

**Monroe County
Drain Commissioner**



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**STORM SEWER SPECIFICATION
MONROE COUNTY DRAIN COMMISSIONER
1005 S. RAISINVILLE ROAD
MONROE, MICHIGAN**

March 2012 Revision

STORM SEWER SPECIFICATIONS
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GENERAL CONDITIONS

STORM SEWERS

- 1) Definition of terms as used in these standards and specifications.
 - a) Owner: Monroe County Drain Commissioner.
 - b) Engineer: Staff Engineer of the Owner or the engineering firm or company hired as consultants for the project.
 - c) Project: The proposed storm 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 has been accepted by the Owner.
 - e) Contractor: The individual firm or corporation who is awarded the contract to construct the storm 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) Construction schedule shall be furnished to the Owner at the preconstruction meeting.
- 4) Prior to commencing construction, the Contractor shall obtain a Permit to Construct from the Owner. The Contractor shall also receive required state permits, agreements, financing and have held a preconstruction meeting before commencing construction.
- 5) Any requirements of the following specifications which may be in conflict with the manufacturer's recommendation; the manufacturer's recommendation shall govern to the extent of the conflict.
- 6) To protect underground utilities, the Contractor shall contact "Miss Dig" by calling 1-800-482-7171 at least seventy-two (72) hours, (three (3) working days, prior to commencing

construction.

- 7) 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 Road Commissioner for such work.

- 8) Maintenance of flow - during construction, where existing sewers are encountered and are interfered with, flow shall be maintained in the existing sewers. Storm water must be handled by the Contractor, with the approval of the Owner by temporarily pumping to a satisfactory outlet; and shall not be pumped, bailed or flumed over the street; or by

- providing a temporary conduit to maintain flow through the trench or other excavation.
- 9) At no time shall storm sewer flows be permitted to discharge into any sanitary sewer system.
 - 10) All storm sewers installed as a part of the Owner's system shall have the installation and acceptance testing inspected and witnessed by the Engineer in accordance with these specifications. The contractor shall provide the Owner with 48 hours notice prior to initiating construction or scheduling acceptance testing procedures.
 - 11) AS – BUILT PLANS – Unless approved otherwise by the Owner, the Agency providing the design storm sewer construction plans shall be responsible to provide AS – Built Construction plans within 45 days after the completion of the storm 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 bond sets of 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 plans do not need to be furnished with the designer's As – Built bond plan sets. The Design Agency shall also furnish one electronic file each 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). GPS coordinates of all outlet pipes into MCDC Drains shall be provided on the plans using the SP NAD83 Harn.

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 storm sewers with all potential utility crossings and clearances shown in the profiles. All plans and specification shall be reviewed and approved by the Owner or his Engineer. The storm sewer shall be noted on the plan and profiles with stationing that is based upon the centerline of road.

1.1a All storm sewer pipe 12” diameter to and including 18” diameter shall be either reinforced concrete or P.V.C. All storm sewer pipes larger than 18” diameter shall be R.C.P. All storm sewer pipes located within road right of ways and or under influence of paved surfaces shall be RCP pipe. Storm sewer pipe located in side lot, rear lot and or grass surface areas may be PVC pipe, HDPE N-12 dual wall pipe or as previously stipulated.

1.1b Public storm sewer main pipe diameter size shall be $D \geq 12''$ and with the pipe diameter being justified by design calculations that are prepared and provided in accordance with the Owner’s requirements. All storm sewer systems shall be designed to transmit a 10-year storm, pipe flowing full conditions. The calculations shall further show that the 25-year Hydraulic Grade line of the storm sewer system will be less than any drain structure rim elevation. The HGL calculations and storm drainage calculations shall be prepared and provided in a separate spreadsheet format for review and approval by the Engineer. The 25-year HGL need not be plotted on the storm sewer profile sheets. 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 (12” @ .20% minimum) and shall have a minimum depth of cover over the storm sewer of

30-inches.

