

# Village of Hillman

## STANDARD SPECIFICATIONS FOR **PROPOSED GRAVITY** **SANITARY SEWER AND WATER MAIN**

VILLAGE OF HILLMAN, MONTMORENCY COUNTY

### A.S.T.M. – A.W.W.A. SPEC LIST

WHERE THE FOLLOWING ITEMS ARE CALLED FOR ON THE PLANS, THEY ARE TO BE CONSTRUCTED ACCORDING TO THE STANDARDS GIVEN BELOW THAT IS OPPOSITE FROM EACH ITEM, UNLESS OTHERWISE INDICATED BY THE ENGINEER

BACKFILL	D698
PIPE	D3034/2241-05
PIPE JOINT	D3212-07/3139-98(2005)
MANHOLES	C478-08, C32-05, C 443-05a
PIPE INSTALLATION	D2321-05
WATER MAIN PIPE	C900-07, C905-08
VALVES	C509-01, C504-06
PRESSURE TESTING	C605-05
HYDRANTS	C502-05
FITTINGS/PIPE CUTTING	C907-04, C900-07

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## GENERAL NOTES

1. Prior to beginning construction it shall be the contractor's responsibility to contact the Miss Dig utility protection service (1-800-482-7171) to verify the location of all existing utilities. Miss Dig shall be notified not less than 72 hours prior to beginning construction.
2. The Contractor shall follow all safety guidelines per MiOSHA at all times, both during construction hours and regarding site safety when the site is dormant.
3. It is the contractor's responsibility to secure all permits or copies of permits and bonds prior to construction. Copies of these permits as they pertain to Right-of-way work on Local, County or State Roads, Soil Erosion Control, and MDEQ Water and Sewer Permits must be provided to Village of Hillman prior to the beginning of construction. For work on County Roads contact the Montmorency County Road Commission at (989) 785-3334, for work on State Highways contact the Michigan Department of Transportation (MDOT) at (989) 346-1802.
4. Commercial, Industrial and multi-family sewer and water connections or extensions of existing mains require sealed engineering drawings and design for approval.
5. During all operations of the CONTRACTOR in the street and roadways, the CONTRACTOR shall maintain barricades, lights, and warning signs as required by the Village of Hillman and as defined and outlined in the Michigan Manual of Uniform Traffic Control Devices.
6. Inspection of public utility (sanitary, water and storm) installation and materials is required and shall be done as directed by the engineer and the Village of Hillman. The contractor is responsible for coordination of all third party inspection. Compaction inspection is recommended by the engineer and shall be contracted by the contractor or owner. Inspection fees where, required shall, be paid prior to beginning the project.
7. Contractor shall notify the Village of Hillman DPW department 24 hours prior to the start of construction. (989) 742-4751.
8. The Contractor shall be required to complete all work in an expeditious manner and shall not stop construction for extended periods once construction has begun. A schedule shall be established as part of the original permit. Fees will be assessed by the OWNER for projects exceeding their set schedule. An extension may be applied for from owner/engineer if required by special circumstances.

9. All major construction changes must have written approval of the consulting engineer and the owner. If changes are not pre-approved the job will be immediately shut-down until the changes have been approved.
10. The contractor shall abide by all of the Village of Hillman DPW requirements regarding the construction of Water and Sewer mains, or other utilities, maintaining traffic barricading, boring, backfill, and restoration. There will be no additional compensation due the contractor for complying with these requirements.
11. The owner shall provide a copy of the Montmorency County Soil Erosion Control Permit and the state NPDES permit to the Contractor. The Contractor shall have permits available on-site during all construction.
12. All construction methods and materials shall conform to these standards and specifications. All materials used must be American made.
13. Prior to the start of construction the contractor shall furnish material certifications and shop drawings to the utility inspector verifying that all materials used on the project are in accordance with these standards.
14. Contractor shall maintain (as much as possible) all existing sanitary sewer, water or storm sewer service connections during construction. Any disruptions in service must be approved by the Village of Hillman and coordinated with local users. Additional adjustments or repairs required to maintain these services shall be made by the contractor and the cost shall be incidental to construction.
15. Contractor shall verify the depth, size, material type and horizontal location of all existing utilities before any work is started. The exact location of existing utilities shall be determined by hand digging. All cost shall be incidental.

## **GENERAL CONSTRUCTION**

### **A. EARTHWORK**

Earthwork shall mean all excavation and backfilling and shall include the removal and disposal of all materials of every sort necessary to be removed for purposes of construction; the furnishing, placing, and maintenance of all sheeting, bracing, and shoring if and where required and the care of existing structures, utilities and street surfaces.

### **B. EXCAVATION**

All excavation, except where necessary to tunnel, bore, or jet under roads, railroads, tree roots, and other obstructions shall be open cut from the surface.

Excavation may be performed by any practical method consistent with the integrity and protection of the work and adjoining- structures and the protection of workmen and the public. If excess excavation is made or the material becomes disturbed so as to require removal, the resulting space shall be refilled with MDOT Class II material solidly tamped into place, in not more than nine (9) inch layers; to the satisfaction of the Village of Hillman DPW, before the construction work proceeds; or may, at the direction of the Village of Hillman DPW be filled with Class B concrete conforming to the standard concrete specifications at the CONTRACTOR's expense.

After structure excavation has been carried down to final grade where applicable, any unsuitable foundation material found at this level shall be excavated and removed until a suitable foundation material (as determined by the inspector for the project) is encountered. Unsuitable materials are organic type soils that are wet and have little stable structure. The excess excavation shall be replaced with MDOT stone or Class II material compacted in 6-inch layers or Class B concrete placed up to the excavation limits.

Excavated material not suitable for backfilling shall be removed and properly disposed of by the CONTRACTOR.

For construction of water mains trenches shall be excavated to a depth required with allowance for bedding the pipe on a minimum 4-inch layer of MDOT Class II granular material, so as to provide uniform and continuous bearing and support for the pipe over the full length between joint cuts. (Unless otherwise specified on the plans.) For gravity sanitary sewer and storm sewer, the trenches shall be excavated to a depth required with allowance for bedding the pipe on a minimum 4-inch layer of MDOT 6A or 10A stone, so as to provide uniform and continuous bearing and support for the pipe over the full length between joint cuts. The trench shall be cut wider and deeper at each pipe joint location to provide for properly completing the pipe joint and to relieve the joint of all loadings. The bottom of the trench shall be shaped so as to conform as nearly as

possible to the outside of the pipe with allowance being made for a 4-inch cushion below the pipe.

