

**ALLENDALE CHARTER TOWNSHIP
OTTAWA COUNTY, MICHIGAN**

**STANDARD CONSTRUCTION REQUIREMENTS
FOR**

**WATER MAIN, SANITARY SEWER, STORM SEWER,
PEDESTRIAN BRIDGE, SIDEWALK, AND SHARED USE
PATH IMPROVEMENTS**

MARCH 2021



TABLE OF AMENDMENTS

SECTION	SUBSECTION	DESCRIPTION
00000 – CHECKLIST	2	Approved final construction prints must be provided prior to submittal of plans to MDEQ for permits
00000 – CHECKLIST	5	All water and sewer laterals must be marked per Township Specifications prior to substantial completion
01000 – GENERAL REQUIREMENTS	1.02	Field changes must be documented within 24 hours .
01000 – GENERAL REQUIREMENTS	1.03.E	Prior to scheduling Pre-con Meeting, all permits to be provided to Township
01000 – GENERAL REQUIREMENTS	1.05.02	Changed Insurance Requirements from Operators and Contractors to General Liability
01000 – GENERAL REQUIREMENTS	1.08	Rough grading must be completed prior to service connections
01000 – GENERAL REQUIREMENTS	1.09	Any utility installation outside of Allendale Charter Township must be inspected by Allendale Charter Township and/or their representatives
01000 – GENERAL REQUIREMENTS	1.18.B	Benchmarks/control points must be provided
01000 – GENERAL REQUIREMENTS	1.18.A	Initial and follow-up inspection be performed at no charge. Any subsequent inspections will be charged to the developer. (10-12-2018)
01000 – GENERAL REQUIREMENTS	1.31.F	Cablevision provider is no longer Allendale Communications. Rather, the cablevision provider is AcenTek (10-12-2018).
01000 – GENERAL REQUIREMENTS	1.37.D	Private roadways without public utilities will be required to provide surety bond or letter of credit in the amount to guarantee installation of sand subbase, aggregate base and asphalt leveling course for the project. Private roadways with public utilities in the right-of-way will be required to provide a surety bond or letter of credit in an amount to guarantee installation of the entire road section including the sand subbase, aggregate base, asphalt leveling course and wearing course for the project. (01-2021)
01000 – GENERAL REQUIREMENTS	1.45	For structures incorporating a grinder pump, the grinder pump must be located within the dwelling and will be the responsibility of the property owner. (01-2021)
01000 – GENERAL REQUIREMENTS	1.49	Hydrant and valve inspection completed before combustibles are brought on site. Also, will need 2 nd inspection at completion of construction. APW must confirm hydrants are operable and turned “on”.
02501 – CONCRETE SIDEWALK AND RAMPS	R28J	Updated sidewalk detail. (MDOT 12-11-2017)
02501 – CONCRETE SIDEWALK AND RAMPS	1.04.F	Two-way intersections have 2 crosswalks, three-way intersections have 3 crosswalks, four-way intersections have 4 crosswalks. (04-26-2019)
02501 – CONCRETE SIDEWALK AND RAMPS	2.01.I	Provide detectable warning surface width to match sidewalk ramp width. (07-02-2019).
02501 – CONCRETE SIDEWALK AND RAMPS	3.02.A.2	Slopes away from the edge of sidewalk must not exceed a 1:4 grade (one vertical foot, four horizontal feet). (07-02-2019)
02501 – CONCRETE SIDEWALK AND RAMPS	3.02.A.5	Sidewalk shall continue through ALL driveways. Previously, only commercial driveways were specified. (04-26-2019)

SECTION	SUBSECTION	DESCRIPTION
02502 – SHARED USE PATHS	1.04.F	Two-way intersections have 2 crosswalks, three-way intersections have 3 crosswalks, four-way intersections have 4 crosswalks. (04-26-2019)
02502 – SHARED USE PATHS	3.04.A.1.c	Slope beyond the edge of path shoulder shall not exceed a 1:4 slope (1 vertical foot, 4 horizontal feet). (07-02-2019)
02660 – WATER MAINS	1.03.A.4	All submittals approved prior to construction. Submittal of record drawings has changed. Please refer to the section. (10-12-2018)
02660 – WATER MAINS	1.04.F	Initial and follow-up inspection to be performed at no charge. Any subsequent inspections will be charged to the developer. Township Inspector or Township Engineer shall be provided notice and allowed three work days to perform major inspection. (10-12-2018)
02660 – WATER MAINS	2.02.B	Added specification for the use of HDPE pipe. The use of HDPE pipe is only permitted with TOWNSHIP approval. (3-21-2019)
02660 – WATER MAINS	2.02.C.2	Water service sizes clarified
02660 – WATER MAINS	2.03.A	Glands and rubber gaskets specified (10-12-2018)
02660 – WATER MAINS	2.03.B	Added joint specifications for HDPE pipe. (03-21-19)
02660 – WATER MAINS	2.04.B	Added fittings specifications for HDPE pipe. (03-21-19)
02660 – WATER MAINS	2.06.E	Added clear space requirements around hydrants
02660 – WATER MAINS	2.07.A&B	References to A.Y. McDonald 74701-22 Series and 76100-22 Series, respectively
02660 – WATER MAINS	2.07.C	Stationary rod must be EAST JORDAN
02660 – WATER MAINS	2.08.C	Mechanical joint restraints specified – Mega lugs to be used.
02660 – WATER MAINS	3.01. A.3	Sanitary to be encased with concrete when above water main.
02660 – WATER MAINS	3.02.D	Tighten bolts evenly per manufacturing recommendations
02660 – WATER MAINS	3.02.E.3.c	Provide 2 measurements to permanent surface features.
02660 – WATER MAINS	3.02.F.2.b	Maintain minimum 5 feet separation from sewer laterals. Locate water services 10 feet from the left property line (facing lot)
02660 – WATER MAINS	3.02.F.2.a	Prohibited services provided by easements
02660 – WATER MAINS	3.02.F.2.e	Cover curb stop boxes with 4' long section of 4-1/2" minimum I.D pipe buried 1' .
02660 – WATER MAINS	3.02.I	Reaction backing only allowed when approved by TOWNSHIP ENGINEER .
02660 – WATER MAINS	3.02.K	Added specification for installing water meters in buildings.

SECTION	SUBSECTION	DESCRIPTION
02660 – WATER MAINS	3.03.A.1.b	The Township must be notified 24 hours in advance for observation, and 48 hours for testing.
02660 – WATER MAINS	3.03.A.1.c	The Township Inspector or Township Engineer shall be provided notice and allowed three (3) work days to perform major inspections for water main. (10-12-2018)

02660 – WATER MAINS	3.03.A.3.k	Testing is in accordance with ASTM F2164. (03/21/2019)
02660 – WATER MAINS	3.03.A.5.a-b	For pressure testing tapping valves and sleeves, 120 psi is used when using air and 150 psi when using water. (10-12-2018)
02660 – WATER MAINS	3.04.A	See table displaying the required flow and openings to flush pipelines.
02660 – WATER MAINS	3.05.A.9	Sampling interval decreased to 15 minutes
02660 – WATER MAINS	3.06	Added testing specifications for HDPE pipe (03/21/2019)
02660 – WATER MAINS	DETAILS	Revised hydrant detail naming from “fire hydrant detail” to “standard fire hydrant installation”. (05/20/2019)
02660 – WATER MAINS	DETAILS	Revised hydrant detail naming to “standard 90-degree fire hydrant installation”. (06/17/2019)
02660 – WATER MAINS	DETAILS	Added hydrant detail to include straight fire hydrant installation. (06/17/2019)
02660 – WATER MAINS	DETAILS	Revised the hydrant assembly naming from “hydrant assembly” to “hydrant detail”. Also added note to use reaction backing when specified by the Township. (05/20/2019)
02661 – REMOVAL/ABANDONMENT OF WATER SERVICES		This section was added and specifies Township requirements for the removal and/or abandonment of water services. (10-12-2018)
02720 – STORM SEWERS	3.02.B.2	All pipes 24 inches and larger shall have joints wrapped.
02720 – STORM SEWERS	3.03.A.2	P.E. pipe to be mandrel.
02730 – SANITARY SEWERS	1.03	All submittals approved prior to construction. Submittal of record drawings has changed. Please refer to the section. (10-12-2018)
02730 – SANITARY SEWERS	1.04.A	Contractor to provide by-pass pumping
02730 – SANITARY SEWERS	1.04.D	Initial and follow-up inspection to be performed at no charge. Any subsequent inspections will be charged to the developer. Township Inspector or Township Engineer shall be provided notice and allowed three work days to perform major inspection. (10-12-2018)
02730 – SANITARY SEWERS	2.01.D	Flexible couplings NOT permitted.
02730 – SANITARY SEWERS	2.01.F	Use hydraulic cement for flow channel work.
02730 – SANITARY SEWERS	2.02.D	Concrete strength of 4000 psi required after 28 days for manholes.
02730 – SANITARY SEWERS	2.02.I	East Jordan 1040 A cover or – two (2) hole cover with the words “ALLENDAL AREA SANITARY SEWER” & East Jordan 1045 Z1 frame. (10-12-2018)
02730 – SANITARY SEWERS	3.01.A	Pipe invert elevation is to be measured prior to setting manhole cone for as-built drawings.
02730 – SANITARY SEWERS	3.02.A.5	Sewer joints above water main shall be encased in concrete.
02730 – SANITARY SEWERS	3.02.A.6	See the pipe slope schedule to identify the associated changes.

SECTION	SUBSECTION	DESCRIPTION
02730 – SANITARY SEWERS	3.02.C.6.b	Hydraulic cement must be used for flow channel grouting. Must provide smooth, constant grade across structure. (07-01-2019).

02730 – SANITARY SEWERS	3.02.D	Fill existing sanitary sewer if it is above the water table.
02730 – SANITARY SEWERS	3.02.E.5	No inside drop connections permitted.
02730 – SANITARY SEWERS	3.02.F.2	Locate service lines 15 feet from left property line unless otherwise directed by the Township.
02730 – SANITARY SEWERS	3.02.F.1	Prohibited services provided by easements
02730 – SANITARY SEWERS	3.02F.5.d	No laterals directly connected to manholes.
02730 – SANITARY SEWERS	3.02.F.8	Cover 2' x 2' wood marker and steel re-rod with 4' long 4-1/2" I.D minimum pipe buried 1 foot.
02730 – SANITARY SEWERS	3.02.J	No excavation near sanitary sewer after backfilling which could impact its function as determined by Township DPW and/or Township Engineer.
02730 – SANITARY SEWERS	3.02.G	Specification for abandoning an existing lateral was added. (06-10-2019).
02730 – SANITARY SEWERS	3.03.E	Water test for leakage (infiltration & exfiltration where eliminated)
02731 – CLEANING AND TELEVISIONING SANITARY SEWERS	1.03.A.1.a.	Complete sewer cleaning and televising per N.A.S.S.C.O. standards.
02731 – CLEANING AND TELEVISIONING SANITARY SEWERS	1.01.C	The Township Inspector or Township Engineer shall be provided notice and allowed three (3) work days to complete major inspections (10-12-2018)
02731 – CLEANING AND TELEVISIONING SANITARY SEWERS	2.01.B.1	Camera operator must be PACP certified
02731 – CLEANING AND TELEVISIONING SANITARY SEWERS	3.03.B	Charges for extra reviews have been specified.
02731 – CLEANING AND TELEVISIONING SANITARY SEWERS	3.03.C	Should excavation be required to repair sewer, another 30-day waiting period will be mandatory prior to televising.
02731 – CLEANING AND TELEVISIONING SANITARY SEWERS	3.02.A.1	Minimum 5 gallons of water to be used for flushing sanitary sewer.
02732 – SANITARY FORCE MAINS	1.03	Material submittals shall be approved by Township prior to construction. Submittal of record drawings has changed. Please refer to the section. (10-12-2018)
02732 – SANITARY FORCE MAINS	2.06.C	Concrete strength of 4000 psi required after 28 days for air release valves and cleanout chambers.
02732 – SANITARY FORCE MAINS	2.06.H	East Jordan 1040 A cover or – two (2) hole cover with the words "ALLENDAL AREA SANITARY SEWER" & East Jordan 1045 Z1 frame. (10-12-2018)
02732 – SANITARY FORCE MAINS	3.01.A.4	Pipe inverts must be measured prior to setting cones, for as-built drawings.
02732 – SANITARY FORCE MAINS	3.02.C.1	Lubricate mechanical joints with material specified by the manufacturer. Bolts must be tightened evenly to manufacturer specifications.
02740 – HORIZONTAL DIRECTIONAL DRILLING	1.07.F	Added requirement for Contractor corrective action plan.
02740 – HORIZONTAL DIRECTIONAL DRILLING	3.12.C	Contractor is responsible for conducting the test. (03/21/2019)
02740 – HORIZONTAL DIRECTIONAL DRILLING	3.12.E	The length tested is limited to a maximum of 2000 LF (03/21/2019)
02800 – SURFACE RESTORATION	1.03.A	Place 4 inches of new topsoil, and HEAVY DUTY HYDROSEED & MULCH.
02800 – SURFACE RESTORATION	3.04	Use heavy duty hydro-seed and hydro-mulch for seeding

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PURPOSE OF THIS DOCUMENT:

The purpose of this document is to provide Developers, Consulting Engineers and Contractors working in the Township with the general requirements and standard construction requirements required by the Township for water main, sanitary sewer, storm sewer, pedestrian bridge, sidewalk, and shared use path improvements which, after acceptance by the Township, will become public facilities.

These standard construction requirements shall be incorporated by reference as part of the contract documents for the acquisition and construction of water main, sanitary sewer, storm sewer, pedestrian bridge, sidewalk, and shared use path improvements in Allendale Charter Township. Michigan Department of Transportation (MDOT) specifications and standard plans referenced throughout the specifications shall be superseded by the most current version published by MDOT.

It is expected and required that each Developer, consulting engineer and contractor will review this document and be familiar with its content and requirement, prior to design of all projects.

These standard construction requirements are applicable to any and all site improvements that are made regardless of existing conditions – known or unknown - regarding water main, sewer main and any of the appurtenances mentioned herein.

DEFINITIONS

Agreement – The written contract between the Owner and Contractor covering the work to be performed.

Certificate of Final Approval – The Developer has met all requirements of the Township and the Township has accepted the project as completed

Contractor – The person, partnership, corporation or other legal entity with whom the Owner has entered into an agreement to construct the work.

Contract Documents – Agreement, plus any or all of the following additional documents, if they exist: addenda (which pertain to the Contract Documents), contractor's bid (including documentation accompanying the bid and any post bid documentation submitted prior to the notice of award) when attached as an exhibit to the Agreement, the notice to proceed, bonds and insurance certificates, general conditions, supplementary conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all written amendments, change orders, work change directives, field orders and Owner's Engineer's written interpretations and clarifications. THESE STANDARD CONSTRUCTION REQUIREMENTS SHALL BE INCORPORATED BY REFERENCE AS PART OF THE CONTRACT DOCUMENTS.

Development Agreement – A written agreement between the Owner (Developer) and the Township covering various items regarding the Project.

Owner – The person, partnership, corporation or other entity (Developer) for whom the Work is being constructed and with whom the Contractor has entered into an Agreement.

Owner's Engineer – The Consulting Engineer, licensed in the State of Michigan, employed by the Owner for the Project.

Plans – The drawings which show the scope, extent and character of the Work to be furnished and performed by Contractor and which have been approved by the Township and Township's Engineer and are referred to in the Contract Documents.

Property Owner – The owner of an individual parcel within the development.

Project – The water system, sanitary sewer system, storm sewer, pedestrian bridge, sidewalk, and/or shared use path improvements which will become a public facility, along with all appurtenances and other improvements necessary to protect the integrity of the public facilities such as asphalt, final grading, restoration, cleaning, televising, access roads and similar items.

Provide – Furnish and install.

Specifications – Those portions of the Contract Documents consisting of written technical descriptions of materials, equipment, construction systems, standards and workmanship as applied to the Work and certain administrative details applicable thereto.

Substantial Completion - The stage of the project where building permits can be issued and building connections are allowed to the Public Utilities

Township – Allendale Charter Township, Ottawa County, Michigan.