1.1c Storm 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 way on the opposite side of the road from sanitary sewer locations. Where storm sewers are approved to be located outside of road right of ways, storm drainage easements shall be provided on prescribed forms of the Owner or dedicated within approved plat and condominium documents. Specific easement widths shall be evaluated on case-by-case basis but typically will adhere to the following requirements:

- 99' wide open channel county drain R/W centered on the drain channel
- Tiled and or enclosed county drain easements established when the drain is enclosed
- 20' wide rear yard drainage swale
- 15' side lot storm sewer easement centered on the sewer pipe
- 15' to 20' interior easements centered on the pipe

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

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

1.2 **CONCRETE PIPE** - All sewer pipes shall be of the best quality cement concrete pipe of the spigot and socket pattern meeting the requirements of ASTM C76, latest revision, except as subsequently specified herein, and of the classes shown.

1.2a In addition to the requirements of ASTM C76, latest revision for reinforcement, the spigot and socket of each piece of pipe, regardless of pipe size, shall contain reinforcement such that the last line of circumferential reinforcement in the spigot end is located between the spigot shoulder and gasket groove at least 1-1/2-inches from the shoulder, and such that the last line of circumferential reinforcement in the socket end, upon making a joint, will overlap the last line

in the spigot.

1.2b Pipes shall be 72-inches or longer in length and of the greatest lengths commercially available. Pipes having elliptical reinforcing shall have the word “Top” or “Bottom” clearly stenciled on the inside of the pipe at the correct place to indicate the proper position when laid. No pipes shall be delivered whose age is less than twenty-one (21) days, regardless of whether they meet the strength requirements.

1.2c For pipes installed in open trench, the maximum allowable trench widths at the top of the pipe for the various sizes of pipe shall be as follows:

<u>MAXIMUM TRENCH WIDTHS FOR CONCRETE SEWER PIPE</u> (As measured at the top of the pipe)					
Pipe Dia. (inches)	<u>ASTM C76 - Class</u> (feet-inches)				
	I	II	III	IV	V
12"	---	2-9	2-9	2-9	3-0
15"	---	3-0	3-0	3-0	3-3
18"	---	3-3	3-3	3-3	3-6
21"	---	3-6	3-6	3-6	3-9
24"	---	4-0	4-0	4-0	4-3
27"		4-6	4-6	4-6	4-9
30"		5-0	5-0	5-0	5-3
36"		6-0	6-0	6-0	6-3
42"		7-0	7-0	7-0	7-3
48"		8-0	8-0	8-0	8-3

1.2d Joints shall be of the rubber “O” ring gasket type conforming to ASTM C443, latest revision. The gasket shall preferably be confined in a groove and shall be the sole element depended upon to make the joint watertight. The maximum tolerances permitted in the construction of the joint shall be those stated in the pipe manufacturer’s design.

1.3 **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 pull-out during the making of the joint. All 12-inch diameter and larger pipe shall be tested for deflection as subsequently specified.

1.3a Manufacturer fittings and stubs designed specifically for water tight connections shall be provided as required to meet the leakage requirements subsequently specified in this section.

1.3b The pipe shall be installed in accordance with ASTM D2321, latest revision, and with the requirements in 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.

1.3c The Contractor shall use extreme care when installing or handling the pipe in any way when the outside air temperature is below 50 degrees F.

1.3d The maximum allowable trench widths (as measured at the top of the pipe) for the various sizes of pipe shall be as follows:

<u>Pipe Dia.</u> (inches)	<u>Maximum Allowable Trench Width</u> (feet-inches)
6"	2' - 3"
8"	2' - 3"
10"	2' - 6"
12"	2' - 9"
15"	3' - 0"
18"	3' - 3"
21"	3' - 6"
24"	4' - 0"

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

1.3.1 HDPE N-12 DUAL WALL PIPE – High Density Polyethylene (HDPE) Dual Wall Pipe shall have annular exterior corrugations and a smooth interior wall. The pipe shall have a minimum pipe stiffness of 46 pii when tested in accordance with ASTM D2412, latest revision. The pipe material shall be impact modified copolymer polypropylene conforming to the requirements of ASTM D4101, latest revision.