The width of trench shall be sufficient to allow the pipe to be laid and jointed properly and shall provide for a minimum net clearance of 6 inches and a maximum net clearance of 12 inches on each side of the barrel of the pipe and to allow the backfill to be placed and properly compacted. Exceptions to these clearances will occur at encasement or special construction.

Foreign materials encountered in the excavation such as wood, boulders and the like, which obstruct the excavation shall be removed. Where such obstructions occur at or near the bottom of the excavation, requiring excavation below grade for their removal, the excavation shall be brought back to grade by MDOT Class II material compacted to 95 percent of its maximum density.

Where the condition of the ground requires, the sides of excavation shall be securely held by bracing and/or sheeting which may be removed in units when the level of the backfill has reached a point where-it is safe to pull the sheeting without disturbing the protected feature.

No sheeting, bracing, or other timber shall be left in the excavation upon the completion of the work. Boxes, as required, shall be used by the CONTRACTOR, wherever the depth of the excavation is ten (10) ft or more.

Where men are required to work in excavation, all trenching, bracing, and shoring shall conform to the requirements of MIOSHA.

If crossing over or under or exposing any main or lateral sewer, sewer connections, basin connections, water main, service connections, gas mains, gas connections wire conduit or any underground improvement, the Contractor shall use all possible care in protecting same from injury or damage. The work shall be performed in such a manner as will result in the least damage or interference. The Contractor will be required to repair, replace or rebuild any such improvement that is injured or damaged by him and he shall be responsible to the department, companies, individuals or corporations controlling or owning such improvements.

Where these services are encountered and are undamaged, they shall be supported and/or protected by the contractor at his expense against later settlement and/or damage after backfill. The contractor shall consult the Village of Hillman DPW, the Road Agency or utility company having jurisdiction over any duct line, gas main, etc., which may cross the excavation to determine the method of supporting such duct or pipe.

All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve

manhole covers, valve boxes, curb stop boxes. Fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the work is completed. Gutters shall be kept clear or other satisfactory provisions made for street drainage, and natural water courses shall not be obstructed, except as otherwise provided for herein on a temporary basis. Excavated materials and disturbed earth causing sedimentation in catch basins and storm sewer shall be cleaned out.

#### Dewatering

The Contractor shall at his own expense pump out or otherwise remove any water which may gather in the trenches or tunnels and shall form all dams, cofferdams or other works necessary for keeping the excavated trenches or tunnels clear of water during the progress of the work. In case of quicksand or other bad and treacherous ground, the work shall be proceeded with day and night without intermission, if the Engineer or Inspector so directs.

### C. BACKFILLING

#### Standards

Density testing as identified in this specification is to be per the test method AASHTO T -180 for a modified proctor.

#### Indicators

Construction tape shall be placed in the trench over all utilities as they are backfilled. Tracer wire shall also be placed over all plastic water main installation.

#### Structural Backfilling

As soon as practical after concrete structures have set, forms, and debris have been removed, the excavated area around structures shall be carefully backfilled up to grade with MDOT Class II material, compacted in place to 95 percent of its dry density in not-to-exceed 12-inch layers. Where the over dig around new or existing structures is less than 12" wide, MDOT 6A or 10A stone must be used to backfill around the structures up to within 6" of grade. Backfilling around house basements shall be as herein specified up to within 24 inches of finished grade. Excavated material can be used to backfill 18 inches up to within 6 inches from grade, with the final 6 inches backfilled with topsoil.

#### Backfilling within County Road Rights-of-Way

Backfill for roadwork within street rights-of-way, under roadways, pavements, shoulders, and sidewalks shall be MDOT Class II granular material compacted to 95 percent of its dry density in not-to-exceed 9-inch layers. Materials such as soft clay, topsoil, muck, cinders, vegetable matter, refuse, boulders, and other objectionable and non-packing earth shall be excluded from the backfill and removed from the site. Stone larger than three (3) inches in any dimension shall be excluded from the backfill and removed from the site by the CONTRACTOR.

Utility and Street Backfilling

In commencing backfill for all pipe work except gravity sanitary sewer, a "cushion" of modified MDOT Class II granular material (100% passing 1 1/2" sieve) shall be thoroughly compacted by hand tamps in not-to-exceed 6-inch layers under, around, and along the sides of the pipe up to the centerline of the pipe. The sand shall be machine tamped in not-to-exceed 9-inch layers to a level a 18 inches above the crown of the pipe. Voids under the pipe joints shall be filled, tamped in place from the sides after the joint is completed. Gravity sanitary sewer shall have 6A or 10A stone surrounding the pipe up to the top of the pipe. Non-woven fabric shall be placed over the stone and modified Class-II can be used above the pipe.

Above the level of 18 inches above the crown of the pipe or the bottom of structural excavations the backfill material shall be as follows:

- a) Under pavements, curb, paved or gravel driveways, gravel roads, and shoulders the remainder of the backfill shall be MDOT Class II material which shall be solidly compacted to 95 percent of its dry density by mechanical tamps in layers of not more than 9-inch loose thickness with backfilling carried up to within 9 inches of finished grade. The fill shall be brought to finished grade with surface compatible to the removed surface. For new pavement see details of pavement sections.
- b) Under sidewalks the remainder of the backfill shall also by MDOT Class II material compacted to 95 percent of its dry density by mechanical tamps in layers not-to-exceed 9-inches loose thickness with backfilling carried up to subgrade.
- c) In all other areas the remainder of the backfill shall be of the excavated material with the exception of those materials excluded above. The backfill shall be spread and compacted not-to-exceed thickness of 12 inches. The finished grade of this backfill shall be restored to its original condition. Compaction of backfill shall be such as to obtain 90 percent of the maximum unit density as determined at the optimum moisture content.

