company R – 1916-F water tight frame and bolted water tight solid cover, CertainTeed PAMTIGHT CDPE70AF, or approved equal. All frames shall be furnished with anchor bolt holes predrilled and covers shall be of the bolted solid watertight type. Both the underside of the lid and the upper surface of the ledge upon which the lid rests shall be machined so as to prevent rocking of the lid on its supporting surface. Castings shall be cleaned and coated in coal tar pitch varnish at the factory.

3.7a The frames shall have a clear opening of not less than 24-inches in diameter and a height of 7-inches. Covers shall have strengthening ribs on the underside and shall have the words “SANITARY SEWER”, cast into the top.

3.7b After installation, the tops of the frames and cover shall be painted with one coat of asphalt paint.

3.8 FRAME AND COVER INSTALLATION - The manhole frames shall be firmly set on top of the adjusting rings with a mastic sealer, Ram-Nek or approved equal and anchored with the stainless steel studs, washers and nuts previously specified. Where manholes are located in paved areas, the surface of the cover shall be made flush with the pavement surface. In unpaved streets and alley areas, the cover shall be set not to exceed 1-inch above the ground surface. On right-of-way and in ditches cover elevation shall be as approved by the Owner or the Engineer.

3.9 STUBS OUT OF MANHOLES - Where required, one length of the proper size and class of sewer pipe shall be laid out of manholes for future sewer connections. An

appropriate pipe stopper shall be installed in all stubs. The pipe and pipe stopper or end cap shall be as specified in Pipe Sewers and Sewer Pipe Fittings respectively.

3.10 MANHOLE REHABILITATION – All existing sanitary sewer manholes called out on the plans to be raised, adjusted and or rehabilitated shall have the total chimney section of the manhole structure sealed water tight. The Contractor shall furnish and install External Manhole Chimney Seal as manufactured Cretex Specialty Products. All requirements of the manufacturer shall be followed to install the chimney seal.

SECTION 4

PUMP STATIONS

4.1 SCOPE & DESIGN CRITERIA – This item shall include the materials and construction of wastewater treatment pump station as shown on the drawings, the furnishing and installation of all components for a complete and operational pump station. The pump station shall be designed and provided in accordance with the requirements of the Recommended Standards for Wastewater Facilities (Ten States Standards), the MDEQ Sewage Pumping Station Checklist, the Owner, and the standard pump station plan details. The MDEQ Pump Station Checklist requirements are included in these specifications by reference and all sewage pump station plans, specifications, calculations and details shall be accompanied with the MDEQ Pump Station Checklist noting by check mark all items included in the pump station design.

- 4.2 GENERAL** – All sanitary sewer pump stations shall be provided the following:
- a. Five year warranty from time of start up.
 - b. 3-phase and 480 volt electric service.
 - c. All exposed electrical conduit shall rigid galvanized steel and sleeved when penetrating concrete slabs.
 - d. Any cabinetry, hatches and or devices requiring locks shall be locked with 2072 pad-locks.
 - e. Telephone service and lines shall be provided for all warning and telemetry systems.
 - f. All weather driveways sized to accommodate the maximum size service truck used by the County Agency shall be provided to access the pump station wet well and control panel.
 - g. Gates and drives shall be located to and designed to provide easy access to the wet well.

- h. If a flow meter is provided, Doppler flow meters shall be provided for stations not requiring billing accuracy. Where billing accuracy is required, a magnetic flow meter shall be installed with by-pass for service.
- i. A building or shed large enough to enter to house controls shall be provided at all submersible pump stations.
- j. If calibration equipment is required to set up the flow meter or any other equipment supplied in the station, the calibration equipment shall be furnished and turned over to the Owner.
- k. A minimum of five (5) O & M manuals will be provided to the owner. The manuals shall contain cut sheets (not copied catalog pages) for all installed equipment and must clearly indicate what specific equipment has been provided.
- l. Pumps shall be Vaughn Chopper Pumps.