Township's Engineer – The person, firm or corporation used by the Township for consulting engineering purposes.

Work – The entire completed construction or the various separately identifiable parts thereof required to be furnished under the Contract Documents. Work includes and is the result of performing or furnishing labor and furnishing and incorporating materials and equipment into the construction, and performing or furnishing services and furnishing documents, all as required by the Contract Documents.

ALLENDALE CHARTER TOWNSHIP STANDARD CONSTRUCTION REQUIREMENTS

EXECUTIVE SUMMARY

This document includes Standard Construction Requirements and Development Standards.

The purpose of having Standard Construction Requirements is to ensure the use of uniform, adequate and acceptable construction methods and materials on all public improvements in the Township. Uniformity is important to minimize the Township's future operations and maintenance costs. Standard Construction Specifications are included for the following:

1. Excavating, backfilling and compacting
2. Boring and jacking
3. Concrete sidewalks and sidewalk ramps
4. Shared Use Paths
5. Water mains
6. Storm sewers
7. Sanitary sewers
8. Cleaning and televising sanitary sewers
9. Sanitary force mains
10. Horizontal directional drilling
11. Surface protection and restoration
12. Pedestrian bridges

The purpose of having Development Standards is to ensure that development projects and their related public improvements are completed in a uniform, acceptable manner. The Development Standards include (but are not limited to) the following:

1. Agreements with the Developer outlining responsibilities
2. Guarantee provisions
3. Insurance requirements to minimize the Township's liability
4. Development Fee to cover the Township's cost of plan review, design engineering, construction observation and administration
5. Plan review process
6. Appendices are included to outline the following:
 - a. Plan submittal process
 - b. Development Fees
 - c. Standard easement forms
 - d. Development Agreement and Letter of Credit form
 - e. Payback Agreement
 - f. Oversizing Policy and Agreements
 - g. Storm Water Operation and Maintenance Agreement
 - h. Pre-construction Meeting Agenda

The following were involved in preparing these requirements:

1. Township Supervisor
2. Township Department of Public Utilities Superintendent
3. Township Engineer
4. Township Attorney

Allendale Charter Township
Project Checklist

	Date
1. Initiation of Project	
<input type="checkbox"/> Plans submitted for review	
2. Prior to submittal of plans MDEQ for permits:	
<input type="checkbox"/> Plans and cost estimate reviewed and stamped approved by Township DPU and Township Engineer	
<input type="checkbox"/> Entire development fee paid	
<input type="checkbox"/> Approved construction plans delivered to Township. 7 for Water or Sewer, or 10 for both.	
<input type="checkbox"/> Development agreement signed	
3. PRIOR TO SCHEDULING pre-construction meeting, the following items must be provided.	
<input type="checkbox"/> Letter of credit in place to guarantee completion	
<input type="checkbox"/> Evidence of insurance coverage	
<input type="checkbox"/> Copy of MDEQ permits	
<input type="checkbox"/> Copy of permits / approval letters from OCRC, OCWRC, MDOT	
<input type="checkbox"/> Executed easements	
<input type="checkbox"/> Executed storm water operations and maintenance	
4. Pre-construction meeting scheduled and held: (after receipt of all permits)	
5. Prior to Substantial Completion:	
<input type="checkbox"/> Water main pressure test and chlorination passed	
<input type="checkbox"/> Connection to water system made	
<input type="checkbox"/> Hydrant and valve operation inspection complete	
<input type="checkbox"/> Sanitary sewer air testing, manhole inspection and video inspection passed	
<input type="checkbox"/> Rough grading complete	
<input type="checkbox"/> Adjust sanitary manhole castings to pavement grade	
<input type="checkbox"/> Force main pressure testing passed	
<input type="checkbox"/> Pump station testing passed	
<input type="checkbox"/> All water and sewer laterals marked per spec	
<input type="checkbox"/> Letter of credit for uncompleted work	
<input type="checkbox"/> Substantial completion approved in writing by Township.	
6. Prior to Final Approval and acceptance by Township	
<input type="checkbox"/> Approved record drawings (i.e. As-Builts)	
<input type="checkbox"/> Copy of recorded easements	
<input type="checkbox"/> Guarantee period agreement signed	
<input type="checkbox"/> Storm water operations and maintenance agreement signed, if applicable	
<input type="checkbox"/> Engineer's certificate signed	
<input type="checkbox"/> Warranty bill of sale signed	
<input type="checkbox"/> All adjustments on water and sewer made to finish grade	
<input type="checkbox"/> Punch list items competed	
<input type="checkbox"/> Paving, grading complete	

GENERAL REQUIREMENTS

SECTION 01000

GENERAL REQUIREMENTS

PART 1 – GENERAL REQUIREMENTS

1.01 AGREEMENT

The Agreement shall incorporate by reference these Standard Construction Requirements and shall provide that the Township is a third-party beneficiary of the Agreement and that all provisions of the Agreement in favor of the Owner and/or Township may be enforced by the Township. The Agreement shall be submitted to the Township for approval prior to its execution.

The Township shall require a Development, Watermain or Sanitary Sewer Agreement between the Developer and the Township.

1.02 STANDARDS/ORDINANCES

All work shall conform to these Standard Construction Requirements and all applicable Township ordinances and rules and regulations.

The Owner, the Owner's Engineer, and the Contractor shall keep themselves fully informed of and shall at all times comply with all local, state and federal laws, rules and regulations applicable to the Project.

THE PROCEDURE FOR GRANTING OF EXCEPTIONS TO THESE STANDARD CONSTRUCTION REQUIREMENTS PURSUANT TO PARAGRAPH 1.50 IS:

- A. A written request for an exception shall be prepared and filed by the Owner or Owner's Engineer with the Township. This written request shall include sufficient information for the Township review and shall be signed by both the Owner and the Owner's Engineer.
- B. The Township will consider the exception request and consult with the Township Engineer as necessary. The Township will then give a written notice to the Owner stating the Township's decision on the exception request. The Township's decision shall be final and binding on the Owner.
- C. Field changes must be documented within 24-hours.

REQUIREMENTS FOR PROJECT RELATED PUBLIC IMPROVEMENTS

Public infrastructure (i.e. sanitary sewer, water main, sidewalk and ramps, shared use paths, pedestrian bridges, storm sewer and street improvements) shall be extended and constructed adjacent to, across the frontage of, and within (as required by Township site plan approval) proposed developments in accordance with these Standard Construction Requirements and applicable Township, Ottawa County Road Commission (OCRC), Ottawa County Water Resources Commissioner (OCWRC), Michigan Department of Transportation (MDOT), and Michigan Department of Environment Great Lake and Energy (MDEGLE).

1.03 PLAN REVIEW PROCESS

For watermain and sanitary sewer:

- A. The Owner's Engineer shall act as the Owner's agent. Copies of all correspondence shall be sent to the Owner's Engineer.
- B. The Owner's Engineer shall submit a preliminary site plan for the Project to the Township's Public Utility Department **concurrent** with submittal to the Township Planning Commission for review of any preliminary plat, preliminary planned unit development plan, rezoning request, preliminary site condominium approval request, site plan or any other planning approval document pertaining to the Project. No water or sanitary sewer Project shall be undertaken unless in conformance with the Township's Sanitary Sewer System and Water System Master Plans or otherwise approved by the Township.
- C. The Owner's Engineer shall submit two sets of Plans and Specifications to the Township Public Utility Department and two sets of plans, specifications and drainage calculations to the Township's Engineer. If easements are proposed, the proposed easement documents shall be submitted to the Township and Township Engineer for review and approval.
- D. After review of the Plans and Specifications, the Township and the Township Engineer will issue joint review letter(s) to the Owner's Engineer.
- E. Upon receipt of the review letter, any changes required must be made and the final plans (and easement documents, if any) shall be submitted for final review. Also, the Development Agreement shall be signed, and the Development Fees paid prior to submitting the Plans and Specifications to the Township for construction permits. Approval by the Township and Township Engineer will be for general conformance to current standards and requirements and does not relieve the Owner's Engineer of professional responsibility to the Owner. The Owner's Engineer shall submit the required number of sealed plans and specifications and one copy of the Act 399 and Part 41 of Act 451 permit applications to the Township. Total sets of Plans and Specifications required are: seven (7) for water main or sanitary sewer, and ten (10) for both water main and sanitary sewer. All copies shall be stamped approved by the Township and Township Engineer prior to submittal to the MDEGLE. The Township and Township Engineer each will retain two (2) approved copies for their files. The remaining approved copies of the plans and specifications and the permit application(s) will be forwarded to the MDEGLE for construction permits. Prior to scheduling a preconstruction meeting, a copy of all permits must be submitted to the Township.

For storm sewer / storm water management:

As required by the current Ottawa County Water Resources Commissioner Standards & Specifications and Storm Water Management Policy. The Ottawa County Water Resources Commissioner, Ottawa County Road Commission, Michigan Department of Transportation, if applicable, and the Township Engineer must approve storm sewer and storm water management plans prior to construction. A copy of all submittals and approval letters shall be sent to Allendale Charter Township. The Township Engineer will also review the grading plan and comment as necessary

A Storm Water Operation and Maintenance Agreement shall be executed on all developments unless a 433 Drainage District Agreement is established with the OCWRC (see form in Appendix G). The proposed Storm Water Operation and Maintenance Agreement shall be approved by the Township and Township Engineer prior to execution.

For sidewalks, sidewalk ramps, shared use paths and ramps, and pedestrian bridges:

Submit plans to the Township, OCRC and OCWRC, if applicable, for review and approval. Pedestrian bridges meeting Section 13425 of the Specifications shall be provided on open channel drain crossings.

Construction details for sidewalks, shared use paths, and ramps shall be included on the plans. Provide shared use paths meeting Section 02502 of the Specifications in locations indicated on the Township Master Plan for Shared Use Paths.

1.04 PERMITS AND APPROVALS

No construction work on the Project shall commence nor shall a pre-construction meeting be scheduled until all of the below required permits/approvals which are applicable have been obtained, the Development Agreement has been signed, an irrevocable letter of credit has been provided to guarantee completion, the Development Fee has been paid, any necessary agreements with the Township have been signed and delivered, all required easements have been signed and delivered to the Township, appropriate evidence that all required insurance is in force and has been filed with the Township, and the Township has reviewed and approved the Agreement.

Prior to scheduling a preconstruction meeting and commencing construction of the Project, the following permits/approvals shall be obtained (if applicable) by the Owner's Engineer:

- A. Township Building & Zoning Administrator and Township Fire Department.
- B. Township Public Utility Department and Township Engineer.
- C. Ottawa County Road Commission.
- D. Ottawa County Water Resources Commissioner – storm sewer and Soil Erosion Sedimentation Control (Part 91 of PA 451). Note: Storm water detention may be required.
- E. Michigan Department of Environmental Quality:
 - 1) Water main construction permit (Act 399).
 - 2) Sanitary sewer construction permit (Part 41 of Act 451).
 - 3) Inland Lakes and Streams (Part 301 of Act 451).
 - 4) Soil Erosion and Sedimentation Control (Part 91 of Act 451).
 - 5) Wetlands (Part 303 of Act 451).
 - 6) Storm Water Discharge (Part 31 of Act 451).
- F. Michigan Department of Transportation.

1.05 INDEMNITY/INSURANCE

1.05.01 Indemnity – General:

The Contractor shall agree in the Agreement that as a condition of performing the Work, the Contractor agrees to assume all liability for and protect, indemnify, save and hold harmless the Township, Ottawa County Road Commission, Ottawa County Water Resources Commissioner (including Road Commissioner's, Water Resources Commissioner's and Township's respective consulting engineers), their agents, consultants, officers, board members and

employees, from and against all actions, claims, demands, judgments, losses, expenses of suits or actions and attorney fees for injuries to, or death of, any person or persons and loss or damage to the property of any person, or persons, whomsoever, and the Contractor's agents, contractors, subcontractors, officer and employees, arising in connection with or as a direct or indirect result of entering into and performance of the Work, whether or not due to or arising out of the acts of the Contractor or its agents, contractor, subcontractors, officers and employees, or by or in consequence of any negligence or carelessness in connection with the same or on account of liability of obligation imposed directly or indirectly upon any of the above named indemnified parties by reason of any law of the State of Michigan or the United States, now existing or which shall hereinafter be enacted, imposing any liability or obligations, or providing for compensation to any person or persons on account of or arising from the death of, or injuries to employees. The Contractor shall pay, settle, compromise, and procure the discharge of any and all such claims and all such losses, damages, and expenses. The indemnified parties shall have the option to retain their own attorney or attorneys and the reasonable expense thereof shall be paid by the Contractor.

1.05.02 Insurance Requirements:

The Agreement shall provide that prior to commencing the Work, the Contractor shall file with the Township, Ottawa County Road Commission and Ottawa County Water Resources Commissioner a certificate of insurance acceptable to the Township as proof that the Contractor has secured the types and amounts of insurance required by this subsection for the Project. The Township shall have the right, in its sole discretion and at any time(s), to require the Contractor to file with the Township certified copies of any policies of insurance required by this subsection.

The Contractor shall provide Owners and Contractors General Liability insurance coverage for the project in the amount of \$2,000,000 (general aggregate) and \$1,000,000 (each occurrence) naming the Township, Ottawa County Road Commission and Ottawa County Water Resources Commissioner (including the Water Resources Commissioner's, the Road Commission's and the Township's respective consulting engineers), if the work is within their service area, of each of the above-named public entities. The named insureds shall include all officers, consultants, agents, employees, and board members.

The certificate or certified policies filed with the Township shall provide for giving the Township no less than 30 days' prior written notice of any cancellation, material change in coverage or non-renewal of the insurance.

The furnishing by the Contractor of any insurance policies and/or insurance certificates and their acceptance or approval by the Township shall not release the Contractor from the obligation to provide sufficient insurance coverage as set forth herein and shall not waive liability of the Contractor to provide indemnification as provided above.

1.06 PRE-CONSTRUCTION MEETING

A pre-construction meeting shall be held with the Township, the Ottawa County Road Commission, the Ottawa County Water Resources Commissioner, the Township's Engineer, the utility companies, and other agencies affected by the proposed construction. The Township's inspection procedures will be reviewed with regards to water main, sanitary sewer, storm sewer, pedestrian bridge, sidewalk, and shared use path improvements. Once all requirements have been met as outlined in paragraph 1.04, the Owner's Engineer shall schedule and preside at the pre-construction meeting to be held at the Township Hall. An agenda out-line to be used at the pre-construction meeting is included in Appendix H. The Owner's Engineer shall prepare and distribute minutes of the meeting to the attendees/invitees.

1.07 ASSESSMENTS/CHARGES/FEES

Water and sanitary sewer assessments/charges/fees include, but are not limited to, stub water services/meters and Plan review and inspection fees (development fees). These assessments/charges/fees will be as established by the Township Board by resolution. It is the responsibility of the Owner to make inquiry as to the amount of assessments, charges and fees applicable to the Project. Payment terms, if any, shall be as agreed upon in writing with the Township.

1.08 CONNECTIONS/ACCEPTANCE AND FINAL APPROVAL

Prior to acceptance of the Project, substantial completion of the Project shall be obtained. In order to obtain substantial completion, the following shall occur:

- A. Water main pressure testing, and chlorination passed
- B. Connection to water system made
- C. Services marked correctly
- D. Asphalt installed to minimum of base grade
- E. Sanitary sewer castings set to asphalt grade, base as a minimum
- F. Sanitary sewer air testing, manhole inspection and video inspection passed
- G. Rough grading complete prior to service inspections
- H. Laterals marked correctly
- I. Force main pressure testing passed
- J. Pump station testing passed
- K. Letter of credit to be provided to the Township to complete the improvements identified on the approved plans
- L. Hydrant and valve inspection completed
- M. Certificate of Substantial Completion accepted by Township

Prior to final approval of the Project by the Township, the following shall occur or be submitted to the Township:

- A. Provide the Township 2 printed sets and the Township Engineer 1 electronic file in AutoCAD format of record drawings (as-builts) with as-constructed dimensions and witnesses.
- B. Copy of recorded easements.
- C. Copy of recorded plat and restrictive covenants, or Site Condominium Master Deed documents showing dedicated easements.
- D. Signed Guarantee Period Agreement (form included at the end of this section).