Clay and organic material will not be permitted as backfill material under any pavement, drive, sidewalk, or curb and gutter in the City, and the CONTRACTOR shall furnish and place all MDOT Class II granular backfill material required, which is not available from trench excavation at his own expense.

Backfill Not in the Road Influence

All trenches between the property line and road shoulder shall be left with a sufficient mound of earth above the original surface, as is deemed necessary by the Village of Hillman DPW, to take care of future settlement.

General Backfill Information

The CONTRACTOR shall continuously maintain all excavations and shall refill and compact to finished grade all settlement which shall occur.

After a one freeze/thaw cycle (November thru May), and if the backfill compaction is satisfactory to the Village of Hillman DPW, MDOT or the Montmorency County Road Commission to provide for any slight settlement, the CONTRACTOR shall retrim neatly any broken edges of pavement and replace the top surface of the backfill within the pavement area with pavement surface equal to that surface which was removed.

Headwalls, culverts, and drainage systems filled, or damaged by the CONTRACTOR during the course of his operation shall be cleaned, relaid, or rebuilt to a condition equal to the original state, at the CONTRACTOR's expense.

Where the excavation is located beside a ditch and/or where an existing ditch is filled or disturbed in the CONTRACTOR's operations, the CONTRACTOR shall clean, repair, or replace the ditch with properly pitched bottom and side slopes and of section and capacity not less than the original section. It will be the CONTRACTOR's responsibility to document the original section in advance to the appropriate road agency in sufficient detail as is acceptable to them. (via pictures, drawings, etc.)

Where excavation has been through lawn areas the Contractor shall restore the disturbed area by placing topsoil and seeding or hydro seeding over the final backfill material.

The CONTRACTOR shall remove excess dirt and other construction material from the site of the work and leave the site in a clean and neat condition.

Should any deficiency in the backfilling occur, in either quantity or quality of excavated materials taken from the trench, the Contractor shall supply the deficiency without extra charge to the Owner. No foreign or perishable material shall be used in the backfilling.

Surplus Earth

Surplus earth is understood to mean the excess of earth excavated and remaining after the required backfilling herein before specified is completed. Such surplus earth shall be loaded by the Contractor and trucked to disposal sites arranged by the contractor. Excess earth not used by the Owner shall become property of the Contractor and shall be removed from the project. The unexcavated portion of the roadway surface shall be left in its original condition, clean and free of any soil deposits. No surplus earth will be left in the road ditches.

**D. WORK WITHIN ROAD RIGHTS-OF-WAY**

The Contractor shall obtain permits for construction within the road right-of-way from the authority having jurisdiction over the road. All work within the road rights-of-way shall conform to the requirements of these specifications and the requirements of MDOT or

the Montmorency County Road Commission. The Contractor shall put up and maintain during the continuance of the work such barriers, caution lights and other protective devices as required by law and shall furnish a watchman so as to effectually prevent any accident in consequence of his work, and he shall be liable for all accidents and damage occasioned in any way by his acts or neglect, or by the acts or neglect of his subcontractors, agents, employees or workmen.

Where the proposed construction parallels the road, the Contractor shall protect the existing surface where possible. Any damage to the roadway shall be repaired by the Contractor.

#### E. REMOVAL OF PAVEMENT, CURB AND GUTTER AND SIDEWALK

Before commencement of excavating operations, the CONTRACTOR shall cut and remove from the work all pavement, curb and gutter, or sidewalk that would be damaged by his operations. Cutting of concrete pavement where permitted, shall be done with a concrete saw, in a manner meeting the approval of the Road Agency having jurisdiction. Asphalt pavements shall be cut by a tool leaving a square neat cut. Pavements shall be cut back so that pavement opening is one (1) foot wider on each side than the width of the trench, and care shall be taken during construction operations so as not to cave the banks or undermine remaining pavement. Where an existing joint in the pavement occurs within nine (9) feet or less from the top edge of the undisturbed soil, the Contractor shall remove and replace the pavement to this point. Any reinforcement encountered shall not be cut out, but shall be left protruding at least 2 ft from the face of the cut and shall be bent out of the way to be replaced later and spliced to new reinforcement.

In cutting through sidewalks, driveways, or curb and gutter, the CONTRACTOR shall remove full slabs of sidewalk or driveway or full lengths of curb and gutter to the nearest regular joint on each side of the excavation.

Broken pieces of pavement, sidewalk, or curb and gutter shall be removed from the work and disposed of by the CONTRACTOR to the satisfaction of the City and under no circumstances shall these materials be used in backfilling any pipe trenches.

All strips of the existing pavement which are less than five (5) ft wide and which are between the cut pavement and the concrete gutter, shall be removed and replaced.

The CONTRACTOR shall exercise special precautions during construction, not to damage any remaining pavement, sidewalk, or curb and gutter and no construction equipment with traction lugs or other defacing or damaging components will be permitted on these surfaces. Where it is necessary for such equipment to travel over paved areas, the CONTRACTOR shall provide suitable planks and blocking to prevent damaging paved surfaces.

## F. REPLACEMENT OF PAVEMENTS AND DRIVES

No pavement replacement is to be done during the period between November 1, and May 1, unless with the written permission of the Montmorency County Road Commission.

### Road Surface Replacement

All road surfaces removed during construction shall be repaired, unless otherwise specified, by placing 6 inches of 22A gravel, 1.5 inches of bituminous base course and 1.5 inches of bituminous wearing course, or pavement of equal thickness to the removed section, whichever is greater. Whenever a road repair is not to be immediately paved after backfilling, a temporary road repair will be required. The temporary repair will consist of 9-inches of 22A gravel brought to existing grade. For final paving, gravel equivalent in thickness to the asphalt pavement shall be removed and the remaining thickness of gravel will provide the base. Road repair may not be delayed more than 2 weeks without written permission. During delay, the Contractor shall maintain the road at his expense.

### Driveway Surface Replacement

All asphalt driveways removed during construction shall be repaired, unless otherwise specified, by placing 6-inches of compacted 22A gravel and 2 inches of bituminous surface course, or pavement equal in thickness to the section removed, whichever is greater. Whenever a driveway is not to be immediately paved after backfilling, a temporary repair will be required. The temporary repair will consist of 8-inches of 22A gravel brought to existing grade. For final paving gravel equivalent in thickness to the thickness of pavement shall be removed and the remaining thickness of gravel will provide the base.