1.3.1a The pipe shall be joined with an N-12 HP gasketed integral bell and spigot joint. The joint shall be watertight according to the requirements of ASTM D3212, latest revision. The spigot shall have an o-ring gasket meeting the requirements of ASTM F477, latest revision. The gasket shall be manufacturer installed and shall be provided protective wrapping until the pipe joints are installed in the field. Pipe joints shall be completed in the field using joint lubricant furnished by the pipe manufacturer.

1.3.1b Bell and spigot connections shall utilize spun-on, welded and integral bell and spigot with gaskets meeting ASTM F477, latest revision. Fitting joints shall meet water tight joint performance requirements of ASTM 3212, latest revision.

1.3.1c Installation shall be in accordance with ASTM D2321, latest revision, and the pipe manufacturer's recommended installation guidelines, with the exception that minimum cover for 12 through 30 inch diameters shall be 2.5 feet. Pipe trenches and backfill shall be in accordance with the details on the Storm Sewer Standard Detail sheets. The maximum allowable trench widths (as measured at the top of the pipe) for the various sizes of pipe shall be as follows:

<u>Pipe Dia.</u> (inches)	<u>Maximum Allowable Trench Width</u> (feet-inches)
6"	2' - 3"
8"	2' - 3"
10"	2' - 6"
12"	2' - 9"
15"	3' - 0"
18"	3' - 3"
21"	3' - 6"

24"	4' - 0"
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The actual trench widths used for installation may be in accordance with ASTM D2321, latest revision.

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.

1.6c Trench excavation shall include the removal of existing pavements and drain structures in the line of construction. Drain structures not in the line of construction, and noted to be removed shall be removed and backfilled in accordance with the requirements Section 203 of the Michigan Department of Transportation "Standard Specifications for Construction" and details noted in the construction plans.

1.6d 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, dewater 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 installation.

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.

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. The Contractor shall verify the location of all existing utilities and shall advise the Engineer of any discrepancy or conflicts.

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 in accordance with the following:

1.8a For pipe 21-inches in diameter and smaller, the material shall be placed around and over the pipe for a distance of 1-foot above the top of the pipe barrel.

1.8b For pipe 24-inches in diameter and larger, the material shall be placed around the pipe up to a horizontal plane even with the top of the pipe barrel. 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.

1.8c 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.

1.8d 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.

1.8e 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.

1.8f 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 time.

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.

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 90% 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 or control density material, the excess excavated material must be removed at the expense of the Contractor.

1.10g In all paved streets, and highways, immediately upon the completion of other backfilling operations, a temporary pavement meeting the requirements of the Monroe County Road Commission shall be provided and shall remain in place and be properly maintained until such time as the permanent pavements are placed. In asphalt concrete or surface treated macadam pavements, the temporary pavement shall be a minimum of 1 1/2-inches thick, but in no case shall it be less than that existing. In concrete, pavements, the temporary wearing course shall be 3-inches thick. The cost of the temporary pavement shall be included in the price bid per lineal foot for the pipe.

1.10h 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.

1.10i 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.

1.10j 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.

1.10k 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 along the proposed improvement and replace all drive connections which are disturbed during construction at his expense. If proposed ditch grades are not included in the plans, the Monroe County Road Commission shall establish all ditch grades to be restored prior to construction. 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.

1.11a Wood sheeting and bracing shall be of sound lumber suitable for the purpose intended and shall be so arranged as to support the trench walls and existing structures and utilities. Sheeting left in place shall be cut off not less than 18-inches below ground surface.

1.11b Sheeting and bracing that is not ordered to be left in place may be removed at the

discretion and responsibility of the Contractor after backfill has been placed and compacted to a level at least two feet above the top of the pipe. In no case shall sheeting be pulled in increments exceeding three to four feet in order to avoid the danger of breaking the pipe due to the weight of the backfill.

1.11e Where it is necessary to drive sheeting below the centerline of the pipe, it shall be driven below the bottom of the pipe, and that sheeting below a point two feet above the top of the pipe shall be left in place.

1.11f Following removal of sheeting and bracing, the space left due to such removal shall be filled immediately and the backfill recompact.

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

1.12a 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.

1.12b 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 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
0.500	38, 40 & 42
0.563	48
0.625	54

1.12c 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 manner that will allow future access for main replacement if required.