E. Signed Storm Water Operation and Maintenance Agreement, if applicable.

F. Signed Engineer's Certificate for Water System, Sanitary Sewer System, Storm Sewer, Pedestrian Bridge, Sidewalk, and/or Shared Use Path Improvements (form at the end of this section).

G. Executed Bill of sale (required form is included at the end of this section).

H. Certificate of Final Approval accepted by Township.

1.09 BUILDING CONNECTIONS

Separate permits will be required for any water service or sanitary sewer lateral connections into buildings. See pertinent Township Ordinances and the Township Water and Sanitary Sewer Rules and Regulations for requirements and regulations pertaining to private water systems, fire lines, sanitary sewer and storm sewer, as well as these Standard Construction Requirements. Any utility infrastructure outside of Allendale Charter Township must be inspected by Allendale Charter Township and/or their representatives (i.e. – Township Engineer, Township Inspector, etc.)

1.10 GUARANTEE

The Agreement shall provide that the Owner (Developer) and the Contractor shall guarantee the completed Work for one year from the date of Substantial Completion, written acceptance by the Township, unless extended as provided in this Section, and shall promptly repair, replace, restore, or rebuild, as the Township may determine, any finished Work in which defects of materials or workmanship may appear or to which damage may occur (or has occurred) because of such defects during the guarantee period, or damage occurs from the installation of other utilities, i.e. gas, electric, cable. Etc. except where other periods or maintenance and guarantee are provided. The one-year guarantee period shall begin on a date agreed upon in writing by the Owner, Contractor and the Township (see Guarantee Period Agreement Form). The one-year guarantee period shall be extended for an additional year from the time that any of the finished Work is repaired, replaced, restored or rebuilt pursuant to the guarantee agreement as determined by the Township.

All subcontractors, manufacturer, or supplier warranties and guarantees, expressed or implied, with respect to any material or equipment used in or incorporated as a part of the Work shall be obtained by the Contractor as agent for the Township, and all such warranties and guarantees shall inure to the benefit of the Township without the necessity of separate transfer or assignment thereof; provided that if required by the Township, the Owner and Contractor shall cause such subcontractors, manufacturers, or suppliers to execute such warranties and guarantees in writing to the Township and, further, that the Agreement shall provide that the Contractor will assign all such warranties and guarantees to the Township on request.

1.11 CONTRACTORS AND SUBCONTRACTORS

The work shall be performed by responsible contractors and subcontractors known to be skilled and regularly engaged in work of similar character and magnitude. The Owner shall receive written approval from the Township of all contractors and subcontractors prior to entering into the Agreement.

1.12 CONTRACTOR RESPONSIBILITIES

1.12.01 General:

All the following Contractor responsibilities shall be incorporated as part of the Agreement.

1.12.02 Safety and Protection:

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

the public and all persons on the Work site or who may be affected by the Work; all the Work and materials and equipment to be incorporated therein, whether in storage on or off site; and

other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, driveways, roadways, sidewalks/bike paths, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.

The Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The Contractor shall notify owners of adjacent property and of underground facilities and utility owners when construction of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in this paragraph caused, directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by the Contractor. The Contractors' duties and responsibilities for safety and protection of the Work shall continue until such time as all the Work is completed and accepted.

1.12.03 Safety Representative:

The Contractor shall designate a qualified and experienced safety representative at the Work site, whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

1.12.04 Emergencies:

In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instruction or authorization from the Owner or the Township, is obligated to act to prevent threatened damage, injury or loss. The Contractor shall give the Owner and the Township prompt written notice if the Contractor believes that any significant changes in the Work or variations from the Work have been caused thereby. If the Owner determines that a change in the Work is required because of the action taken by the Contractor in response to such an emergency, with prior written approval of the Township, the Owner may issue a change order or otherwise authorize a change in the Work to account for the consequences of the action taken with respect to the emergency.

1.12.05 Supervision and Superintendence:

The Contractor shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor shall be responsible to see that the complete Work complies accurately with the Plans and Specifications.

The Contractor shall keep on the Work at all times during its progress a competent superintendent, who will cooperate fully with the Township at all times, and who shall not be replaced without written notice to the Township. The superintendent will be the Contractor's representative at the site and shall have authority to act on behalf of the Contractor. All communications given to the superintendent shall be binding as if given to the Contractor. The superintendent will be identified at the preconstruction meeting and noted within the meeting minutes. He/she will be proficient in communications including email, fax and letter writing.

1.12.06 Labor, Materials and Equipment:

The Contractor shall provide competent, suitably qualified personnel to perform the Work. The Contractor shall at all times maintain good discipline and order at the site.

The Contractor shall furnish and assume full responsibility for all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the furnishing, performance, testing, start-up, and completion of the Work.

All materials and equipment shall be of good quality and new, except as otherwise provided in the Plans and Specifications. If required by the Township, the Contractor shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with instructions of the applicable supplier, except as otherwise provided in the Plans and Specifications.

Where required, shop drawings shall be submitted to the Township and Township Engineer for acceptance.

1.12.07 Construction Records:

The Contractor shall provide construction record information for the preparation of as-built drawings by the Owner's Engineer. The Contractor shall also submit sketches, dimensions, witnesses, etc. necessary to accurately locate all buried fittings, lines, valves, reducers, mains, couplings, bends, elbows, etc. For watermain, provide at least 2 witness measurements from permanent surface objects for curb stop boxes, valve boxes, ends of stubs. Also, provide length and size of services. For sanitary sewer, provide at least 2 witness measurements from permanent surface objects for ends of stubs and laterals. Also, provide lengths and invert elevations for stubs and laterals. Provide measurement from downstream manhole for all wyes and provide stations for manholes and length between manholes. Provide on title sheet the name, address and phone number of the Contractor. See Example of Record Drawing (plan and profile) at end of this Section.

1.13 ASBESTOS, PCB's, PETROLEUM, HAZARDOUS WASTE OR RADIOACTIVE MATERIALS

If, during the course of construction, any asbestos, PCB's, petroleum, hazardous waste or radioactive materials are uncovered or revealed at the Work site which were not shown or indicated on the Plans and Specifications, to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site, the Contractor shall cease operations affecting the find and shall notify the Township and also the Owner in writing, who shall notify the necessary parties. No further disturbance of the materials shall ensue until the Contractor has been notified by the Owner and the Township that the Contractor may proceed.

1.14 PAYMENT

Payment shall be made by the Owner to the Contractor in a timely basis as required in the Agreement. The Township, unless it is the Owner, shall not have any liability to the Contractor for amounts due the Contractor under the Agreement, or for any part of the cost of the Project. The method of payment (lump sum, unit prices, etc.) is between the Owner and the Contractor.

1.15 COST SHARING

All cost sharing agreements (if any) between the Township and Owner shall be in writing and shall be signed and delivered prior to the start of construction.

1.16 WORK SITE

The Contractor shall confine its work to the public rights-of-way, easements and Owner's property. Any other area required for equipment or material storage or for construction operation shall be the Contractor's responsibility.

1.17 ACCESS

The Township and its representatives shall be allowed access to all parts of the Work at all times and shall be furnished such information and assistance by the Contractor as may be required to make inspections.

1.18 INSPECTORS and INSPECTIONS

A. The Township Inspector or Township Engineer shall be provided 48-hour notice and three (3) workdays to perform major inspections for both water main and sanitary sewer. Major inspections include the following;

1. Substantial Completion

a. Initial inspection and follow-up inspection will be at no charge. Any subsequent inspections will be charged to the developer.

2. Completion

a. Initial inspection and follow-up inspection will be at no charge. Any subsequent inspections will be charged to the developer.

3. Fire Protection System Inspection

B. Authority and Duties of Township Inspectors:

Township inspectors will inform the Township as to the progress of the Work and the quality of the completed Work, and the quality of the materials being used. Township inspectors shall not supervise, direct, or have control of the Contractor's means, methods,

techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto. Township inspectors are not authorized to revoke, alter, enlarge or relax any of the Specifications nor to change the plans in any way. Township inspectors are not authorized to increase or decrease any Agreement item nor add new items to the Agreement. In no instance, shall any action or omission on the part of the Township inspector relieve the Contractor of the responsibility for completing the Work in accordance with the Agreement.

The Township shall make an inspection of the completed Work, or such portions thereof which are eligible for acceptance, upon notification by the Contractor that the work is complete or substantially complete and that benchmarks/control points have been provided. If the completed Work is not acceptable to the Township at the time of such inspection, the Township shall inform the Owner and the Contractor orally or in writing as to the particular defects to be remedied.

Inspection may be done by Township staff or by the Township's Engineer on behalf of the Township. Inspection will consist of daily inspection of water main and sanitary sewer installation, testing of water main and sanitary sewer and **limited assistance in gathering construction record information** of items related to water main and sanitary sewer construction, including sanitary laterals, water services and related appurtenances. Inspection for sidewalks, shared use paths, and pedestrian bridges will consist of daily inspection.

All construction staking, compaction testing, concrete testing, off-site materials testing, major field changes, as-built drawings and pay estimates will be the responsibility of the Owner's Engineer. Sufficient staking shall be provided to allow Township inspector to confirm grades and conformance to approved plans.

The Owner's Engineer shall periodically review the Work for conformance to the Plans and Specifications and these Standard Construction Requirements. The Owner's Engineer shall complete, sign and submit to the Township the Engineer's Certificate.

Township acceptance must be obtained in writing prior to placing water main, sanitary sewer, storm sewer, pedestrian bridge, sidewalk, or shared use path improvements in service. This written approval may include a punch list of additional items or concerns that need to be addressed. Final approval of the Work shall be as provided in Section 1.08 of these Standard Construction Requirements.

1.19 DEFECTIVE MATERIALS AND WORK

All materials, which do not meet the requirements of the Specifications at the times they are to be used, shall be rejected, unless otherwise authorized as acceptable by the Township in writing.

All completed Work that is found to be defective before the final acceptance of the completed Work, shall be corrected and replaced immediately in conformance with the Specifications.

1.20 SCHEDULING

The Contractor shall file a construction schedule with the Township and the Ottawa County Road Commission prior to commencing construction.

Certain projects may require street closings. The Contractor shall coordinate its work with the Ottawa County Road Commission and the Township and shall take all necessary precautions required by the Ottawa County Road Commission and applicable standards to minimize traffic

interference. All detours must be approved by the Ottawa County Road Commission. The Contractor's emergency telephone number shall be filed with the Township.

1.21 MAINTENANCE OF TRAFFIC

When working within the limits of existing streets, the Contractor shall accommodate vehicular traffic in road rights-of-way as approved by the Ottawa County Road Commission. Access to manholes, fire hydrants, water and gas valves shall be maintained at all times during construction.

Where streets are partially obstructed, the Contractor shall place and maintain temporary driveways, ramps, etc., which, in the opinion of the Ottawa County Road Commission and/or the Township, are necessary to accommodate the public.

The Contractor shall inform the Ottawa County central dispatch (1-800-249-0911), the Allendale Township Fire Department (616-892-3121) and schools (616-892-4403) at least 24 hours in advance of street obstruction and detours. Detouring and construction signage shall be in accordance with the current edition of the Michigan Manual of Uniform Traffic Control Devices and in accordance with the directions of the Ottawa County Road Commission and Allendale Township Fire Department.

1.22 LIMITATION OF OPERATIONS

When working within the limits of existing streets, the Contractor shall at all times conduct its work so that there is a minimum of inconvenience to the residents and traveling public within the Project area. Working hours shall be limited to the period of 7:00 am to 7:00 pm. No work shall be performed on Sundays and Holidays, and on special event days designated by the Township.

1.23 PROTECTION OF WORK

The Contractor shall protect the Work until accepted by the Township in writing. Any part of the completed Work that is damaged prior to acceptance by the Township shall be replaced at the Contractor's expense.

1.24 DUST CONTROL

All haul roads, detour roads and other public and private roads (including backfilled trenches), driveways and parking lots used by the Contractor must be maintained in a dust free condition. The control of dust shall be accomplished by the application of dust control materials and methods of application as approved and/or sweeping shall be applied as often as is necessary to control the dust or if directed to do so by the Township (within 12 hours after notification).

Cost of providing dust control shall be considered incidental to the Project and shall not be charged back to the Township.

1.25 MATERIAL HAUL ROADS

Any spillage on public roadways used as haul roads shall be cleaned daily.

Gravel roads shall only be used by the Contractor when permission is given to the Contractor in writing by the Ottawa County Road Commission and only if the Contractor assumes responsibility of maintenance, dust control and restoration of the gravel roads to the satisfaction of the Ottawa County Road Commission.

1.26 VIDEOTAPING

The entire Project area involving existing streets may be videotaped by the Ottawa County Road Commission. These videos will be available to the Contractor, Owner and the Township during construction of the project.

1.27 MAILBOXES

The Contractor shall temporarily relocate mailboxes interfering with the construction so that mail service is not interrupted. Mailboxes shall be replaced in a condition and location equal to that prior to construction or as required by the U.S. Postal Service.

1.28 TREES/CLEARING AND GRUBBING

Trees marked "REMOVE" on the Plans shall be taken down and removed from the right-of-way or easement in a manner that does not endanger the adjoining property or persons, or traffic using the right-of-way. The wood shall become the property of the adjoining property owner when in an existing right-of-way, or the property owner who granted the easement. If the adjoining property owner or property owner granting the easement does not want the wood, it shall become property of the Contractor. Burning or burying will not be permitted.

Existing stumps and stumps of trees which are removed shall not be ground down but shall be completely removed.

Because of the special concern for Preservation of trees in the Township, only those trees, which have been indicated for removal on the Plans, may be removed. All other trees are to be preserved unless prior written permission for removal is obtained from the Township and the property owner. Selective pruning of trees will be permitted to allow operation of the Contractor's equipment. Tree branches and roots shall be pruned neatly, and the scars shall be covered with an approved tree dressing.

1.29 DEWATERING

Where dewatering is required, the Contractor shall limit the dewatering operation to the minimum time and depth required for construction. The Contractor will be required to furnish and maintain temporary water service to property owners whose wells may be affected by the dewatering operations. The Contractor shall also be responsible for any necessary repairs to existing wells required to place them back in operation after construction is completed. If the Contractor does not provide temporary water in a timely manner, the Township will cause temporary water to be provided and the Contractor or Owner shall promptly reimburse the Township for all of its expenses. Dewatering discharge shall be in accordance with the specifications and MDEGLE requirements.

1.30 USE OF SLAG

No slag shall be permitted for use below the normal water table.

1.31 EXISTING UTILITIES

There is no guarantee that the location shown for existing utilities and underground structures on the Plans is accurate, nor that additional underground utilities or structures may not be encountered.

The Contractor shall notify MISS DIG for utility locations before starting any open cut or tunnel construction or before drilling holes for construction purposes. The Contractor shall cooperate with the utility companies in any repair, relocation or other work to be performed on the utility caused by the construction of the Project.

The Contractor shall be fully responsible for the location, protection, relocation, replacement, etc., for all existing underground utilities, which may reasonably be expected in any area, regardless of whether or not such utilities are shown on the Plans. Items in this category shall include, but not necessarily be limited to water mains and services, sanitary sewer and laterals, forcemains, gas mains and services, storm sewer and catch basin leads, telephone, electric, and cable TV wire, etc. Such work shall be considered incidental to the major items of construction unless otherwise noted on the Plans.

A. Water Mains:

Construction on water mains is limited to construction site temperatures above 25°F as determined by Allendale Township or their inspector.

It shall be the responsibility of the Contractor to uncover such mains for a reasonable distance ahead of his construction operation to permit field adjustments where such might be made in grade, location or alignment of the proposed sanitary sewer and water main and/or appurtenances.

An existing water main, including water services, shall be raised to pass over the sanitary sewer (where the elevation of the water main conflicts with the elevation of the sanitary sewer), provided a minimum cover of five feet is maintained from the top of the water main to final grade. The existing water mains may be lowered where the elevation of the water main conflicts with the elevation of the sanitary sewer. The raising or lowering of existing water mains shall be accomplished by using vertical bends properly anchored. Report as soon as the conflict is encountered and build as approved by the Township. A sand cushion shall be provided between the water main and the sanitary sewer. The Contractor shall notify the Township before any work on existing water mains is begun. The Township shall approve the configuration of the bends and thickness of the sand cushion. (A minimum of 18" vertical separation between watermain and any sewer is required).