4.3 CONTROLS – The following Control equipment shall be provided:

- a. Oversized stainless steel cabinets for easy maintenance and future additions are required. A single cabinet shall house all control equipment including telephone, alarm systems, flow equipment, etc. NO ENTRIES IN THE TOP OF THE CABINETS WILL BE PERMITTED.
- b. Condensation heaters and thermostats are required in unheated cabinets.
- c. Resettable run-time indicators for pump motors are required.
- d. All parts, relays, and switches will be identified with embossed, not tape-type, labels.
- e. High quality selector switches – not toggle switches – will be used in control panels.
- f. NEMA rated motor starters are required.
- g. If a cabinet is used in direct sun light, thermally compensated motor starters will be used.
- h. A light and duplex receptacle is required.
- i. An indicator will be provided showing wet well level.
- j. Intrinsically safe relays are required on float systems.
- k. Phase failure and low voltage protection will be provided separately for each pump control with auto-reset capability.

- l. The control transformer shall be sized to also power the generator controls and block heater.
- m. Liquid level controllers shall be A) individual pressure switches, B) Gorman Rupp EBS 2000, C) Mercoïd MPC, D) or approved equal by the Owner.
- n. RACO (cb8) chatterbox alarm system shall be required.
- o. Sleeve style wire markers will be used each and every place wire is terminated or needs identification.
- p. Drawings with wire number identification will be laminated and attached to the panel door.
- q. The lag pump controls will not be dependent on the lead pump controls to function.
- r. All strands of each multi-stranded wire shall be trimmed or neatly and fully inserted into the panel.
- s. Bubbler liquid level control shall be provided on the sewage pumping station.
- t. Pumping to allow bubble tube to be blown out directly from air storage tanks will be provided.
- u. A selector shall be provided to switch from normal operating controls to emergency float operation. The high and low level floats shall function with both control systems.
- v. Wires, tubes, etc will not be fastened to cabinets with adhesive stick-on holders. Screws with tapped holes must be used.

4.4 Wet Well – Requirements:

- a. Floats will be mounted on Stainless steel chain with suitable anchor.
- b. If submersible pumps and floats are used, conveniently located splice boxes must be provided.
- c. No splices of any kind are allowed inside of the wet well.
- d. Conduits and hatches shall be positioned so a worker can easily reach conduit to remove pump and float cords without entering the wet well.
- e. If pump cords are pulled into conduit, the conduit must be sized according to percentage fill based on cord size, not conductor size.
- f. If valve pits are used they shall gravity drain into the wet well. The gravity discharge piping shall be equipped with a trap and discharge into the wet well

below the low water level or a trap with gas and water tight valve must be used.

- g. All hardware, nuts, slide rails, chain, universal links installed in the wet well shall be of stainless steel.
- h. A five (5) float back up system is required. The floats shall consist of: lead float start, lag float start, pump off float, high level float, and low level float. The high level floats shall be tied to the telephone alarm system and the low level float shall latch the pumps off.

4.5 GENERATOR – Requirements:

- a. A pad mounted stationary emergency generator with auto transfer switch is required.
- b. Alarm contacts from the generator system to the auto-dialer shall consist of: A) generator trouble, B) low fuel and fuel tank rupture, C) load shifted from normal to emergency.
- c. Generator fuel tanks will be filled with fuel before start-up.
- d. Exposed conduits shall be rigid galvanized and sleeved when penetrating concrete slabs.
- e. Warranty shall be five (5) years from start-up.

4.6 SPARE PARTS – Requirements:

- a. One identical spare pump shall be provided.
- b. Spare parts will be provided, one spare for each type of bulb, fuse, relay, and printed circuit installed. In place of a spare motor starter relay, a set of contacts and spare coil will be acceptable.

SECTION 5

PAVEMENT REPLACEMENT

5.1 **SCOPE** - This item shall include the providing of permanent pavement replacement, except as noted, of HMA bituminous pavements, which are damaged or removed in connection with trenching or other operations. Gravel or stone roadways, driveways or parking areas are not classified as pavements and shall be replaced to a condition similar or better to that existing before the start of the project, at the expense of the Contractor, with a minimum of 8 inches of compacted 23 A stone to be provided.

5.1a The 2003 Michigan Department of Transportation Standard Specifications for Construction shall be followed insofar as applicable. Driveways and parking areas shall be classified as pavements according to the materials of construction.

5.1b **All work shall be approved by the Monroe County Road Commission.**

5.2 **PAVEMENT REMOVAL** – Pavement shall be removed to limits shown on the plans and the method of removal shall be in accordance MDOT Section 204.