1.13 **SERVICE CONNECTIONS** - 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 green, shall be placed vertically at the plug and extended to 3-feet above grade.

1.13a 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 building for entry into the building will not be permitted. The lead shall be installed at a continuous grade from the wye or riser at the main sewer to the building.

1.13b 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.

1.13c 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.

1.13d 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.

1.13e Service connections shall be 4-inches diameter, unless otherwise shown and shall be installed for existing and future houses and businesses. Pipe material shall be PVC SDR35. 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 located within road right of ways using flexible manhole connectors (Kor-N-Seal as manufactured by The Core and Seal company or approved equal). Service connection to

roadway catch basins or rear yard drain structures shall not be permitted. No more than three (3) service lead connections are permitted into any 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

1.13f Final locations 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.

1.13g 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.

1.13h 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 1.0% grade and the pipe shall be laid in open cut, except where otherwise specifically required or permitted by the Engineer. 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.

1.14 CONNECTIONS TO STRUCTURES - When required, the new sewers shall be connected to structures through stubs provided for same or an opening shall be carefully made at the proper elevation in the wall of the structure, the pipe inserted and the opening around the pipe neatly and permanently closed with a non-shrink and non-corrosive grout. Grout shall be Five Star as manufactured by the U.S. Grout Corporation; Seal tight 588 Grout as manufactured by W.R. Meadows, Inc.; or approved equal. All connections shall be watertight. Where necessary the bottoms of existing manholes shall be reshaped to give a smooth flow in all directions. Pipe connections to structures located within the influence of roadway pavement shall be made using flexible boot connectors such as Kor-N-Seal Assemblies as manufactured by the Core and Seal Company or approved equal.

1.14a 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.

1.15 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.

1.15a 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.

1.15b 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.

1.16 **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 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.

1.17a 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.

1.17b 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.

1.17c 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.

1.18 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.

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.

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

1.19 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.

1.20 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.

1.21 MAINTENANCE OF FLOW - During the construction of the new storm sewers, where existing sewers are encountered and are interfered with, flow shall be maintained in the existing sewers. Sanitary sewage or other non-stormwater liquid must be handled by the Contractor either by connection into existing sanitary sewers, with the approval of the Engineer; by providing conduit to maintain flow through the trench or their excavation; or by temporarily pumping to a satisfactory outlet approved by the Engineer; and shall not be pumped, bailed or flumed over the street or ground surface. This also includes the maintenance of flow in all existing storm water service connections until their connection into the new storm sewers. Existing field tile drains shall be free to drain at all times.

1.22 REPLACEMENTS - Where any pavements, driveways, parking areas, curbs, gutters, berm stone, sidewalks, waterlines, gas lines, sewers, catch basins, inlets, headwalls, drains,

field tile, conduit pipes, cables or other existing facilities are removed or otherwise disturbed in carrying out this Contract, 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.

1.22a In any event, the Contractor shall be liable for any damage to public or private property caused by movement of equipment or by other operations and he shall repair or replace, to the condition existent prior to his operations.

1.23 **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.

1.23a 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.

1.23b 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.

1.23c 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.

1.23d 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.

1.23e 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.

1.23f 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.

1.23g 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.

1.23h The cost of seeding operations and the furnishing of all materials shall be included in the price bid per lineal foot for the pipe.

1.24 **LEAKAGE** - All visible leakage in pipes, sewers and related structures shall be repaired to the satisfaction of the Owner/Engineer at the expense of the Contractor.

1.25 **TESTING FOR DEFLECTION** - PVC 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.

1.25a 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 test.

1.25b 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.

1.25c The deflection probe shall be as available from Wortoco, 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.

1.25d 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 provided 1-3/4" ferrule loop insert or similar piece for attaching the pulling medium.

SECTION 2

SEWER PIPE FITTINGS

2.1 SCOPE - The fittings covered by these specifications include tees, bends, and stoppers necessary for service connections, or as otherwise necessitated in connection with the work.

2.2 CONCRETE PIPE FITTINGS - Concrete pipe fittings shall meet the requirements previously specified for concrete pipe. Each socket shall receive the spigot of the adjoining pipe to its full depth without chipping.