B. Sewers (Sanitary, Storm, Culverts, Under drains and Force mains):

All existing sewers crossing or parallel to proposed sewers and water mains (even if not shown on the Plans) shall be replaced or repaired by the Contractor if damaged during construction, unless otherwise indicated on the Plans.

Existing manholes catch basins and inlets shall be saved and protected unless otherwise indicated on the Plans to be removed. Catch basins and inlets shall be reconstructed if damaged during construction. Costs for rebuilding, removing and/or repairing existing sewer, manholes, catch basins, inlets, house leads, headwalls, etc., shall be considered incidental unless otherwise noted on the construction Plans or in the Specifications.

A manhole shall be placed at the end of an existing sanitary sewer stub if necessary, to accommodate change in grade and / or alignment, or if in a submerged condition.

C. Electric Services:

Consumers Energy and Great Lakes Energy operate electric systems in the Township.

D. Gas:

DTE / Michcon and SEMCO provide natural gas services in the Township.

E. Telephone:

AcenTek and AT&T / SBC / Ameritech provide telephone service in the Township.

F. Cablevision:

Charter Communications and AcenTek provide cable TV service in the Township.

G. MISS DIG:

The Township and other local units of government, Consumers Energy Company, Great Lakes Energy, DTE / Michcon, SEMCO, AcenTek, AT&T / SBC / Ameritech and Charter Communications are members of a utility communications system called "MISS DIG" that provides service to participating units of governments and utilities. The Contractor shall contact "MISS DIG" not less than three (3) business days before starting construction for assistance in locating utilities or for any work to be done on utilities. The toll-free number is (800) 482-7171.

H. Utilities:

The Contractor shall notify other units of government and the utility companies of the Contractor's schedule and obtain any necessary permits from them. These units of government and companies include the Township, Consumers Energy, Great Lakes Energy, DTE / Michcon, SEMCO, AcenTek, AT&T / SBC / Ameritech, and Charter Communications.

The Contractor shall pay for any charges by the units of government and utility companies for permits, inspections, or similar charges required to construct the project as shown on the Plans.

I. Water and Sewer:

The Township operates and maintains the water and sanitary sewer systems in the Township.

J. City of Grand Rapids Water Transmission Line:

The City of Grand Rapids operates and maintains a 46-inch water transmission line along M-45 and a 60-inch water transmission line along Fillmore Street.

K. Ottawa County / City of Coopersville Water Transmission Line:

Ottawa County, on behalf of the City of Coopersville, operates and maintains a 16-inch water transmission line along 60th Avenue north of M-45. As the Township watermain in 60th Avenue is extended north, any water services that may be connected to the Coopersville transmission line shall be reconnected to the Township water main.

1.32 UTILITY POLES

When necessary, the Contractor shall shore and brace utility poles that interfere with construction. Shoring and bracing shall be such that sinking or excessive tilt does not take place. All relocation or removing and replacing of power poles, light poles and telephone poles should be done in accordance with the pole owner's standards and all expenses shall be paid for by the Contractor. All arrangements for pole relocations shall be completed by the Contractor with the pole owner at least 72 hours prior to need for relocations.

1.33 TELEPHONE

An emergency telephone system (listing of number) shall be set up and given to the Township so that the Contractor may be immediately notified of any unsafe conditions or emergencies encountered during times that the Contractor is not working on the Project.

The Contractor shall provide a local number and a local employee so that the Contractor may be contacted at any time (including weekends and holidays) 24 hours a day.

1.34 EXISTING PRIVATE FACILITIES

Existing wells, septic tanks, tile fields, lawn irrigation systems and sump pump discharge lines which are or are not on the Owner's property which are disturbed or damaged by the Contractor, shall be repaired and restored to working condition before the end of that working day. Under no circumstances will such interruptions be extended overnight. The Contractor shall take necessary precautions not to allow any discharge from the above to enter any lake, stream or canal along the line of work. Costs for repairs or temporary service caused by the Contractor shall be at the Contractor's sole expense whether shown on the Plans or not.

All precautions necessary shall be taken to ensure no damage occurs to homes, including basements.

1.35 CASTING OR STRUCTURE GRADE ADJUSTMENTS

Casting adjustments on existing and proposed manholes, water main valve boxes, hydrants, etc., that are required in order to meet the new/restored grade, shall be made by the Contractor in compliance with current specifications.

1.36 MATERIAL TESTING

The Township reserves the right to sample and test any of the materials required for the proposed construction, either before or after delivery to the Project and to reject any material represented by any sample which fails to comply with the minimum requirements specified.

The Contractor shall furnish all materials reasonably required by the Township for sample testing and analysis necessary for the testing of materials as required by the Specifications.

If any pipe fails to meet the specified requirements, all pipe represented by the sample shall be rejected unless the Contractor can demonstrate through additional tests, at the Contractor's sole expense, that the remainder of the pipe is satisfactory.

As a minimum requirement, the following shall be submitted to the Township by the Contractor (at no cost to the Township).

- A. Pipe: Certified test reports for strength from the manufacturer.
- B. Product Data: Valves, pipe, hydrants, etc., by type and manufacturer.

1.37 BONDS OR LETTER OF CREDIT

The Township will require a Letter of Credit from the Developer to guarantee completion of public improvements and to secure the site. The amount of the Letter of Credit shall be based on the cost estimate (refer to the cost estimate example at the end of the General Requirements section for general form) for the construction prepared by the Owner's Engineer and approved by the Township Engineer. Bonds will be required when the Township is the Owner and the amount of construction exceeds \$50,000. The amount on the Letter of Credit or Surety Bond will not be reduced prior to substantial completion of the project. At substantial completion, the Township will review the project status and consider reducing the Letter of Credit or Surety Bond to 10% of the project cost estimate plus 10% contingency, or the Engineers estimate of remaining work on the project plus a 35% contingency whichever is greater. Developer must provide a cost estimate for all remaining improvements to be reviewed by the Township. The improvements identified are to include all construction necessary to protect and preserve the integrity of the public infrastructure. Such improvements are expected to include but not be limited to items such as:

- A. Water and sanitary sewer mains
- B. Final grading
- C. Structure adjustments (i.e. – fire hydrants, valve boxes, P.I.V.'s, manhole castings, curb stop boxes, etc.)
- D. Roadway and paving (i.e. – wearing course)
 - a. Private roadways without public utilities (i.e. Water and/or sanitary sewer) in the right-of-way will be required to provide a surety bond or letter of credit in an amount to guarantee installation of a sand sub-base, aggregate base and asphalt leveling course for the project.
 - b. Private roadways with public utilities (i.e. Water and/or sanitary sewer) in the right-of-way will be required to provide a surety bond or letter of credit in an amount to guarantee installation of the entire road section including the sand subbase, aggregate base, asphalt leveling course and wearing course for the project.
- E. Applicable sidewalks, non-motorized paths
- F. Restoration
- G. Flushing, cleaning, testing, and televising
- H. Access lanes
- I. Storm sewers

1.38 BUILDING OCCUPANCY INSPECTION

Before a certificate of occupancy can be issued for any structure or portion thereof, the Township shall perform an occupancy inspection to ensure water and sanitary mains, services, and appurtenances have been installed, approved and accepted into service.

1.38.1 AUTHORITY OF THE TOWNSHIP AND THEIR AUTHORIZED REPRESENTATIVES

The Township and their authorized representatives have the authority to verify that the Project is being constructed in accordance with the Plans and Specifications, the Standard Construction Requirements, the Township's Rules and Regulations and the Development Agreement.

The Township and their authorized representatives also have the authority to suspend and/or **terminate work as provided in Section 1.40 below.**

1.39 DISPUTES

All disputes between the Owner and the Contractor or Owner's Engineer shall be reviewed and resolved in a prompt manner so that the completion date is not compromised or extended.

1.40 SUSPENSION OF WORK AND TERMINATION

The Township and their authorized representatives reserve the right to suspend the Work until all disputes between the Owner and the Contractor or Owner's Engineer are resolved. The Township and their authorized representatives may also suspend the Work when the Township or their authorized representatives make a determination under Section 1.38 above that the Project or Work is not being constructed in accordance with the Plans and Specifications previously submitted or these Standard Construction Requirements.

1.41 CONTRACT AMENDMENTS/CHANGE ORDERS/NOTIFICATION/CONCURRENCE

When necessary, the Owner or the Owner's Engineer will prepare for the Township's prior written approval, agreement amendments and change orders.

1.42 SITE CLEANLINESS

The Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land areas identified in and permitted by the Plans and Specifications and other land and areas permitted by law, rights-of-way, permits and easements, and shall not unreasonably encumber the Work premises with construction equipment or other materials or equipment. The Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work.

1.43 SUBSURFACE CONDITIONS

The Contractor shall make a conscientious effort and shall provide reasonable assistance to the Township as may be required to verify the locations and/or elevations of all existing utilities, which may be affected by the proposed construction.

At points where the Contractor's operations are near the properties of railroad, telephone and power companies, or are near existing underground utilities, damage to which might result in considerable expense, loss or inconvenience, work shall not be commenced until all arrangements necessary for the protection thereof have been made.

The Contractor shall protect, shore, brace, support and maintain all utilities affected by its operations. The Contractor shall be responsible for all damage to utility properties or facilities and shall make arrangements satisfactory to the Owner, with the agency or authority having jurisdiction thereover, concerning repair or replacement or payment of costs incurred with said damage.

In the event of interruption to water or other utility services as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the Township or other utility owner and shall cooperate with the Township and/or such owner in the restoration of service. If water service or other essential service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire

hydrants until provisions for continued service have been approved by the Township Fire Department.

1.44 WATER MAIN VALVE TURNING AND SANITARY SEWER PLUGS

The Township shall operate all valves in the water and sanitary sewer systems. No such valves shall be operated by the Contractor unless authorized by the Township.

Where connection to the existing sanitary sewer system is proposed, the existing sanitary sewers or the proposed sanitary sewer shall be plugged to prohibit dirt and foreign material from entering the existing sanitary sewer system. The plugs used shall be approved by the Township and shall not be removed until authorization is received in writing from the Township. The plugs shall be provided, installed and removed by the Contractor at its sole cost and expense, as directed by the Township.

1.45 SANITARY SEWER PUMPING STATIONS

All public sanitary sewer pumping stations will be operated by the Township and must be approved by the Township's Engineer. Plans and Specifications for all sanitary sewer pumping stations will be prepared by the Township Engineer and provided to the Owner's Engineer. The Owner's Engineer shall coordinate and incorporate the Plans and Specifications prepared and provided by the Township's Engineer into their documents prior to submitting for approval and permits.

For structures incorporating a grinder pump, they must be located within the dwelling and will be the responsibility of the property owner.

1.46 MASTER PLANS

The Township's master plans for water system, sanitary sewer system, sidewalks, and shared use paths shall be followed by the Owner's Engineer in the design of the Project. It is recommended that prior to any design being completed, that a meeting be scheduled and held with the Township and Township Engineer to review these master plans. Looping of water main may be required.

1.47 ROOF DRAINS/FOOTING DRAINS/SUMP PUMP DISCHARGES

All buildings and other structures shall provide for positive points of discharge for roof drains, footing drains and sump pumps.

Sump pump discharges will not be permitted to the sanitary sewer.

1.48 EASEMENTS

All easements to be granted to the Township shall be on forms included in the Appendix. Utility easements shall be minimum width of 20 feet centered on the utility unless otherwise directed by the Township. Sidewalk and Shared Use Path easements shall be of width directed by the Township. A survey sketch depicting the easement and easement description shall be included as an Exhibit. All easements must be executed and delivered to the Township Engineer prior to construction of the Project.

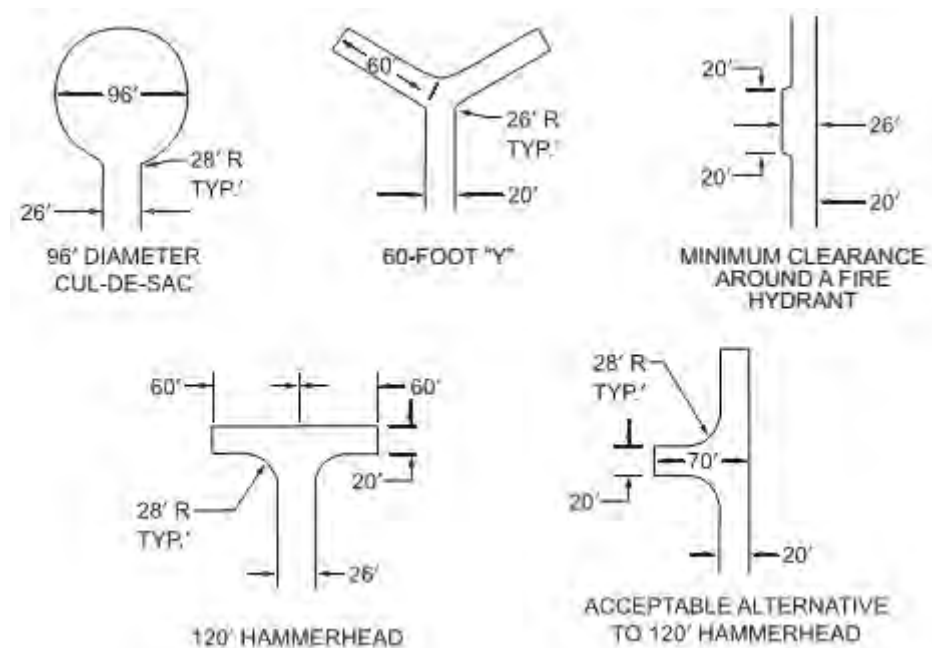
1.49 ALLENDALE FIRE DEPARTMENT REQUIRED ACCESS FOR FIRE FIGHTING AND WATER SUPPLY FOR FIRE PROTECTION

The Allendale Fire Department enforces the most recent edition of the International Fire Code including but not limited to:

Fire Apparatus Access Roads:

Facilities, buildings or portions of buildings hereafter constructed shall be accessible to fire department apparatus by way of an approved fire apparatus access road with an asphalt or concrete driving surface capable of supporting the imposed load of fire apparatus weighing at least 75,000 pounds.

Where a fire hydrant is located on a fire apparatus access road, the minimum road width shall be 26 feet exclusive of shoulders. Dead end fire apparatus access road turnarounds shall be limited to the following configurations:



Where building heights exceed 30 feet, approved fire apparatus access roads shall be provided. Aerial fire apparatus access roads shall have a minimum unobstructed width of 26 feet, exclusive of shoulders, in the immediate vicinity of the building. At least one of the required access routes shall be located within a minimum of 15 feet and a maximum of 30 feet from the building and shall be positioned parallel to one entire side of the building. The side of the building on which the road is positioned shall be approved by the fire code official. Overhead utility and power lines shall not be located over the fire access road or between the road and the building.

Multiple-family residential projects having more than 100 dwelling units shall be equipped throughout with two separate and approved fire apparatus access roads. Projects having up to 200 dwelling units may have a single approved fire apparatus access road when all buildings, including nonresidential occupancies are equipped throughout with approved automatic sprinklers systems. Multiple-family residential projects having more than 200 dwelling units shall be approved with two separate and approved fire apparatus access roads regardless of whether they are equipped with an approved automatic sprinkler system. Developments of one or two-family dwellings where the number of dwelling units exceeds 30 shall be provided with two separate and approved fire apparatus access roads. Where more

than 30 dwelling units on a single public or private fire apparatus access roads and all dwelling units are equipped throughout with an approved automatic sprinkler system, access from two directions shall not be required.

Where two fire apparatus access roads are required, they shall be placed a distance apart equal to not less than one-half length of the maximum overall diagonal dimension of the property or area to be served, measured in a straight line between accesses.

An approved water supply for fire protection, either temporary or permanent, shall be made available prior to the arrival of combustible material on the site. All fire department access road(s), fire hydrants and valves must be operational and pass Township inspection prior to the arrival of combustible materials on site. Fire hydrants must be turned "on". A second inspection of the fire hydrants and valves must be performed and approved as a requirement for Certificate of Occupancy.

Water supplies must meet the required minimum fire flow for the building(s).