5.3 **TEMPORARY PAVEMENT** - In all paved streets and / or highways, immediately upon completion of backfilling operations, the contractor shall provide permanent pavement replacement as detailed in the plans and approved by the Monroe County Road Commission. In cases where permanent pavement replacement cannot be immediately provided, temporary pavement shall be provided to open the roadway travel lanes to traffic movement. Temporary trench pavements may include the use of steel plates, temporary HMA bituminous pavement surface, aggregate base and cold patch material or a combination of these methods. Any temporary measure to be provided to open the roadway to traffic movement shall be approved by the Monroe County Road

Commission and be in accordance with their requirements. The contractor shall be responsible to monitor and provide maintenance to any temporary pavement measures to maintain a safe traffic surface condition.

5.4 PREPARATION - Prior to the replacement of the permanent pavement, any temporary pavement provided shall be removed and the existing pavement removed to a neat straight edge 12 inches each side of the trench in accordance with MDOT Section 204.

5.4a Any excess granular material placed under the appropriate item of construction shall be removed to allow for the placement of the permanent pavement in accordance with the plan details. If required, additional mechanically tamped granular material shall be provided to fill all depressions and bring the base to the proper elevation. If, in the opinion of the Engineer or the Monroe County Road Commission, the aggregate base is not adequately compacted and keyed, the Contractor shall be required to scarify the base to a sufficient depth and work the aggregate in with mechanical tampers or vibratory devices to obtain maximum compaction condition as called out in the plans. The compacted aggregate shall have a firm, even surface ready for the placement of the permanent pavement. All excess material shall be removed.

5.5 PERMANENT PAVEMENT REPLACEMENT – Permanent pavement shall be replaced in accordance with the details shown in the plans and MDOT Sections 501 and 502. For existing bituminous concrete driveways and parking areas having a pavement sealer, as determined by the Engineer or Monroe County Road Commission, not less than 60 days after replacement of the permanent pavement a pavement sealer shall be provided on the surface from the property line to the edge of the roadway at the expense

of the Contractor. The pavement sealer shall be Jennite J-16, or equal and shall be applied in strict accordance with the manufacturer instructions.

5.6 SHOULDERS, CURBS, GUTTERS, ETC. - All shoulders, curbs, curb drains and curbs and gutter on either side of the pavement which are damaged or removed during construction must be replaced to their original condition as found. For shoulders, the surface shall be scraped clean of all mud, including contaminated material, to a depth of not less than 2 inches and new 23A stone placed and compacted as required.

5.7 MONROE COUNTY ROAD COMMISSION - Any requirements in this section which may be inconsistent or in conflict with the requirements of the Monroe County Road Commission, the Monroe County Road Commission shall govern, to the extent of the inconsistency or conflict.

SECTION 6

EXISTING SEWER AND DRAIN REPLACEMENT

6.1 **SCOPE** - This item shall include all labor, materials, tools and equipment to complete Existing Sewer and Drain Replacement as herein specified. All existing sewers and drains, which must be removed or are damaged during trenching or other operations shall be replaced in a workable condition equal to or better than that found. Existing pipes, tiles, etc. in good condition and not damaged during removal may be re-laid upon the approval of the Engineer.

6.1a The Owner, reserves the right to change the location of the proposed improvements in order to avoid existing sewers and drains.

6.2 **REPLACEMENTS** - The Contractor is cautioned to use the greatest care in reporting to the Engineer all existing sewers and drains lines exposed during trenching or other operations. The requirements of Sections 401, 402, 404, & 909 of the 2003 MDOT Standard Specifications for Construction shall be followed insofar as applicable.

6.2a Drains of perforated pipe or open joints shall be replaced with perforated pipe. Joints between existing and replacement pipes, when of differing materials or with otherwise non-compatible joints, shall be made using banded neoprene couplings as manufactured by Fernco, Inc., or equal.

6.2b Existing sewers and drains shall be replaced so as to withstand future settlement by bridging with timber supports a minimum of 6 inches square. Bridging shall extend into undisturbed earth a minimum of 12 inches each side of the trench, and the pipe, tile, etc., banded or tied to the bridging for its full length. Where timber bridging cannot be supported by a firm foundation, the Contractor shall provide vertical support for the bridging, including lateral bracing necessary to provide a firm and substantial support.

Supports, bracing, etc., shall be of native hardwood and shall be provided at the expense of the Contractor.