All concrete driveways removed during construction shall be repaired, unless otherwise specified, by placing 8-inches of compacted 22A gravel and 6-inches of concrete, or concrete equal in thickness to the removed section, whichever is greater. All concrete work shall be done in accordance with the best modern practice using 4,000 psi concrete. Whenever a driveway is not to be immediately paved after backfilling, a temporary repair will be required. The temporary repair will consist of 14-inches 22A gravel brought to existing grade. For final paving, crushed gravel in thickness to the concrete shall be removed and the remaining thickness of gravel will provide the base.

All gravel driveways removed during construction shall be repaired, unless otherwise specified, by placing 6-inches of 22A gravel compacted and finished to match existing grade. Whenever a driveway is not to be immediately finished to final repair after backfilling, a temporary repair will be required. The temporary repair will consist of 7-inches 22A gravel brought to just above existing grade. For final repair, the gravel shall be compacted and graded to match existing elevations.

#### G. CLEAN UP

All backfilled trenches shall be leveled to original grade and finished as required above. All excess material, refuse and debris removed and ditches and drainage restored not more than 500 feet behind the construction operation. Two inches of topsoil shall be deposited and fine graded on all disturbed lawn areas. Seeding of lawn areas is the responsibility of the Contractor. The clean up and restoration of each street and easement, as nearly as reasonably possible, to its original condition, shall be considered a part of the new utility construction.

#### H. EXCEPTIONS

Any types of construction required for the project and not specifically identified in this manual shall be done in accordance with the current MDOT specifications.

## **PVC SANITARY SEWER**

### **1. SCOPE**

All sanitary sewer constructed in the Village of Hillman shall be constructed in accordance with these Standard Specifications.

### **2. MATERIAL**

#### Sewer Pipe

All pipe for gravity sewer is to be PVC truss pipe and these those installed under this section shall be for sanitary sewer 15 inches in diameter and smaller. The pipe shall meet ASTM D3034, SDR-35 with bell-and-spigot ends for gasketed joints.

All pipe for service leads shall be PVC pipe SDR-35 and shall meet or exceed all the requirements of the current ASTM D3034 for polyvinyl chloride sewer pipe and fittings.

All PVC pressure pipe for force main shall be ISP SDR-26 w/ slip joints and shall comply with ASTM D2241

Samples of the pipe and physical and chemical data sheets shall be submitted to the Village of Hillman DPW for review before initiation of sewer construction.

#### Sewer Pipe Fittings

All fittings shall meet ASTM D3034. Fittings shall be the same material as the pipe and in no case shall the walls be thinner than that of the pipe furnished. Wye and tee fittings shall be reviewed by the Village of Hillman DPW before approval and purchasing. The dry fit of all PVC fittings must be snug. If the fit is such that it is loose, the pipe or fitting will be rejected as faulty and of improper size.

Pressure Sanitary sewer shall have PVC fittings meeting ASTM D3139-98(2005)

Pressure Sanitary Sewer clean out assemblies shall have valves with mechanical joint fittings and valves meeting the same specification as Water Valves in the %Water Main+ section of these specifications. The clean out riser must have a standard threaded cap with a keyed top plug for access. All the parts shall be supported with a pipe support,

#### Sewer Pipe Joints

PVC pipe shall be jointed with a ring gasketed bell end. Jointing material shall be applied to the bell end of the pipe at the point of manufacture in such a manner that a tight, uniform joint, will be achieved and such that when the joint is made up in the field the joint material will not roll or tear from the pipe. A proper joint lubricant shall be furnished by the pipe manufacturer. The joints for PVC SDR-35 pipe shall conform to ASTM D3212 for sanitary sewers. The joints for ISP SDR-26 shall conform to ASTM D3139

### 3. LAYING PIPE

#### Excavation and Backfill

All excavation and backfill for PVC pipe shall be made in accordance with these specifications and ASTM D2321 for excavation and backfill. All sanitary sewer shall be separated from potable water main with a 10-foot minimum horizontal separation and 18-inches minimum vertical separation.

#### Bedding

All PVC pipe shall be laid on a bed of MDOT 6A, 10A or equal placed on the bottom of the trench to a depth of one-quarter (1/4) the outside diameter of the pipe, but not less than four (4) inches conforming to this bedding. STONE material shall be at a around the pipe and flush with the top of the pipe. Modified MDOT Class II granular material (100% passing 1 1/2" sieve) shall be placed to a minimum depth of 18 inches above the pipe. The MDOT Class II material shall be compacted to 98 percent of the maximum density as designated by the test method AASHTO T -180 for a modified proctor. The remaining backfilling shall be as identified in the "General Construction, C. BACKFILLING" portion of this specification

Installation of PVC pipe shall be in accordance with the current ASTM D2321-05 spec. All pipe shall be laid true to the required lines and grades. All trenches, when pipe laying is in progress, shall be kept dry. The CONTRACTOR shall provide proper dewatering procedures such as well points, wells, or other means to insure that the pipe is laid in dry trenches. All pipes and fittings shall be uniformly supported on properly trimmed bedding with holes at each joint to receive bells. All pipe shall be laid with bells uphill. All joints shall be made up in accordance with the manufacturer's instructions using materials and equipment specially prepared for the type of joint to be used. Each pipe shall be laid accurately to the line and grade as shown on the plans approved by the Village of Hillman DPW, and in such a manner as to form a closed concentric joint with the adjoining pipe to prevent sudden offsets of the invert. The interior of the sewers shall, as the work progresses, be cleaned of all dirt, cement, debris and other superfluous material of every description. All pipe and fittings shall be carefully lowered and moved into position in trench or vault in a controlled manner such as will prevent damage to the pipe and any coatings or linings. An excessive amount of scratching on the surface of the PVC pipe will be considered cause for rejection. All cutting of the pipe shall be done in a neat, workmanlike manner, with the least amount of waste and without damage to existing or new lines. A fine tooth saw, tubing cutter, or similar tool may be used to cut PVC pipe. Cuts must be square. Ragged edges shall be removed with a cutting tool or file. After cutting bell and spigot or socket pipe, a stop mark shall be made with a pencil or crayon using dimensions as shown by the manufacturer's instructions or by using another pipe in the field as a guide.