Fire Hydrants:

All fire hydrant placement shall be determined by Allendale Fire Department's Fire Inspector as part of the plan review process.

To be useful, fire hydrants must be accessible. To ensure this, a clear space of not less than ten feet (10') shall be provided in front of and around each fire hydrant. A clear space is required to be free of all obstructions such as parked cars, landscaping, utilities, service vehicles, construction work, snow and all other blockages.

Road Closure:

Any and all road closures must be called into Central Dispatch (616.842.2299), and to Allendale Fire Chief, not less than 24 hours in advance. Also notify the Township inspector. Any detour or "bypass" must be approved by the Allendale Fire Department. If the road is a last-minute necessity it must be approved by the Fire Department.

1.50 EXCEPTIONS

Exceptions to these Standard Construction Requirements may be granted in writing by the Township. Exceptions shall only be approved by the Township when applied for in writing and in circumstances where compliance with the Standard Construction Requirements is impossible or would cause extreme hardship. All requests for exceptions shall be in writing and signed by the Owner and Owner's Engineer. The exception request shall include all relevant supporting documentation and information, including information supplied by the Owner's Engineer. The burden of proof shall be on the Owner to provide convincing proof that the exception is necessary because it is impossible to comply with the Standard Construction Requirements or compliance will cause extreme hardship. Additional cost is not justification for the granting of an exception. If granted, the exception shall be granted in writing by the Township, endorsed by each affected department (such as Public Utility Dept., fire dept., etc.). The decision of the Township shall be final.

**ENGINEER'S CERTIFICATE
FOR WATER MAIN, SANITARY SEWER, STORM SEWER,
PEDESTRIAN BRIDGE, SIDEWALK, AND/OR SHARED USE PATH IMPROVEMENTS**

Date: _____

Project Name: _____

Township of ALLENDALE Section: _____

County of OTTAWA, State of Michigan

I hereby state that the construction of the Project is complete.

Exception(s): _____

and that to the best of my knowledge and belief:

- (1) The Work has been installed and completed in accordance with the approved Plans and Specifications and the Allendale Charter Township Standard Construction Requirements.
- (2) The construction materials meet the approved Specifications.

(Seal)

Signed: _____
Registered Professional Engineer

BILL OF SALE

_____, whose address is _____,
(hereinafter referred to as "Seller") for and in consideration of One Dollar (\$1.00) and other good and valuable consideration, does hereby grant, dedicate, transfer, and deliver to ALLENDALE CHARTER TOWNSHIP, whose address is 6676 Lake Michigan Drive, Allendale, Michigan 49401, (hereinafter referred to as the "Township")

Seller hereby warrants and represents to the Township that the Improvement has been acquired, constructed and completed in accordance with the Plans and Specifications prepared by _____ and dated _____ for the Improvement previously approved by the Township, with only those change orders approved in writing by the Township, and that no claim, action, or liability exists with respect to the Improvement and its construction and installation.

Seller further warrants and represents to the Township that it is the lawful owner of the Improvement, and that the Improvement is free of all liens and encumbrances of any kind. Seller further represents that it has the authority to transfer the Improvement and that the Seller will warrant and indemnify the Township against all claims asserted by any entity or person arising out of the installation, construction and completion of the Improvement. Seller also warrants that the Improvement is free from defects in material and workmanship. All warranties and guarantees pertaining to the Improvement are hereby assigned and transferred to the Township.

Witnesses:

DEVELOPER:

(1) _____ (LS) By: _____ (LS)

Its: _____

Dated: _____, 20__

ALLENDALE CHARTER TOWNSHIP:

(1) _____ (LS) By: _____ (LS)

Its: Supervisor

Dated: _____, 20__

(2) _____ (LS) By: _____ (LS)

Its: Clerk

Dated: _____, 20__

GUARANTEE PERIOD AGREEMENT

It is hereby agreed between the undersigned Developer, Contractor and Township that a one-year guarantee period is in place for the improvements described as

and completed by the Contractor under Agreement with the Owner (Developer). The Contractor shall guarantee the completed work for a one-year period commencing on the date of Substantial Completion by the Township (in writing), in accordance with paragraph 1.10 of the General Requirements of the Allendale Charter Township Standard Construction Requirements. If all franchise utilities are not installed at the time of Substantial Completion, the Developer and Contractor will be responsible for all repairs to the water and sanitary sewer utilities up to the point of Final Completion. This one-year guarantee period shall be extended for an additional one-year period from the time that any of the finished Work is repaired, replaced, restored or rebuilt pursuant to the guarantee agreement as determined by the Township.

IN WITNESS WHEREOF, the parties have executed this Agreement.

Witnesses:

DEVELOPER:

(1) _____ (LS) By: _____ (LS)

Its: _____

Dated: _____, 20__

CONTRACTOR:

(1) _____ (LS) By: _____ (LS)

Its: _____

Dated: _____, 20__

ALLENDALE CHARTER TOWNSHIP:

(2) _____ (LS) By: _____ (LS)

Its: Supervisor

Dated: _____, 20__

COST ESTIMATE EXAMPLE for LETTER OF CREDIT for ALLENDALE CHARTER TOWNSHIP

Project Name:

Engineer:

Developer:

Water main system

[illegible]

Sanitary Sewer System

[illegible]

Storm Sewer System

[illegible]

Applicable Sidewalk

Description	Quantity	LF/Each	Cost	Total
				\$0.00
				\$0.00
				\$0.00

Roadway and Paving

<u>Description</u>	<u>Quantity</u>	<u>LF/Each</u>	<u>Cost</u>	<u>Total</u>
				\$0.00
				\$0.00
				\$0.00
				\$0.00

SUB TOTAL	
------------------	--

\$0.00

CONTINGENCY

10%

\$0.00

TOTAL

\$0.00

SUBSTANTIAL COMPLETION

This document serves as official date of approval

Prior to Substantial Completion or any building connections **the following actions must be completed and approved in writing by the Township:**

- Water main pressure test and chlorination passed 02660-3.03, 02660-3.05
- Connection to water system made 02660-3.02
- Services marked correctly 02660-3.02
- Asphalt installed to minimum of base grade
- Sanitary sewer castings set to asphalt grade, base as a minimum 02730-3.02
- Sanitary sewer air testing, manhole inspection and video inspection passed 02730-3.03
- Rough grading complete
- Laterals marked correctly 2730-3.02
- Force main pressure testing passed 02732-3.03
- Pump station testing passed
- Letter of credit to complete the improvements identified on the approved plans 01000-1.37, Appendix D
- Hydrant and valve inspection complete

DATE:

Project:

Chad E. Doornbos
Superintendent of Public Utilities

Jon Currier
Public Utilities Field Inspector

- **Building connections can now be made**
- ALLENDALE CHARTER TOWNSHIP**

CERTIFICATE OF SUBSTANTIAL COMPLETION

REQUEST BY OWNER (DEVELOPER) AND CONTRACTOR:

OWNER (Name and Address) _____

CONTRACTOR (Name and Address) _____

Project (description of public improvements), or portion thereof: _____

In relation to the above described Project (public improvements), or portion thereof, the applicable Items a) thru f) in the first paragraph of Section 1.08 of the General Requirements of the Township's Standard Construction Requirements have occurred. Therefore, the OWNER and CONTRACTOR request the Township to certify Substantial Completion of the above described Project (public improvements), or portion thereof, at this time.

☐ A reduced Letter of Credit in the amount of \$_____ and expiration date of _____ is proposed to guaranty completion of the uncompleted work.

☐ A reduced Letter of Credit is not proposed.

OWNER (DEVELOPER)

By: _____
(signature)

Printed Name: _____

Its: _____

Date: _____

CONTRACTOR

By: _____
(signature)

ACCEPTANCE BY TOWNSHIP:

The Township certifies that the Work to which this Certificate of Substantial Completion applies has been reviewed and has been found to be substantially complete. The date of Substantial Completion of the Project, or portion thereof, designated above is hereby declared.

Date of Substantial Completion

The following documents are attached and made part of this Certificate of Substantial Completion:

This Certificate of Substantial Completion does not constitute final approval of the Project.

Recommended by TOWNSHIP ENGINEER

Date

ALLENDALE CHARTER TOWNSHIP

By: _____
(Signature)

(Date)

Printed Name: _____

Its: _____

CERTIFICATE OF FINAL APPROVAL

REQUEST BY OWNER (DEVELOPER) AND CONTRACTOR:

OWNER (Name and Address) _____

CONTRACTOR (Name and Address) _____

Project (description of public improvements): _____

In relation to the above described Project (public improvements), the applicable Items a) thru h) of the second paragraph of Section 1.08 of the General Requirements of the Township's Standard Construction Requirements have occurred or have been approved.

OWNER (DEVELOPER)

CONTRACTOR

By: _____
(signature)

Printed Name: _____

Its: _____

Date: _____

FINAL APPROVAL BY TOWNSHIP:

The Township certifies that Final Approval of the Project designated above is hereby declared.

Recommended by PUBLIC UTILITIES SUPERINTENDENT

Date

ALLENDALE CHARTER TOWNSHIP

By: _____
(Signature)

(Date)

Printed Name: _____

Its: _____

**ALLENDALE CHARTER TOWNSHIP
DEPARTMENT OF PUBLIC UTILITIES**

“AS-BUILT PLANS”

Allendale Charter Township’s Construction Standards clearly states the requirements for “as-built” prints. Refer to – General Requirements, Section 1.08 for final approval and acceptance. Paragraph “1.08.A” describes how many copies of what type of print must be provided and to whom they must be provided.

Allendale Public Utilities will be responsible for incorporating GPS coordinates into our GIS Mapping Database. The locations will be gathered at the time of Substantial Completion. This will include:

- Curb Stop Boxes
- Main line valve boxes
- Hydrant Valves
- Hydrants
- End of stubs
- Sanitary sewer stubs and laterals
- Manholes
- Bends

Attached is an example of a correctly completed “as-built” plan.

Water Main

Need witness measurements from two (2) permanent surface objects for the following:

- Curb stop boxes
- Valve boxes
- End of stubs
- All bends and deflections (horizontal & vertical)
- Water services – need length and size

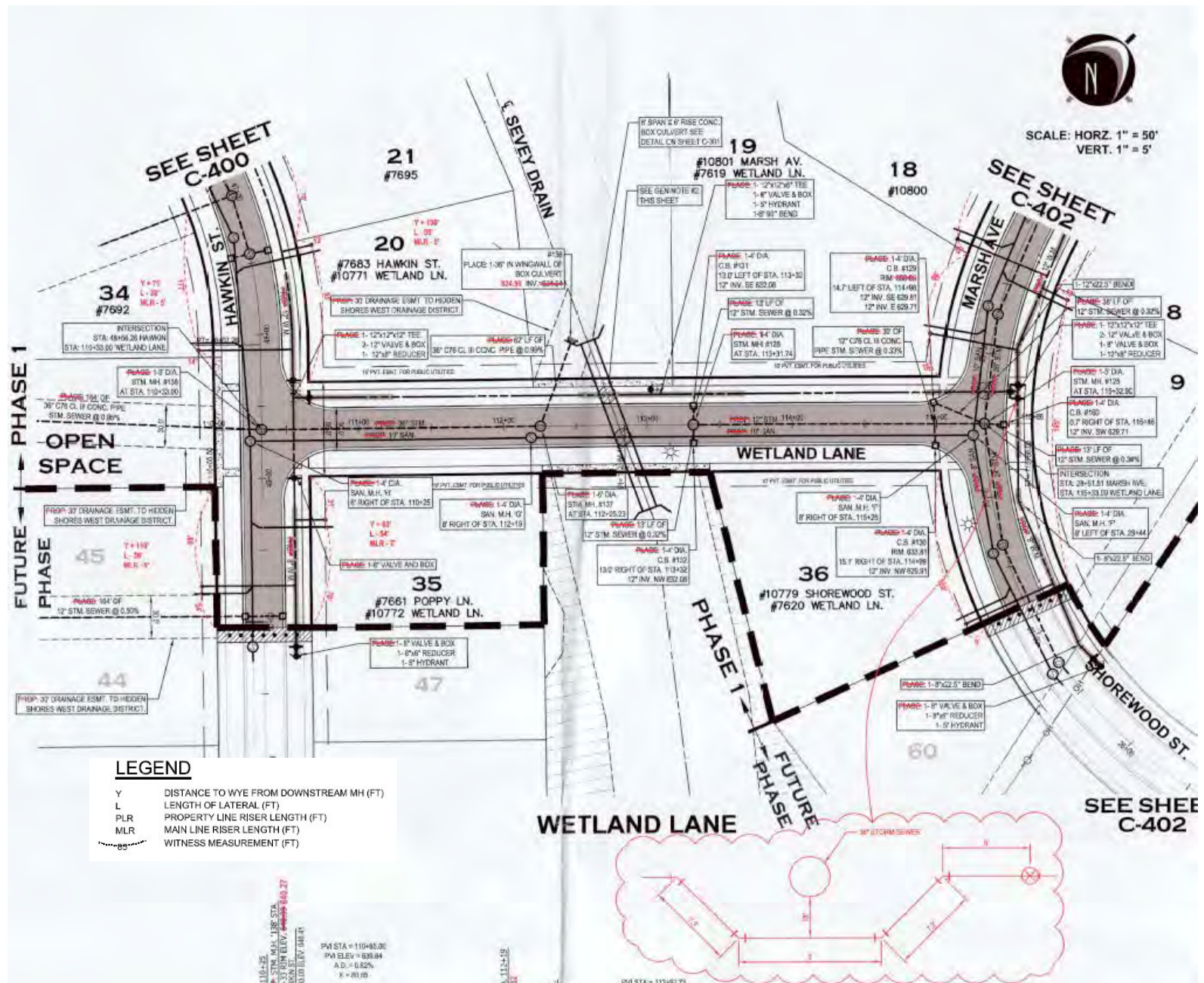
Sanitary Sewer

Need witness measurements from two (2) permanent surface objects for the following:

- Stubs and laterals – also need inverts and lengths
- Wye connections – need measurement from downstream manhole
- Manholes – need station numbers and length between manholes

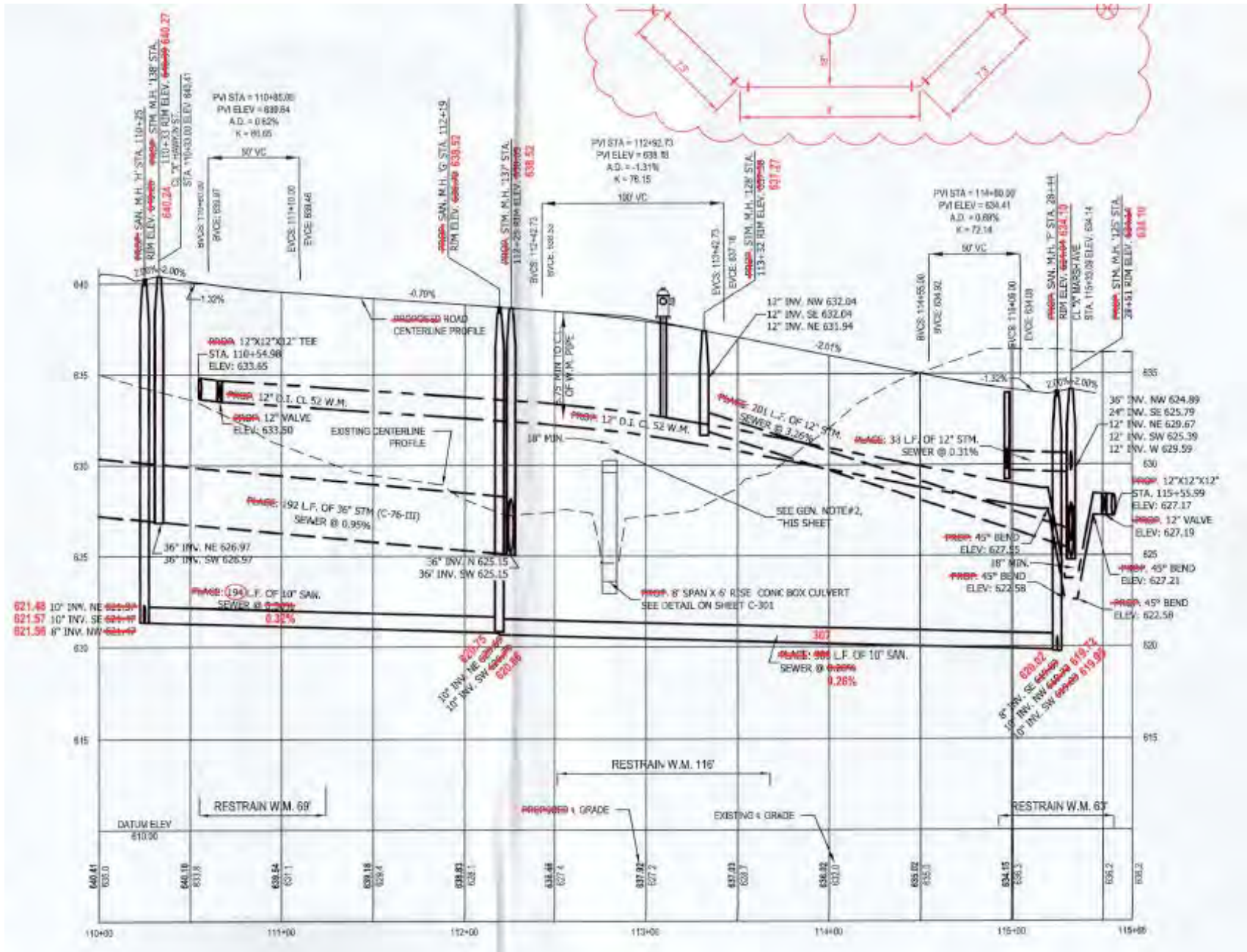
Notes on Plan

Include name, address and phone number of Contractor



EXAMPLE OF RECORD DRAWING

EXAMPLE OF RECORD DRAWING



SPECIFICATIONS

SECTION 02220

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the work required for trenching, excavating and backfilling, clearing, boring and jacking, special pipe foundations and special work below grade.