2.3 POLYVINYL CHLORIDE (PVC) PIPE FITTINGS - PVC plastic pipe fittings shall meet the requirements previously specified for PVC plastic pipe.

2.3.1 HDPE N-12 DUAL WALL PIPE FITTINGS – HDPE N-12 pipe fittings shall meet the requirements previously specified for HDPE N-12 Dual Pipe.

2.4 INSTALLATION - Fittings shall be located as approved by the Engineer and methods of laying and jointing shall be the same as those previously specified in Section 1. Connections into the new sewer shall be accomplished by the use of proper fittings and each connection shall incorporate an appropriate adapter as manufactured by Fernco, Inc., Joints, Inc., or equal, to provide a flexible, watertight joint between the branch on the fitting in the main line and the service connection. The cost of providing the adapters shall be included in the respective prices bid for the appropriate fittings.

2.4a 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 green, shall be

placed vertically at the plug and extended to 3-foot above grade. Any connection into the new sewer shall be accomplished by the use of proper fittings.

2.5 PIPE STOPPERS - Pipe stoppers (or end caps) shall be provided at the expense of the Contractor 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, for 4-inch service connections, shall be removable without damaging the pipe. Any pipe damaged when installing or removing pipe stoppers shall be replaced at the expense of the Contractor.

SECTION 3

DRAINAGE STRUCTURES MANHOLES, CATCH BASINS AND END SECTIONS & HEADWALLS

3.1 **SCOPE & DESIGN CRITERIA** - This item shall include the materials and construction of the manhole, catch basin, curb catch basins, yard catch basin structures, endwalls and the furnishing and installation of cast iron frames and covers or grates for the structures.

3.1a Manholes shall be located at the ends of each line, all locations of change in alignment, grade, pipe size and changes in invert elevations. The spacing provided between manhole structures shall be as follows:

- 400 feet maximum for storm sewers ≤ 15 " in diameter
- 500 feet maximum for storm sewers 18" to 30" diameter
- 600 feet spacing for storm sewers greater than 30" diameter will be considered on a case by case basis, maximum reach of mechanical cleaning equipment and must be approved by the Engineer

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 sanitary sewer structures.

3.2 **BASES** - Bases for manholes, catch basins and inlets 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 approved 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 the 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 inside diameter 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. All catch basins and yard catch basins shall have 2'-0" sump below the invert of the pipe unless otherwise noted on the drawings.

3.3 **WALLS** - Walls shall be constructed of precast concrete ring walls.

3.3a Manholes and catch basins constructed with precast concrete ring walls 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. Rear yard catch basins shall be constructed of precast reinforced concrete structures meeting the requirements of ASTM C76.

3.3b The cast iron drainage structure frame shall be set at the proper elevation by use of precast concrete adjusting rings 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.

3.4 **SIZING OF DRAINAGE STRUCTURES** – Manholes and catch basins shall have a minimum inside diameter of 4-feet. Rear yard catch basins shall be allowed a minimum diameter of 2-feet or 2' square.

3.4a All drainage structures shall narrow down eccentrically to the proper diameter to receive the cast iron frame and cover, unless made impossible by depth of cover constrictions, in which case a reinforced concrete flat top may be used.

3.4b The size and type top of all structures shall be approved by the Engineer.

3.5 **STEPS** - Steps shall be provided in all manholes and catch basins unless otherwise noted. Steps shall meet the requirements of ASTM C478 and shall be of aluminum or of reinforced polypropylene.

3.5a Aluminum steps shall be of the drop-front design, with nonskid 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.

3.5b 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 pounds per leg, as evidenced by test data.

3.6 **BACKFILLING** - Upon completion of the drainage structure, 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 drain structures are located in existing ditches, ditches shall be reformed around the structure.

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

3.7 **FRAMES AND COVERS** - All frames and covers for the various types of structures shall be gray iron castings conforming to ASTM 48. Both the underside of the cover/grate and the upper surface of the ledge upon which the cover/grate rests shall be machined so as to prevent rocking of the cover/grate on its supporting surface. Castings shall be cleaned and coated in coal tar pitch varnish at the factory.