#### Slope

The pipe slope shall be in accordance with the plans and shall at all times meet the "GLUMRB - Recommended Standards for Wastewater Facilities - 2004 edition".

Minimum slopes are:

8-inch	0.40 %
10-inch	0.28%
12-inch	0.22%

#### 4. TESTING OF THE PIPE

After the construction has been completed, the CONTRACTOR shall furnish all equipment and personnel to conduct system acceptance tests as required by the Village of Hillman Standard Specifications. All tests shall be conducted under the supervision of the appointed inspector and the Village of Hillman DPW Director. No acceptance tests shall be conducted until the entire sewer system is constructed or just prior to placing the line in service. Unless otherwise noted, no test shall be conducted until fifteen (15) days after the pipe is laid and backfilled.

##### Force Main

All sanitary sewer force main pipe must have a water pressure test. The test must be performed at 1-1/2 times the design operating pressure of the pipe.

##### Tests for Leakage - Air Tests

After a manhole-to-manhole section of line has been backfilled and cleaned, it shall be plugged at each manhole and shall be air tested as specified under the sanitary sewer section of the Standard Specifications. The tests shall be conducted by installing pneumatic plugs inflated to 35 psig internal pressure. The design of the pneumatic plugs shall be such that they will hold against the line test pressure without requiring extended blocking or bracing. There shall be three (3) hose connections to the pneumatic plug. One hose shall be used only for inflation of the pneumatic plug. The second hose shall be used for continuously reading the air pressure rise in the sealed line. A third hose shall be used only for introducing low pressure air into the sealed line. There shall be a 0-30 psig gauge for reading the internal pressure of the line being tested. Calibrations from the 1-10 psig range shall be in tenths of pounds (not ounces) and this 0-10 portion shall cover 90 percent of the complete dial range. Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4 psig greater than the average back pressure of any groundwater pressure that may be over the pipe. At least two minutes shall be allowed for the air pressure to stabilize. After the stabilization period, the third hose shall be disconnected. The portion of line being tested shall be accepted if the portion under test does not loose air at a rate greater than 0.003 cfm per square foot of internal pipe service when tested at an average pressure of 3 psig greater than any back pressure exerted by groundwater that might be over the pipe at the time of the test. The above requirements shall be accomplished by performing the tests as follows. The time requirement for the pressure to decrease from 3.5 to 3.0 psig (greater than the average back pressure of any groundwater that may be over the pipe) shall not be less than that shown in the following table from manhole to manhole.

6-inch pipe	42 seconds/100 ft. of pipe
8-inch pipe	72 seconds/100 ft. of pipe
10-inch pipe	90 seconds/100 ft. of pipe

12-inch pipe	108 seconds/100 ft. of pipe
18-inch pipe	144 seconds/100 ft. of pipe

If any section of the sewer fails to meet this requirement, the CONTRACTOR shall perform a television inspection of the faulty section and repair or replace at his own expense all defective materials and/or workmanship to the satisfaction of the Township. The test procedure shall be repeated until the test results are acceptable.

Test for Alignment

All sewers shall be laid accurately to the line and grade as approved by the Township. The sewers will be tested for alignment by shining a light through the pipe at a manhole and viewing the light from an adjacent manhole. Any section of sewer in which a light cannot be seen from one manhole to the next shall be corrected to the satisfaction of the Township.

Test for Deflection of PVC Pipe

Deflection testing will occur no sooner than 30 days after installation. PVC pipe, the sewers shall be installed in such a manner that the initial deflection of the conduit shall not exceed 5 percent of the inside diameter of the pipe. Deflection of PVC pipe shall be tested by pulling a wooden pig or equivalent through the pipe. The pig shall be constructed in accordance with the following table of maximum outside diameters and shall be submitted to the Township for review before testing is initiated.

<u>Pipe I.D.</u>	<u>Pig O.D.</u>
8 inches	7.60 inches
10 inches	9.50 inches
12 inches	11 .40 inches

The pig shall be drawn through the pipe from manhole to manhole. Any portion of pipe through which the pig passes freely shall be deemed to have passed the deflection test. Sections of pipe through which the pig does not pass shall be located, uncovered, and the pipe zone bedding improved and backfilled by the CONTRACTOR at his own expense. The pipe shall then be retested before acceptance is granted.

Televising - Upon request of the Village of Hillman DPW

The Village of Hillman DPW can request all public sewer extensions to be televised. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. lighting for the camera and position of the camera within the sewer shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 500 line resolution video picture. Picture quality and definition shall be to the satisfaction of the DPW Director.

The camera shall be moved through the line, manhole to manhole, in either direction at a uniform rate, stopping when necessary to insure proper documentation of the sewer's

condition, but in no case will the television camera be pulled at a speed greater than 30 ft/minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If during the inspection operation the television camera will not pass through the entire manhole section, the CONTRACTOR shall reset his equipment in a manner so that the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire manhole section corrective action shall be taken by the CONTRACTOR and the section retested.

Whenever remote powered and controlled winches are not used to pull the television camera through the line, telephones, or other suitable means of communication shall be setup between the two manholes of the section being inspected to insure good communication between members of the crew.

Location records shall be kept by the CONTRACTOR and will clearly show the location in relation to adjacent manholes of each defect discovered by the television camera. In addition, other points of significance such as locations of sewer leads or taps to the sewer, and/or other discernible features will be recorded and a copy of such records will be supplied to the DPW Director.

Measurements for location of defects shall be above ground by means of a meter device. Markings on cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurements meters will be accurate to two-tenths (0.2) of a foot over the length of the section being inspected. Accuracy of the measurement meters shall be checked daily by use of a walking meter, roll-a-tape, or other suitable device.

All visible defects shall be corrected by the CONTRACTOR at his own expense. Repaired sections shall be retested.