1.02 DEFINITIONS:

- A. Maximum Density: Maximum dry weight in pounds per cubic foot of a specific material.
- B. Optimum Moisture: Percentage of water at maximum density.
- C. Rock Excavation: Includes all boulders or rock weighing 400 pounds (approximately one cubic yard) or more and all solid or ledge rock, slate, shale, sandstone and other hard materials that require continuous use of pneumatic tools, heavy rippers or continuous drilling and blasting for removal. Pavements are not included.
- D. Suitable Excavated Material: Mineral (inorganic) soil free of cinders, refuse, sod, boulders, rocks, pavement, soft or plastic clays, vegetable or other organic material and capable of being compacted as specified. Moisture content has bearing on the suitability of materials to be used.
- E. Granular Material: Coarse grained materials having no cohesion, which derives its resistance to displacement from internal stability.
- F. Cohesive Material: Fine grained material which derives its resistance to displacement by manual attraction between particles of the mass, involving forces of molecular origin (i.e. Clays are considered cohesive).
- G. Grade Terminology: Article 3.07 SCHEDULES.

1.03 REFERENCES:

- A. MDOT - Michigan Department of Transportation, *"Standard Specifications for Construction"*, Current edition.
- B. ASTM - American Society of Testing Materials, latest edition.

1.04 JOB CONDITIONS:

- A. Obtain and comply with construction permits from agencies having jurisdiction over the work.
- B. Scheduling: Clean up promptly following utility installation backfilling.
- C. Dust Control: Broom or apply dust palliatives as needed.

- D. Driveway Closing: Eight (8) hour maximum with prior notification to resident. Maintain emergency access to all properties during construction.
- E. Signs, mailboxes and other movable surface features:
 - 1. Witness location prior to removal. Relocate to accessible location and maintain during construction.
 - 2. Upon completion of construction, replace to original position and condition.
 - 3. Replace regulatory traffic control signs immediately after utilities are placed and backfilled.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Trench Backfill
 - 1. Granular Material shall be MDOT 902.07, Class III limited to 1.0-inch maximum size.
 - 2. Select Granular Material shall be MDOT 902.07, Class II or IIa limited to 1.0-inch maximum size.
 - 3. Concrete shall be Class B, 3000 psi compressive strength, 4-inch maximum slump.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Clearing and Grubbing
 - 1. Perform clearing, grubbing and tree removal required for proposed construction within limits of right-of-way, easement and/or project site.
 - 2. Dispose of tree, stump and brush material by removing it from the site or as otherwise approved by the TOWNSHIP.
 - 3. Save and protect all trees and vegetation unless identified to be removed.
 - 4. Repair or replace trees, shrubs and other vegetation damaged by CONTRACTOR's operation.
- B. Removal of Surface Improvements
 - 1. Remove improved surfaces such as pavement, drives, sidewalk, curb and gutter, lawns, etc. just prior to excavating / trenching operations. Edges of pavements removed shall be saw cut.
- C. Conflicting Utilities
 - 1. Before starting excavation, establish location and extent of existing utilities in work area.
 - 2. Establish potential conflict areas prior to construction.
 - 3. Excavate and expose existing utilities presenting potential conflict to determine their exact location and elevation.
 - 4. Advise OWNER's ENGINEER of conflicts and obtain instructions on how to proceed.
 - 5. Make adjustments in proposed utility location.
 - 6. Make arrangements with owner of existing utility for relocation, if necessary.
 - 7. Schedule work accordingly.
- D. Dewatering
 - 1. Provide and maintain dewatering equipment as necessary to provide dry trench subgrade.
 - 2. Provide temporary water supply to homes interrupted by dewatering operations.

- E. Soil Erosion and Sedimentation Control
 - 1. Obtain permit from Ottawa County Water Resources Commissioner.
 - 2. Provide and maintain soil erosion and sedimentation control measures during construction.

3.02 EXCAVATION:

- A. General:
 - 1. Dispose of surplus and unsuitable excavated material.
 - 2. Remove, salvage and stockpile topsoil on-site in area designated by OWNER's ENGINEER.
 - 3. Unsuitable material encountered in sub-grade or below payment line: Notify OWNER's ENGINEER and obtain instruction on how to proceed.
- B. Trenches:
 - 1. Depth: Provide a uniform and continuous bearing and support for proposed utility on solid and undisturbed or compact granular material.
 - 2. Minimum Width: Allow space for jointing and bedding. Meet requirements of AWWA C600 or C605, as applicable, for water main.
 - 3. Maximum Width: The following limitations shall apply at utility crown:
 - a. 6 inch through 10-inch diameter: 30 inches.
 - b. 12 inch through 30-inch diameter: Outside diameter plus 24 inches.
 - c. 30 inch and over diameter: Outside diameter plus 36 inches.
 - d. Elliptical: Outside pipe width plus 36 inches.
 - 4. Shoring: Provide sheeting, shoring, bracing, shelving, etc. in order to protect excavations in accordance with current MIOSHA and OSHA regulations.
- C. Blasting:
 - 1. Obtain and comply with required permits.
 - 2. Perform only during hours approved by OWNER and TOWNSHIP.
- D. Length of Open Trench shall be 200 feet maximum.
- E. Damage to Existing Underground Utilities:
 - 1. Report all damage to OWNER's ENGINEER and utility owner.
 - 2. Repair to utility owner's standard.

3.03 BACKFILLING:

- A. Pipe bedding area and special pipe foundation area: Compact granular material to ninety percent (95%) of maximum density according to the Modified Proctor Method or to ninety-five percent (95%) of maximum density using the Michigan Cone Test.
- B. Trench Backfill Area:
 - 1. Under permanent pavement, shoulder areas and areas within a one on one slope from the shoulder edge:
 - a. Compact granular material in 9.0-inch layers to ninety-five percent (95%) of maximum density according to the Modified Proctor Method or to ninety-five percent (95%) of maximum density using the Michigan Cone Test.
 - 2. Under nonpermanent pavement: Same as permanent pavement.
 - 3. Under unimproved right-of-way areas: Compact suitable excavated material to eighty-five percent (85%) of maximum density.
 - 4. Under landscaped and unimproved areas: Compact suitable excavated material to eighty percent (80%) of maximum density.

5. Under undercut existing structure: Place concrete.

C. Structures:

1. Density requirements: Same as Trenches.
2. Concrete structure: Place backfill only after seventy-five percent (75%) of concrete design strength has been reached.

3.04 TRENCH UNDERCUTTING AND BACKFILL:

- A. Excavation: Perform to OWNER's ENGINEER instructions.
- B. Backfill: Provide to payment line with granular material compacted in place.

3.05 BORING AND JACKING:

- A. Comply with MDOT, Ottawa County Road Commission, OWNER's ENGINEER and the TOWNSHIP ENGINEER's requirements.

3.06 COMPACTION, TESTING AND INSPECTION:

- A. Surplus excavated, and unsuitable excavated material shall become the property of the CONTRACTOR.
- B. Dispose of surplus excavated or unsuitable excavated materials off-site.
- C. Performance and test equipment will be provided by approved independent laboratory.
- D. Moisture - Density relationships:
 1. Cohesive (clays) soils: ASTM D 1557 (Modified Proctor).
 2. Granular (sands) soils: Michigan Cone Test.
- E. Field Density: Either of following:
 1. ASTM D-2167 (Rubber Balloon).
 2. ASTM D-6938 (Nuclear).
- F. Furnish equipment and personnel to provide access to test location and depth. Density tests will be performed at various levels, as determined, during or after backfilling operation.
- G. Correct any deficiencies resulting from insufficient or improper compaction. Retesting of density in areas of failed tests shall be performed at the CONTRACTOR's expense.

3.07 SCHEDULES:

- A. Excavating and backfilling terminology (included on next page)

END OF SECTION

SECTION 02290
BORING AND JACKING

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the work required to place a specified size and type of casing pipe under a structure, roadway or railroad by boring and jacking, without disturbing their condition or use, including placement of the utility pipe (carrier pipe) inside the casing pipe, filling the annular space and related work.

1.02 SUBMITTALS:

- A. Submit the following for review by TOWNSHIP ENGINEER:
 - 1. Design data.
 - 2. Jacking and receiving pit bracing.
- B. Permits:
 - 1. Supply written verification that all the boring and jacking equipment and materials are in compliance to applicable permit requirements.
 - 2. Submit this verification for the TOWNSHIP ENGINEER's review prior to beginning the work.
 - 3. Obtain any required permits for the boring and jacking operation.

1.03 JOB CONDITIONS:

- A. MDOT Right-of-Way: Comply with MDOT "Provisions for Jack Construction for permitting, installing and inspecting jacked-in-place and directional-drilled pipe within MDOT right-of-way.
- B. Other Jurisdictions: Comply with all permit requirements.

1.04 SCHEDULING:

- A. Provide all equipment, materials and personnel necessary for non-stop completion of the boring and jacking operation, including all equipment and materials required for safety and protection of the public.
- B. Special Conditions: Where special use or conditions of overlying structure exist, schedule the work such as not to alter, interfere or endanger the structure.
- C. Permit Scheduling: Conduct the work in such a manner as to comply with any permit scheduling requirements. Notify the permitting agency with adequate notice.
- D. Clean-up promptly after completion of the backfill operation.

1.05 START-UP:

- A. Provide scheduling notification to the TOWNSHIP ENGINEER, prior to start-up.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Carrier Pipe shall be as shown on the drawings and in conformance to the specification Sections.
- B. Casing Pipe:
 - 1. Welded steel pipe ASTM A-139, Grade B with a minimum of 35,000 PSI yield strength and welded leak-proof joint construction.
 - 2. Size Requirements: Larger size will be permitted, if desired.
 - a. Pressure main: Inside diameter of casing pipe shall be at least 6 inches greater than the outside diameter of the pressure pipe bells.
 - b. Gravity sewer: Inside diameter of casing pipe shall be at least 8 inches greater than the outside diameter of the gravity pipe bells.
 - 3. Nominal outside diameter and wall thickness shall be as required by permit agency and as indicated on the drawings.
- C. Casing Filler Material shall be one of the following:
 - 1. Pea Gravel: Commercial grade meeting the following gradation:

Sieve Size:	<u>5/8"</u>	<u>3/8"</u>	<u>No. 4</u>	<u>loss by wash</u>
% Passing:	100	0-85	0-8	0-3
 - 2. Sand: MDOT 902.08, Grade 2MS.
 - 3. Cementious Grout: MDOT 702.
- D. Auger or Boring Device:
 - 1. Provide mechanical means or arrangement to prevent the auger and cutting head from leading the casing pipe, to prevent any unsupported excavation ahead of the casing pipe.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Permits: Obtain all permits required prior to initiation of construction. Notify permitting agency in advance of starting the boring and jacking operation.
- B. Clearing: Clear all areas as necessary for access pits.

3.02 ACCESS PITS:

- A. Location:
 - 1. Streets and rural roads: Minimum 15 feet from edge of pavement to the face of pit.
 - 2. Railroads: Minimum 25 feet from outside rail to the face of pit.
 - 3. Limited Access Highways: Minimum 30 feet from edge of pavement to the face of pit.
- B. Protection:
 - 1. Protect all open access pits with suitable fencing.
 - 2. Protect open pits in right-of-way with MDOT type III lighted barricades.

- C. Dewatering:
 - 1. Dewater pits without removing adjacent soil and undermining the access pit structure.
- D. Size: Provide adequate space for jacking equipment and blocking.

3.03 SHEETING AND BRACING:

- A. Provide steel sheet piling at the front face of all access pits, as a minimum.
- B. Provide steel sheet piling on all faces of the access pit when located within right-of-way, or within 1 on 1 slope from edge of pavement to bottom of access pit.
- C. Provide steel sheet piling in accordance with MDOT 704.02 and 704.03. Provide a minimum sheet piling section modulus of 5.4 cubic inches for access pits up to 15 feet deep.

3.04 INSTALLATION:

- A. Alignment and Grade:
 - 1. Provide two or more guide rails to support the casing pipe at the established line and grade.
 - 2. Keep rails lubricated during jacking operation.
- B. Depth:
 - 1. Provide a minimum of 5 feet of cover between bottom of structure or pavement, and top of casing pipe. Provide minimum 7 feet of cover between bottom of railroad tracks and top of casing pipe.
- C. Jacking:
 - 1. Provide jacks and backstops of sufficient capacity to withstand the jacking thrust.
 - 2. Provide bearing blocks to transfer the pressure uniformly from the jacks to the casing pipe perimeter so as not to exceed the design compressive strength of the pipe.
 - 3. Lubricate the outside of the casing pipe with bentonite or other suitable lubricant.
 - 4. Jacking forces shall be distributed in a manner that average compressive stresses developed will not exceed design compressive strength of the pipe used.
- D. Boring:
 - 1. Provide sufficient auger lengths to complete entire bore.
 - 2. Upon initial placement, jack the casing pipe a minimum of ½ diameter to initiating boring.
 - 3. Do not allow auger to extend beyond the leading edge of the casing pipe at anytime during installation.
- E. Carrier pipe Installation:
 - 1. Install carrier pipe on suitable skids or blocking to maintain line and grade as shown on the drawings.
 - 2. Join each carrier pipe section prior to inserting into casing pipe.
 - 3. After carrier pipe installation, check line and grade and test for leakage in accordance with testing requirements.
 - 4. After acceptance, fill the annular space between the casing and carrier pipes with casing filler material to within 2 inches of the top of the casing pipe.
 - 5. Upon completion of filling operation, seal the ends of the casing pipe with a 1 foot thick concrete bulkhead.
- F. Log: Contractor shall keep a log of any additions or alterations of auger or casing pipe.

- G. All voids around the outside of the jacked pipe shall be filled by means of pressure grouting with approved material as specified in the standard MDOT Specifications. Grouting shall be completed within 48 hours of completing the bore or as directed by the Engineer. Should soil squeezing occur causing failure or damage to the earth supports, immediate steps shall be taken to stop the flow of earth and to strengthen the bracing. If loss of heading occurs, the problem area shall be stabilized as soon as possible and all voids filled by such methods and materials as approved by the TOWNSHIP ENGINEER.