3.7a As listed, the following (or an approved equivalent) are approved frames/covers for various structures:

Manholes: East Jordan Iron Works 1040 frame with Type "A" solid cover
Neenah Foundry Company R-1642 frame with Type "B" or "C" solid cover, or approved equal.

Catch Basins

Road Ways with no curb & gutter:

East Jordan Iron Work's 1040 frame with Type "n" oval grate or Type "02"
beehive grate, or approved equal
Neenah R-1642 frame

MCRC Mountable Curb:

East Jordan Iron works 7065 Frame with 7045 Grate Type M1 and
7060 Back
Neenah R-3034-B with Type S Grate, or approved equal

MDOT Type F Curb

East Jordan Iron works 7020 w/T1 Back
Neenah Foundry R-3031-A

MDOT B2 Curb

East Jordan Iron Works 7085 w/ Type M1 Grate
Neenah Foundry R-3038-A

Rear Yard Catch Basins:

Circular Casting	East Jordan Iron Works 6527
Circular Casting	Neenah Foundry R-4340-B
Square Casting	East Jordan Iron works 6500
Square Casting	Neenah Foundry R-4345

3.7b All manhole, catch basin and yard drain castings shall be furnished from the manufacturer with the following or equivalent language cast into the frame and or grate:

"DUMP NO WASTE DRAINS TO FRESH WATER" & Fish Image

3.7c The Contractor shall submit shop drawings to the Engineer for approval of the manufacturer's product information sheets of all drain structure casting frames, covers and grates before furnishing any such materials to the project site for installation.

3.8 **FRAME AND COVER INSTALLATION** - The drain structure frames shall be firmly set on top of the adjusting rings with a mastic sealer, Ram-Nek or approved equal. Where drain structures 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 DRAIN STRUCTURES** - Where required, one length of the proper size and class of sewer pipe shall be laid out of drain structures 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 **STORM SEWER END SECTIONS AND HEADWALLS** – Storm sewer end sections / headwalls shall be constructed of concrete in accordance with MDOT 401.03(G) of the 2003 Michigan Department of Transportation "Standard Specifications for Construction" and to the dimensions shown on the approved construction plans. Concrete shall be of Grade S2 in accordance with Section 701 of the same MDOT specifications. Concrete construction shall be in accordance with Section 706 of the same MDOT specifications.

SECTION 4

PAVEMENT REPLACEMENT

4.1 **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 23A stone to be provided.

4.1a 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.

4.1b **All work shall be approved by the Monroe County Road Commission.**

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

4.3 **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.

4.4 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.

4.4a 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.

4.5 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, and 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.

4.6 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.

4.7 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 5

EXISTING SEWER AND DRAIN REPLACEMENT

5.1 **SCOPE** – This item shall include all labor, materials, tools and equipment to complete Existing Sewer, Water Main and Drain Replacement as herein specified. All existing sewers, water mains 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 relayed upon the approval of the Engineer.

5.1a The Owner, reserves the right to change the location of the proposed improvements in order to avoid existing sewers and drains.

5.2 **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 Michigan Department of Transportation ‘Standard Specifications for Construction’ shall be followed insofar as applicable.

5.2a 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.

5.2b Existing sewers, water mains, 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.

SECTION 6
UNDERDRAINS

6.1 **SCOPE** – Underdrains shall be provided within pavement sections, as required by the construction plans and as required by the Monroe County Road Commission.

6.2 **PIPE** – Shall be perforated PVC pipe or corrugated tubing meeting the requirements of Section 909.07 of the 2003 Michigan Department of Transportation “Standard Specifications for Construction” and shall be encased in a fabric sock to retard entry of soils and sediment into the pipe. The pipe size shall be as required and called out on the plans. Underdrain connections to drain structures located within the influence of road pavement shall be as previously specified within Section 3.0, “Drainage Structure Manholes, Catch Basins, End Sections & Headwalls”.

6.3 **INSTALLATION** – Underdrains shall be installed in accordance with Section 404 of the 2003 MDOT “Standard Specifications for Construction except as required by the approved construction plans and or as required by the Monroe County Road Commission.