A VHS video tape or DVD recording shall be made of all televised sections. The purpose of the tape recording shall be to supply a visual record of problem areas of the lines that may be replayed at future presentations. Video tape recording playback shall be at the same speed that it was recorded. The CONTRACTOR shall be required to have all tapes and necessary playback equipment readily accessible for review by DPW Director during the project. All tapes shall be given to the DPW at the completion of the project.

Instant developing, 35mm, or other standard size photographs of the television monitor or problem areas shall be taken by the CONTRACTOR upon request of the DPW.

#### Material Tests

The CONTRACTOR shall have tests of pipe and strength made by an independent testing laboratory. Tests of up to 4 lengths of sewer pipe per hundred lengths may be

required to show compliance with the Specifications. All pipe delivered to the job site shall be accompanied with a manufacturer's certificate of compliance to the Specifications.

## 5. MANHOLES

### Reinforced Concrete Manholes

Reinforced concrete pipe for manholes shall conform to the latest revision of ASTM Specifications for Precast Reinforced Concrete Manhole Sections, Serial Designation C478, Class II or III as required, with rubber gasket joints. Details of manholes shall be as on plans.

Manhole section joints shall be of the o-ring type.

### Mortar for Manholes

Mortar for brickwork of manholes and for plastering the outside surface of manholes, if required, shall be made of one (1) part Portland cement and two (2) parts sand.

### Brick for Manholes

Brick for manholes extensions shall be such as will fully meet the latest revision of the "Standard Specifications for Clay Sewer Brick," Serial Designation C32 of the ASTM.

### Manhole Covers

Each manhole frame and cover shall be made of cast iron and shall weigh not less than 350 lbs. Each frame and cover shall have machined bearing surfaces, and shall be suitably notched for convenient removal of the cover. Each cover shall be marked "SANITARY SEWER" with letters cast integrally in the frame. Manhole covers for sanitary sewers shall be solid cover No. 1040 as manufactured by East Jordan Iron Works or equal.

There must be a minimum of 24" clear opening in the frame for all Sanitary Manholes.

All manhole frames and covers shall be coated at one point of manufacture with coal tar pitch varnish or other approved asphaltum coating.

Manhole cover frames shall be set in a full bed of mortar and the covers shall be accurately set to the proposed grade.

### Manhole Steps

Steps shall be 16-inches on center, with top step to be 1 ft 6 inches below top of casting.

### Manhole Installation

The top elevation of cone shall be set to grade. The top 6 to 12 inches of all manholes shall be of brick masonry of hard burned brick or precast concrete rings. Where so used, the exterior surface of the brick masonry shall be plastered with 1/2-inch thick

coat of mortar and brick work shall be laid in mortar.

When the manhole is completed, a cast iron ring and cover of the size and type previously specified shall be set in place to line grade.

Connection of sewers to manholes shall be made through a flexible rubber boot which shall be securely clamped into a core drilled pipe port. Pipe ports shall be core-drilled at the point of manhole manufacture and shall be accurately located within 1/2-inch of proposed sewer centerline.

Neoprene rubber for the manhole boot shall meet ASTM Specification C443 and shall have a minimum thickness of 3/4-inch. Pipe clamps shall be corrosion-resistant steel.

## 6. CONNECTIONS TO EXISTING SEWERS

Where existing sewers, including house leads, are to be connected to new sewers, suitable pipe and fittings shall be furnished and installed to complete the connection. Existing house leads shall be connected to the sewers as the work progresses, keeping any interruption of sewer service to a minimum.

### Installation of a New Wye connection for Service Leads

To install a Service lead into the existing main, the main may be cut and a new wye connection placed in line with the sewer. A clean cut, with either a saw or pipe cutter, must be made around the existing main. The total cut length must be made no more than 1/2 inch larger than the wye connection to be installed. Fernco fittings shall be placed each side of the existing pipe w/ the ties in place. The new wye connection should be placed and the fernco connections pulled to span the connection 1/2 way. The ties should then be tightened.

The mainline flow must be pumped around the area of connection during construction, with a plug in the downstream inlet of the manhole immediately upstream of the proposed connection. The CONTRACTOR may make individual requests to temporarily limit the use of any connections that are not closed upstream of the proposed connection. All parties who are asked to limit usage must be immediately informed when normal usage may be resumed.

### General Information

All service leads are to be a minimum of 6" in diameter.

All temporary pumping, pipe fittings, plugs and other materials and equipment necessary to handle sewage flows from the existing intercepted sewers, shall be furnished, installed and maintained by the CONTRACTOR. Special care shall be taken in connecting the sewer service leads to the existing house laterals to insure watertight connections.

Where bulkheads are to be installed in existing sewers, a form is to be constructed in the pipe to be plugged. The bulkhead shall be of Class A concrete and shall have a nominal thickness of 12 inches.

All sanitary lead shall be identified as to location, by witnessing same from both property corners of the lot. If the structure is already in place, the lead shall also be located from each house corner. The location shall be submitted to the Village of Hillman prior to final connection. Forms may be obtained at Village of Hillman Offices. All sanitary leads for future connection shall also be marked by the installation of a 4" X 4" weather-proof lumber imbedded four (4) ft and is two (2) ft above final grade with permanent markings indicating size and elevation of lead.

#### 7. CONNECTIONS TO EXISTING MANHOLES

Extensions of sewer mains must always tie into existing manholes. When convenient, new house leads may also be connected to existing manholes.

When a sewer is connected to an existing manhole, a hole adequate to receive the new pipe shall be cut into the manhole.

If the existing manhole is of reinforced concrete pipe construction, a hole shall be cut into the concrete wall to receive the new pipe. Reinforcing steel shall not be cut, but shall be replaced in the area that it is to be patched and a form shall be constructed over the area of pipe penetration. This formed area shall then be filled with "Class A" concrete.

If the existing manhole is of brick construction, a single rowlock of brick shall be turned over the new pipe and the existing manhole brick work shall be cleaned, pointed up, and given a 1/2-inch mortar coat on the outside surface.

New sewer main extensions that tie into an existing manhole must have an invert not more than 24" above the existing sewer invert. Pressure connections shall have be not less than 12" and not more than 24" from the existing sewer invert.

## WATER MAIN CONSTRUCTION

### 1. SCOPE

All water main, valves and valve boxes and fire hydrants in the Village of Hillman Sewer District shall be constructed in accordance with these standards specifications.