END OF SECTION

SECTION 02501

CONCRETE SIDEWALK AND SIDEWALK RAMPS

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the work required for concrete sidewalk and sidewalk ramps.
- B. Definitions:
 - 1. Pavement Structure: The combination of the base, subbase and HMA or concrete surface placed on the subgrade. Pavement includes gravel, HMA and concrete surfaced streets and driveways.
 - 2. Subgrade: The portion of the subgrade on which the concrete sidewalk is to be placed.
 - 3. Subbase: The layer of specified material of designed thickness placed on the subgrade as a part of the pavement structure.

1.02 REFERENCES:

- A. MDOT - Michigan Department of Transportation, "*Standard Specifications for Construction*", *Current Edition*.
- B. ASTM - American Society of Testing Materials, latest edition.
- C. ADAAG – Americans with Disabilities Act Accessibility Guidelines.

1.03 SUBMITTALS:

- A. Certification of quality by producer for the following:
 - 1. Cement
 - 2. Aggregates
- B. Concrete Test Specimens: Deliver to the place of inspection and testing.
- C. Concrete Mix Design: Provide job-mix formula prepared by independent lab or approved by MDOT two weeks prior to placement.
- D. Submittal of as-built plans to the Township upon completion of project.

1.04 JOB CONDITIONS:

- A. General Limitations: Concrete shall not be placed between November 1 and April 1, unless authorized by the TOWNSHIP. Concrete shall not be placed when the air temperature in the shade is less than 40 degrees Fahrenheit and falling. Concrete shall not be placed if portions of the base, subbase, or subgrade layer are frozen, or if the grade exhibits poor stability from excessive moisture levels. Chemicals shall not be added to reduce the freezing point. Any deviation from the above, when authorized, will require protection from freezing until the concrete has attained a compressive strength of at least 1,000 psi (1,000 psi strength will typically be attained after 2 days of curing). Concrete damaged by frost action shall be removed and replaced.

- B. Clean-up promptly following sidewalk installation.
- C. Maintenance of Temporary Surfaces: Maintain temporary surfaces until permanent sidewalk installation is completed.
- D. Driveway Closing: 24-hour maximum for removal and replacement of concrete plus additional 96 hours (4 days) for curing. Prior to replacement, the removed portion of the driveway shall be brought up to its proposed grade with gravel and/or bituminous.
- E. Protect areas under construction with lighted barricades and reflectorized fencing in accordance with applicable MDOT, MIOASHA and ASHA regulations.
- F. Number of Crosswalks: two-way intersections (i.e. – 90-degree intersections) are required to have 2 crosswalks, three-way intersections to have 3 crosswalks, and four-way intersections to have 4 crosswalks. Each crosswalk shall have 2 concrete ramps.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Subbase: Granular material MDOT class II, MDOT 902.
- B. Concrete: Limestone aggregate, 5½ sack minimum, 4% to 7% entrained air, five (5) gallons per sack maximum water/cement ratio, 3-inch slump maximum, 3,500 psi minimum compressive strength at 28 days.
- C. Concrete Joint Filler: Conform to MDOT 914.03.
- D. Forms: Rigid in accordance with MDOT 803.03B, except at curved sections which shall utilize a bendable material to provide a uniform radius, supported at adequate intervals.
- E. Gravel Base: MDOT 902.05, 22A Aggregate.
- F. HMA Patching: HMA Mix 36A.
- G. Bond Coat: MDOT 501.02 and 904.03C.
- H. Brick Pavers: Concrete brick pavers (4" x 8" size) designed for heavy vehicles.
- I. Detectable Warning Surfaces:
 - 1. Cast ductile iron plate with anchor lugs.
 - 2. Slip resistant textured surface.
 - 3. Provide width to match sidewalk ramp width.
 - 4. Meet ADAAG.
 - 5. Manufacturer: East Jordan Iron Works or Neenah Foundry Company.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Removal: Remove or saw cut at the existing joint or line marked by OWNER's ENGINEER in area of removal. Remove adjacent pavement structure necessary to place forms.

- B. Removal of subgrade material to maintain existing sidewalk elevation and meet specified concrete thickness shall be included in the cost of the sidewalk.
- C. Disposal of all removed material shall be performed by the CONTRACTOR. Keep all removed material off private property at all times.
- D. For sidewalk crossing bituminous drives: Saw cut existing bituminous and use as forms.
- E. For sidewalk crossing concrete drives: Remove or saw cut at the existing joint or line marked by the OWNER's ENGINEER.
- F. Cut and protect tree roots as directed by the OWNER's ENGINEER.
- G. Excavation: Form subgrade by trenching, excavating or filling to the required elevation.
- H. Notify OWNER's ENGINEER if unsuitable material exists below subgrade. Remove unsuitable material as directed by OWNER's ENGINEER. If unsuitable material is removed, place a minimum 4-inch sand subbase to elevation required for bottom of concrete. In fill areas, the subbase shall be at least 1 foot wider than the sidewalk width.
- I. Compact subbase to 95% maximum density.
- J. Scheduling: Maximum time between removal and replacement, or between excavation and placement, shall be 7 days.

3.02 PERFORMANCE:

- A. Sidewalk and Ramp Requirements:
 - 1. All sidewalks in residential areas shall be 5 feet in width, with the grade of $\frac{1}{4}$ inch per foot from the back of sidewalk towards the street, unless otherwise directed. Sidewalks in residential areas shall also be in accordance with the "Residential Sidewalk Specifications" and "Sidewalk Specs Agreement Form" included in Article 3.06 SCHEDULES.
 - 2. Slopes away from the edge of sidewalk must not exceed a 1:4 grade (one vertical foot, four horizontal feet).
 - 3. Where sidewalks are intended to serve a dual purpose as a fire apparatus access road, sidewalk must be 10 feet in width and capable of supporting a load of 90,000 pounds.
 - 4. The elevation at the back of sidewalk shall be 6 inches above the road centerline, unless otherwise approved.
 - 5. All sidewalks shall be a minimum of 4 inches thick except through driveways where they shall be a minimum of 6 inches thick for residential and 8 inches thick for commercial/industrial, with WW mesh reinforcement. Sidewalks shall continue through all driveways.
 - 6. Sidewalk ramps shall have a uniform grade except as necessary for short grade changes and shall be in conformance with ADAAG and these specifications. Detectable warning surfaces shall be provided.
 - 7. Sidewalk ramps shall be 8 inches thick with WW mesh reinforcement.
 - 8. The space behind the curb and between ramps at intersection corners shall be concrete (8-inch thick with WW mesh reinforcement), brick pavers (concrete brick over sand bedding over 6-inch thick concrete with WW reinforcement) or pre-approved landscaping.
 - 9. Detectable warning surfaces:

- a. Provide for tactile and visual warning that contrast visually with adjacent walking surfaces, either light-on-dark or dark-on-light.
 - b. Provide cast ductile iron detectable warning plates embedded into newly cast concrete. Provide same width as sidewalk, minimum. Install in accordance with manufacturer's recommendations, ADAAG and these specifications. Surface applied products will not be allowed. Do not construct detectable warnings by forming or stamping in newly cast concrete.
 - c. Provide detectable warning plates on all sidewalk ramps for sidewalk crossings of public roads, private roads that are stop sign controlled, and commercial driveways that are stop sign controlled or experience high traffic volumes that would warrant a safe sidewalk crossing of the drive. Ottawa County Road Commission requirements for providing detectable warning surfaces on sidewalk ramps on public roads and at commercial drives shall be met.
- B. Structure Adjustment: Any utility structures in the sidewalk or ramp not conforming to the finished grade shall be adjusted to $\frac{1}{4}$ " below grade. Conform to MDOT 403.03C and TOWNSHIP specifications.
- C. Concrete Mixing and Delivery: Transit mix concrete conforming to MDOT 601.03E.
- D. Placing and Finishing Concrete:
 - 1. Place concrete on a moist base in one (1) lift to the specified depth. The concrete shall be thoroughly spaded along the faces of the forms before finishing operations are started. The concrete shall be struck off to the required grade and cross section.
 - 2. All edges and joints shall be slightly broomed transversely to roughen the surface after the concrete has received a float finish. The sidewalk ramps shall be textured with a coarse broom transversely to the ramp slope.
- E. Curing and Protection:
 - 1. Concrete shall be cured and protected as specified under MDOT 602.03M and 602.03T except that pedestrian traffic may be allowed after 48 hours.
- F. Joints:
 - 1. Joints shall be constructed to true line with their faces perpendicular to the surface of the sidewalk and shall not vary more than $\frac{1}{4}$ inch from their designated position. Transverse joints shall be constructed at right angles to centerline of the sidewalk and longitudinal joints shall be constructed parallel to the centerline unless otherwise required. When sidewalk is constructed in partial width, transverse joints shall be placed in line with like joints in the existing sidewalk.
 - 2. The concrete at the faces of all joints shall be thoroughly spaded or vibrated and compacted to fill all voids and the surface shall be finished smooth and substantially true to grade.
 - 3. One-half ($\frac{1}{2}$) inch transverse expansion joints shall be placed in line with all expansion joints in abutting curb, gutter or combination curb and gutter. When sidewalk does not abut such pavement, $\frac{1}{2}$ inch transverse expansion joints shall be placed at intervals not exceeding 50 feet and at all transitions between 4 inch and 6-inch sidewalk. Expansion joint filler shall extend the full depth of the joint with the top slightly below the finished sidewalk surface. The filler shall be supported temporarily until concrete is poured against it.
 - 4. One-half ($\frac{1}{2}$) inch longitudinal expansion joints shall be placed between the sidewalk and the back of abutting parallel curb or gutter, between the sidewalk and buildings, or other rigid structures.

5. One-half (½) inch expansion joints shall be placed between sidewalk approaches and the back of curb and gutter, or the edge of pavement, including bituminous driveways.
 6. Contraction joints shall be placed at 5 foot intervals. They shall divide sidewalk into areas not more than 36 square feet nor less than 16 square feet. Contraction joints will be produced by slab division forms extending to the full depth of concrete or by cutting joints in the concrete after floating to a depth of not less than ¼ the thickness of the concrete. The cut joints shall not be less than 1/8-inch or more than ¼ inch in width and shall be finished smooth and substantially true to line.
- G. Backfilling and HMA patching:
1. After concrete has gained sufficient strength (70% of design), all rails, forms, stakes and supports shall be removed in a manner as not to injure finished concrete and all exposed edges of the concrete shall be backfilled, compacted and leveled immediately.
 2. In areas where the sidewalk crosses bituminous drives, saw cut existing bituminous. HMA patching shall be placed and compacted.
- H. HMA Patching:
1. Place minimum 4 inches of aggregate base 22A and compact to ninety-five percent (95%) of maximum density.
 2. Place minimum 2 inches of HMA Mix 36A.
- I. Concrete curb and gutter: TOWNSHIP's, Ottawa County Road Commission's or MDOT's Standard.
1. Match existing curb and gutter.
 2. Construction methods: MDOT 802.03.

3.03 TESTING AND INSPECTION:

- A. Observation: By TOWNSHIP, TOWNSHIP's ENGINEER or designated representative.
1. Inspection of forms is required prior to pouring concrete.
- B. Acceptance Testing:
1. Cement: Certification of quality by producer.
 2. Concrete:
 - a. Sample: ASTM C172
 - b. Frequency: Once for each 50 cubic yards of each class of concrete placed.
 - c. Perform following from sample:
 - (1) Mold three 6-inch cylinder compressive strength specimens: ASTM: C31
 - (2) Slump test: ASTM C143
 - (3) Air test: ASTM C231
 - (4) Yield test: ASTM C138
 - (5) Strength test: ASTM C139
 3. If initial testing indicates failure or nonconformance to specifications, additional testing shall be paid for by the CONTRACTOR. Replace nonconforming material.
- C. Aggregates: Provide certification of approved stockpiled material.
- D. Concrete:
1. Limestone aggregate.
 2. Slump: 3-inches maximum.
 3. Entrained Air: 4 percent to 7 percent.
 4. Strength: 3500 psi, at 28 days.

3.04 TREE ROOT CUTTING:

- A. The following information shall be used as a guide when trimming tree roots:
 - 1. Excavate as shallow as possible in the area adjacent to the tree root.
 - 2. Make clean cuts with a saw or sharp chisel. Do not bury jagged or torn roots.
 - 3. Do not allow the exposed root ends to dry out. If exposed for more than a day, they can dry out. Cover all exposed roots with soil at the end of the day.
 - 4. Avoid cutting roots larger than 3.5 inches.

3.05 TREE ROOT BARRIER:

- A. Install tree root barrier along the sidewalk adjacent to trees to reduce future damage by tree roots in areas determined by the TOWNSHIP or TOWNSHIP ENGINEER. Installation shall be in accordance with manufacturer's recommendations.
- B. Install in 4-inch wide trench (with roots removed) adjacent to the sidewalk between the sidewalk and tree to a minimum depth of 30 inches. Secure with pins. Backfill carefully to avoid dislodging the barrier and compact firmly.
- C. Manufacturer: Typar Biobarrier or approved equal.

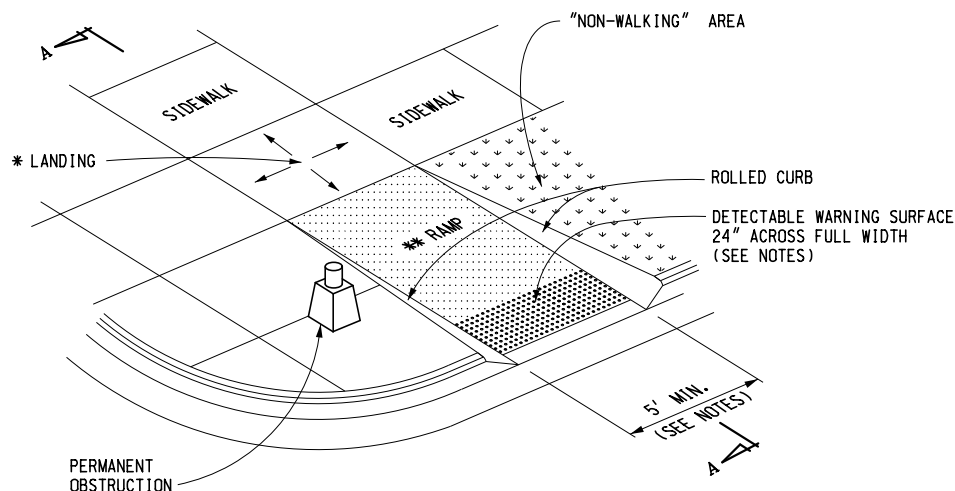
3.06 SCHEDULES:

- A. MDOT Standard Plan R-28-J SIDEWALK RAMP AND DETECTABLE WARNING DETAILS (7 sheets).
- B. MDOT Standard Plan R-29-I DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK (4 sheets).
- C. Typical Sidewalk Requirements (2 sheets).
- D. Residential Sidewalk Specifications and Sidewalk Specs Agreement Form (2 sheets).