### 2. MATERIALS

#### PVC Pipe, Gaskets and Fittings

PVC pipe 12" or less than 12" in diameter shall conform to the latest revisions on ANSI/AWWA C900-07 specifications. PVC pipe 14" through 48" in diameter shall conform to ANSI/AWWA 905-08.

#### Hydrants

Hydrants shall conform to the latest revisions of AWWA Specifications C502-05 for 150 pound working pressure. Hydrants shall be the compression type designated to open against the line pressure. Hydrants shall be manufactured by the East Jordon Iron Works Company and conform to the Village of Hillman DPW Sewer Authority standards. Jordon BRA-1-C.

The hydrant valve openings shall be 5-1/4" for hydrants with a 6" inlet. The inlet shall conform to the Village of Hillman standards.

Hydrants shall have two, 2-1/2" National standard fire hose connections and one, 4-1/2" National standard pumper connection. All nozzles shall be on a movable head on the hydrant barrel so that they can be rotated by changing the position of the top flange without removing the barrel. All drains shall be plugged.

Hydrants shall be plainly marked with an arrow near the operating nut showing the direction of left hand open. Hydrants shall be of proper length for installation in a trench depth of 5'-0". Hydrant barrel extensions, where necessary, shall be incidental to the hydrant installed.

Each hydrant shall be tested to 300 pounds hydrostatic pressure from inlet side, first with valve closed and second with valve open.

#### Gate Valves

Gate valves shall conform to the latest revision of AWWA specification C509-01 and shall be used for water mains up to and including eight inches diameter. Valves shall be left hand, resilient seat gate valves with mechanical joint ends. Valve stems shall have double "O" ring packing and shall be as manufactured by Waterous, Mueller, American Valve and Hydrant, or an approved equal.

Valves to be buried in the ground shall each have a valve box and be equipped with a 2" wrench nut for key operation.

Butterfly Valves

Butterfly Valves shall conform to AWWA Standard C504-06 and shall be used for water mains over eight inches in diameter. Manufacturer and design to be approved by the Village of Hillman DPW.

Valves shall be designed for 150 pounds working pressure and shall be tested to 300 pounds hydrostatic pressure. The name of the manufacturer and size shall be cast on each valve.

Valve operators shall be designed to withstand 300 pounds of torque at full open or full closed positions without damage to the valve or operator. The Operator shall be fully gasketed and grease packed. Valves shall open left (counter-clockwise) and shall require a minimum of 30 turns to move from fully open to fully closed positions.

Fittings

PVC fittings shall be for minimum 150 psi and conform to the latest ANSI/AWWA C907-04 and C900-07.

Valve Boxes

Valve boxes shall be 5-1/4" diameter, three piece, and adjustable screw type with No. 6 round base or No. 160 oval base as necessary for installation in a 6'-0" trench depth.

Each box shall be provided with drop cover marked with the word "Water", and installed flush w/top of proposed finish grade.

Service Leads

Pipe for service leads shall be 1" soft annealed type K copper tubing.

Curb stops for service connections shall be Mueller 300 Ball Curb Valves, compression both ends, Minneapolis top thread, catalog #B-25155.

Corporation stops shall be Mueller 300 Ball Corporation valve, compression, catalog #B-25008.

Couplings shall be straight three part union Mueller 110, compression both ends, catalog #H-15403.

Curb Boxes shall be Mueller 1-1/4" x 5' telescoping curb box, Arch pattern, with pentagon type plug with rods.

Tapping saddles shall be 2-band bronze construction for service lines larger than 1" (all service lines).

### 3. Workmanship

#### Excavation

The excavation for the work shall be done in open trench or in tunnel as herein specified, and as shown on the plans. All work shall be done to true line and grade as established on the plans, except that unreasonable adherence to said grade will not be required for water main construction. The governing factor for water main construction shall be a minimum cover of 5' based upon future conditions when street grades are cut down for paving. The Contractor must protect the line and grade stakes and will be held responsible for any defective work occasioned by his negligence in this regard. The Contractor shall remove all rubbish or encumbrances which may be in the proposed line of the work and the cost for doing such work shall be understood as being included in the contract unit price per lineal foot of laying water main.

A trench width of at least 12 inches greater than the outside diameter of the pipe (6" min. on each side) shall be excavated. Bell holes shall be excavated at each joint and shall be made of a size and depth sufficient to permit the workmen to do their best work. The minimum width of trench shall be 20 inches.

#### Backfilling

Backfilling shall be done in accordance with "General Construction, C. BACKFILLING" section of this specification.

### 4. TURNING ON OR OFF OF VALVES AND HYDRANTS

Valves and hydrants shall not be turned either on or off without written consent and the presence of a representative from the Village of Hillman DPW. Separate permission will be required for each time a valve is used. Valves which, when turned on or off, will effect connections to private property cannot be used unless sufficient notice has been given to allow the Village of Hillman DPW time to notify each property owner before the written permit is issued. The date, time and duration of time shall be determined and written on the permit. Hydrants may not be used for any purposes without first attaining a permit from the Village of Hillman DPW. The Contractor will be held responsible for all damage and breakage of valves and hydrants which he uses and shall either replace or repair damaged or broken valves or hydrants which he uses or the same will be done by others and the cost thereof billed to the Contractor.

### 5. MAIN CONSTRUCTION

#### Laying of Water Main

After the trench or tunnel has been excavated and the bottom has been graded, the Contractor shall furnish and place a 4" layer of Modified MDOT Class II sand (100% passing 1 1/2" sieves) in the trenches as a bed of cushion for the pipe. The pipe shall then be carefully laid on the sand cushion to insure positive bearing along the full length of the pipe. The Contractor then shall place a 4" vertical layer of compacted sand along the side of the pipe filling in any void space under the pipe. Additional tamped sand shall then be placed along side of the pipe to a height equal to the top of the pipe.

The interior of all pipe special castings must be thoroughly cleaned by brushing, swabbing or washing out all dirt before laying. All branches or other openings shall be stopped-up with wooden plugs or heads until either capped or connected. All pipe or special castings connecting to exiting mains, between said connection and the first valve, shall be thoroughly cleaned and swabbed with a 1:100 percent chlorine solution (100 parts per million) before laying. Jointing of the pipe and specials shall immediately follow the laying operation.

There shall be a minimum of 10-foot horizontal separation and 18-inches of vertical separation between water mains and sanitary or storm sewer.

#### Placement of Hydrants

All hydrants shall be set at the location and grade, as indicated in the original design. Each fire hydrant shall be set on a flat stone or concrete block not less than 18 inches square and 6- inches in thickness. Backfill material beneath and around the base of each hydrant and extending twelve (12) inches above the drip shall consist of approved fill sand. The remainder of the excavation shall then be filled with the excavated material, well tamped around the hydrant so that no uneven pressure is brought to bear upon the stem.

No hydrant shall be set unless the Engineer or inspector is present and the hydrant setting must be approved by the inspector before being backfilled. The Contractor shall be responsible for the proper operation of all hydrants until the mains are laid and all the work formally accepted.

#### Valves and Fittings

All valves, gate valves, tees, curves, crosses and connections are to be laid as shown on the plans and as directed.

#### Valves

Valves must be examined before installation and adjusted so that when the installation is made, they will work easily and properly and must be left with the valve closed. All nuts on valves must be checked for tightness before being lowered into the trench. Valves shall be set truly vertical so that when the valve boxes are set, the axis of the valve box will be in line with the valve stem.

In setting valve boxes, the base should rest two (2) or more inches above the flanged joints of the valve dome so that the nut of the valve is on a line with the hub or upper part of the valve box base, thereby leaving ample space all around the valve and preventing the box from touching the valve. The top of the valve box shall be adjusted to the ground level as directed by the Engineer or Inspector.

#### 6. BLOCKING PIPE

All bends, curves and dead ends of pipe or special castings shall be blocked with concrete in accordance with the detailed plans.

#### 7. FITTINGS

Standard fittings shall be used wherever possible. Flanged joint pipe and fittings shall be American Standard for 125 pounds steam pressure, faced and drilled. Mechanical joint fittings shall conform to A.S.A. A21.11.

#### 8. JOINTING

All jointing shall be per ANSI/AWWA C900-07. Mechanical joint connections shall be made as follows:

- 1) Clean part thoroughly, and then slip gland and gasket over plain end. Small side of basket and lip side of gland face bell.
- 2) Lubricate gasket with approved food-grade lubricant.
- 3) Push gasket into position making sure it is evenly seated in socket.

#### Pipe Cutting

Whenever it becomes necessary to cut a pipe to make a connection or closure in either old or new work, the pipe shall be cut on the shortest outside circumference. The cutting shall be sufficiently into the material that it shall break without fracturing or cracking the body of the pipe. All connections made on cut pipe shall be per ANSI/AWWA C907-04 and C900-07.

#### 9. MAIN TAPPING AND SERVICE LEADS

##### Main Tap

Tapping into the main shall be done in accordance with the Village of Hillman standards. The Contractor is responsible for the coordination of main isolation and timing of the tap. The Village of Hillman DPW and third party inspector must be present during the tapping of the main.

##### Service Leads

All Service leads shall be tapped using a tapping saddle. A corp stop or curb stop shall be placed on all new service leads. Meters shall be placed at the facility utilizing the water service.

Galvanized service lines will be replaced with copper to the property line. Existing copper lines less than 5' in depth will be replaced.

When crossing a paved street, the service lead shall be jacked under the pavement. Augering and/or jacking requirements on paved streets for the installation of pipe less than 2-1/2" outside diameter shall be made by a "compactor" type machine or similar method without removing existing soil, if soil conditions permit.

## 10. CLEANING AND DISINFECTING

Before disinfecting, the new main shall be flushed out with potable water until water runs clear.

### Chlorine Application

The chlorinating agent shall be applied at a point at the beginning of the pipe line extension, or any valved section of it and through a corporation cock inserted in the horizontal axis of the newly laid main. Water from the existing distribution system should be controlled to flow very slowly into the newly laid pipe line during the application of chlorine. The end-most valve shall be partially opened to permit the flow of water through the pipeline and to prevent the building up of water pressure in excess of twenty (20) pounds. The treatment shall be continued until the water flowing from the end of the main contains enough residual chlorine to develop a deep red color (Minimum of 25 PPM) when D.P.D. reagent is added to a sample of water. The flow of water and chlorine shall be stopped at the point of application.

The treated water shall remain in the pipe line for at least twenty-four (24) hours; after which time, the main shall be thoroughly flushed with potable water until all of the chlorinated water is removed. The Inspector or his agent will test water samples to ensure that this has been accomplished. No main shall be placed in service until bacteriological water samples, which will be collected by the contractor, have passed. This sampling will be carried out under the direct supervision of the Superintendent of Water or his agent. Samples will be transported to an approved laboratory by the contractor and a representative of the water department. Two sets of samples taken at 24 hour intervals must show "safe" results in accordance with requirements set by the U.S. Environmental Protection Agency and the Michigan Department of Public Health for safe drinking water. If, however, the results are unsafe, the whole process of chlorine application will be repeated.

## 11. PRESSURE LEAKAGE TEST

After the entire water main or any part of a water main contained between two gate valves has been laid, chlorinated and bacteriological tested it may be given the pressure leakage test. The pressure leakage test shall consist of the following procedure.

The completed pipe line shall be slowly filled with water until all the air has been expelled. When certain that all air has been expelled from the pipe line, the water pressure shall be raised by a pump to 150 pounds per square inch and shall be maintained at this pressure for a period of at least two hours. The amount of additional water to maintain this pressure shall be taken as the amount of leakage. The pressure on the pipe line shall be determined by a tested pressure gauge equipped with a snubber. The amount of water used shall be determined by connecting a tested water meter into the pump supply line or in the case of testing a short section of pipe line, a sterilized container may be used to supply replacement water to the pump and the amount of water calculated by direct measurement. Water main will be pressure-tested

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in 1500 foot sections. If longer sections are tested, the allowed leakage will be the same as for 1500 feet. Pressure testing shall be conducted in accordance with current AWWA standards C605-05. Chlorinated Water shall be used for pressure-testing.

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