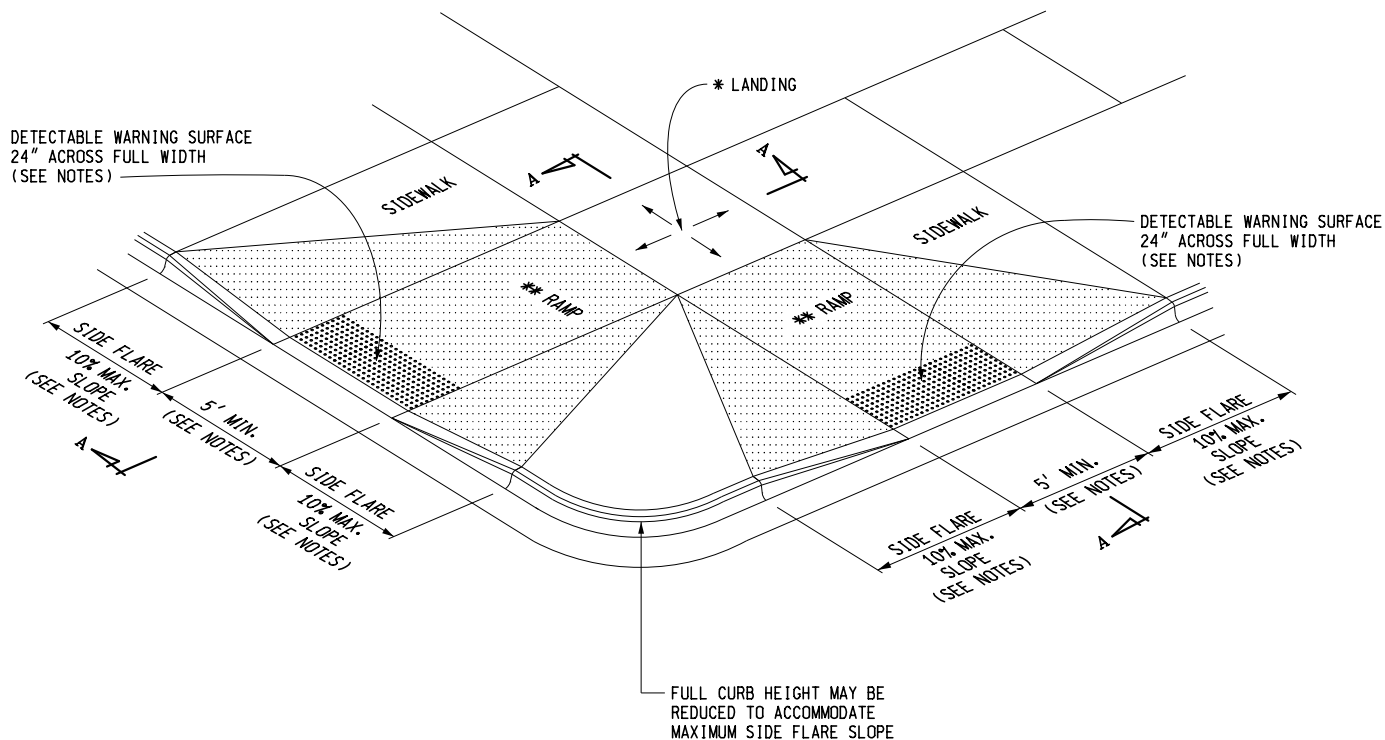
END OF SECTION

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



SIDEWALK RAMP TYPE R
(ROLLED SIDES)



SIDEWALK RAMP TYPE F
(FLARED SIDES, TWO RAMPS SHOWN)



PREPARED
BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Paul C. Ajegba

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL

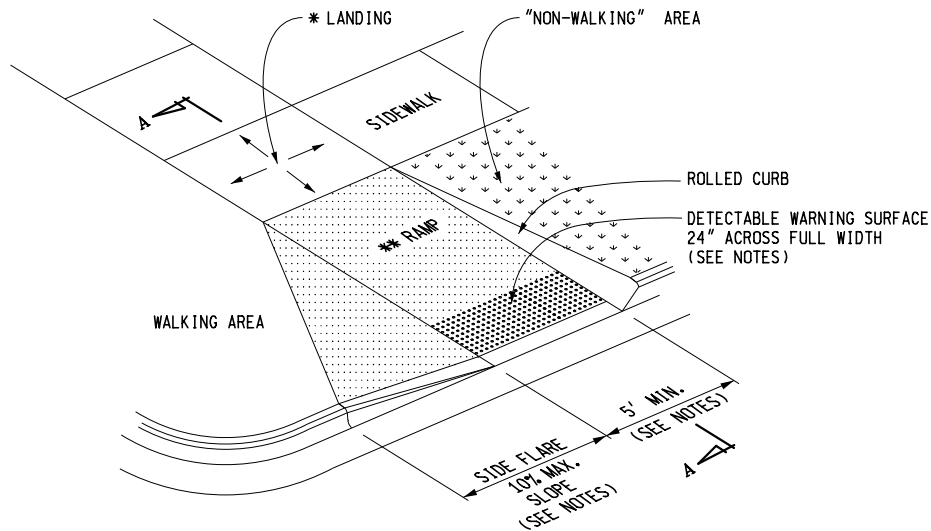
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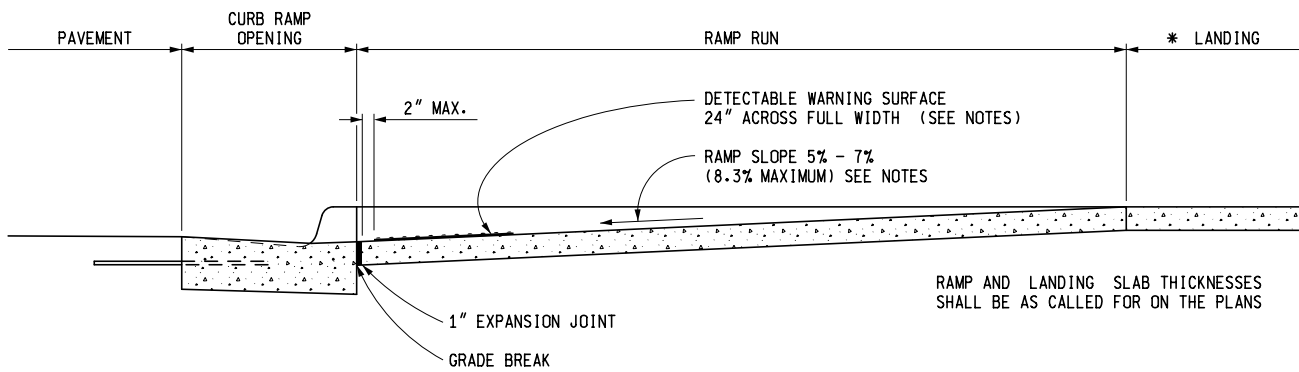
SHEET
1 OF 7

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



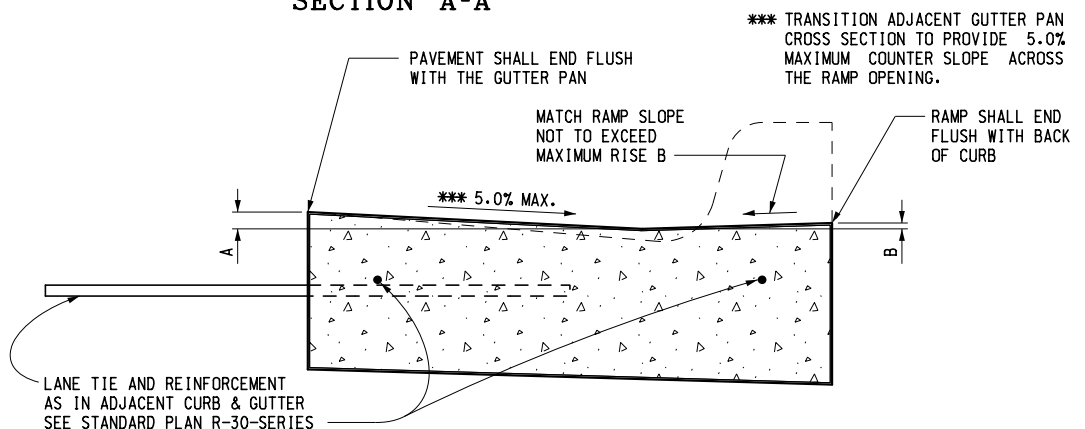
SIDEWALK RAMP TYPE RF
(ROLLED / FLARED SIDES)



SECTION A-A

CURB TYPE	MAXIMUM RISE (INCHES)	
	A	B
B1	3/4	1
B2	3/4	1
B3	3/4	1
D1	3/4	1
D2	3/4	1
D3	3/4	1
C1	1/2	1/2
C2	1/2	1/2
C3	3/4	1/2
C4	3/4	1/2
C5	1	1/2
C6	1	1/2
F1	1/2	1/2
F2	1/2	1/2
F3	3/4	1/2
F4	3/4	1/2
F5	1	1/2
F6	1	1/2

FOR CURB TYPES SEE
STANDARD PLAN R-30-SERIES



SECTION THROUGH CURB RAMP OPENING
(TYPICAL ALL RAMP TYPES)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL

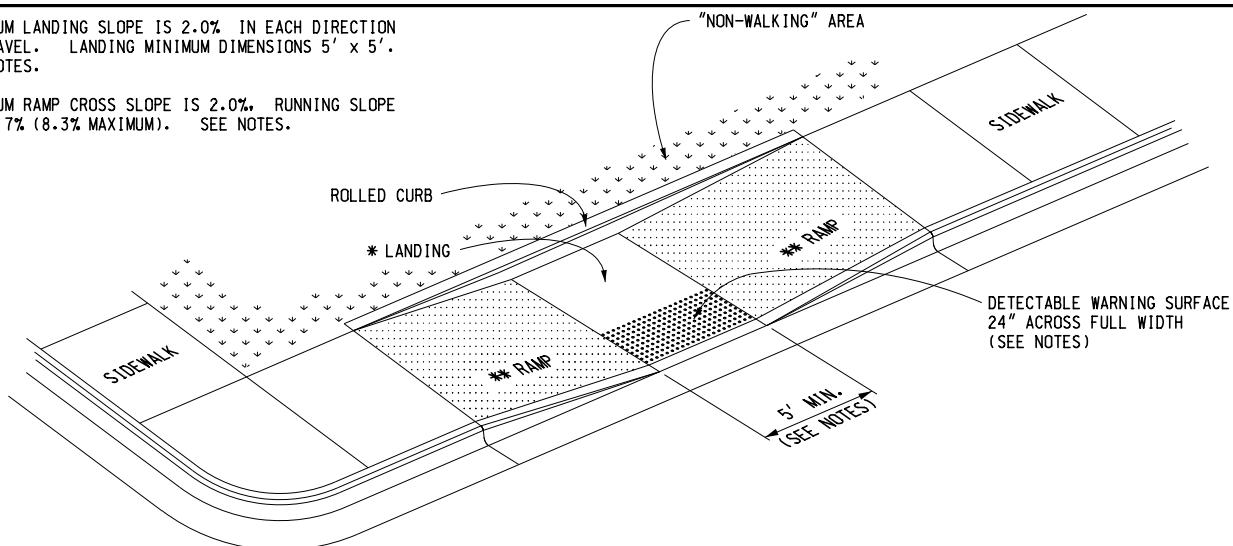
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PLAN DATE

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SHEET
2 OF 7

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

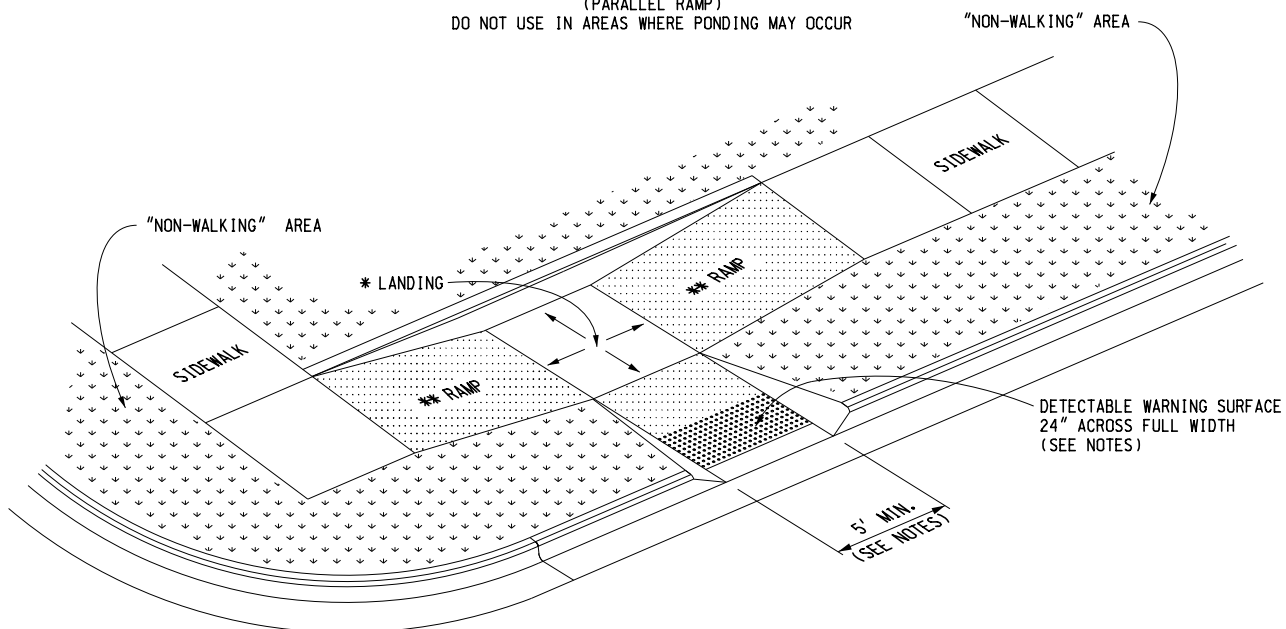
** MAXIMUM RAMP CROSS SLOPE IS 2.0%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



SIDEWALK RAMP TYPE P

(PARALLEL RAMP)

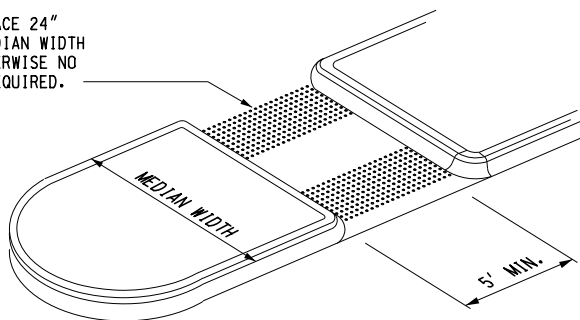
DO NOT USE IN AREAS WHERE PONDING MAY OCCUR



SIDEWALK RAMP TYPE C

(COMBINATION RAMP)

DETECTABLE WARNING SURFACE 24" ACROSS FULL WIDTH IF MEDIAN WIDTH IS AT LEAST 6'-0". OTHERWISE NO DETECTABLE WARNING IS REQUIRED.



SIDEWALK RAMP TYPE M

(MEDIAN ISLAND)

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL

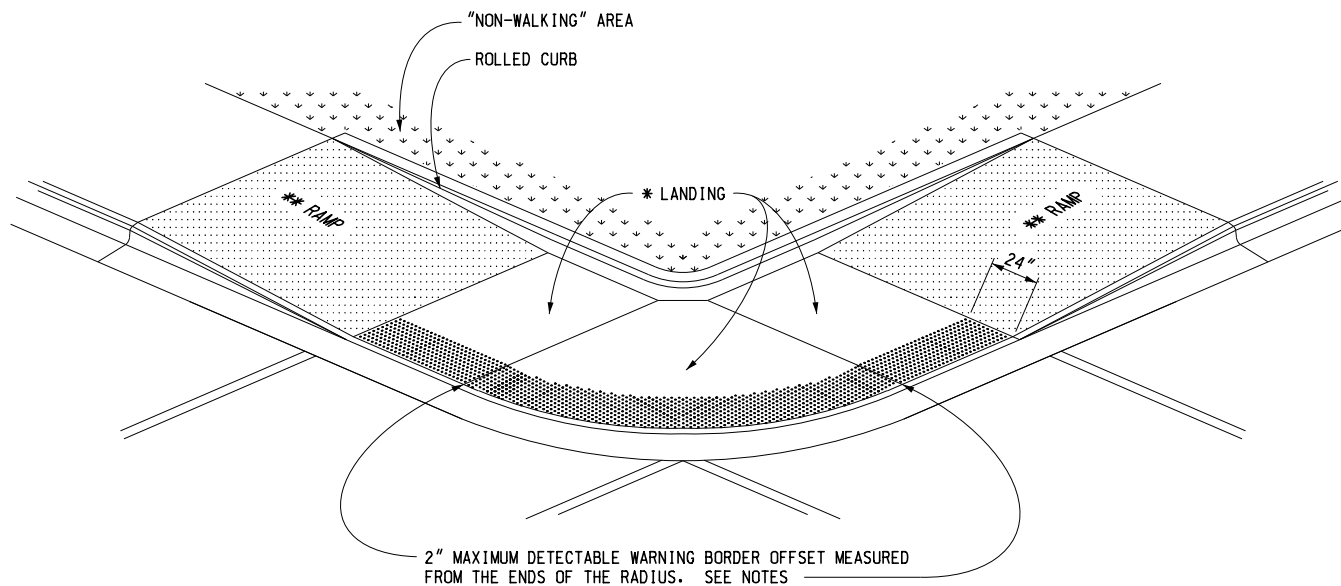
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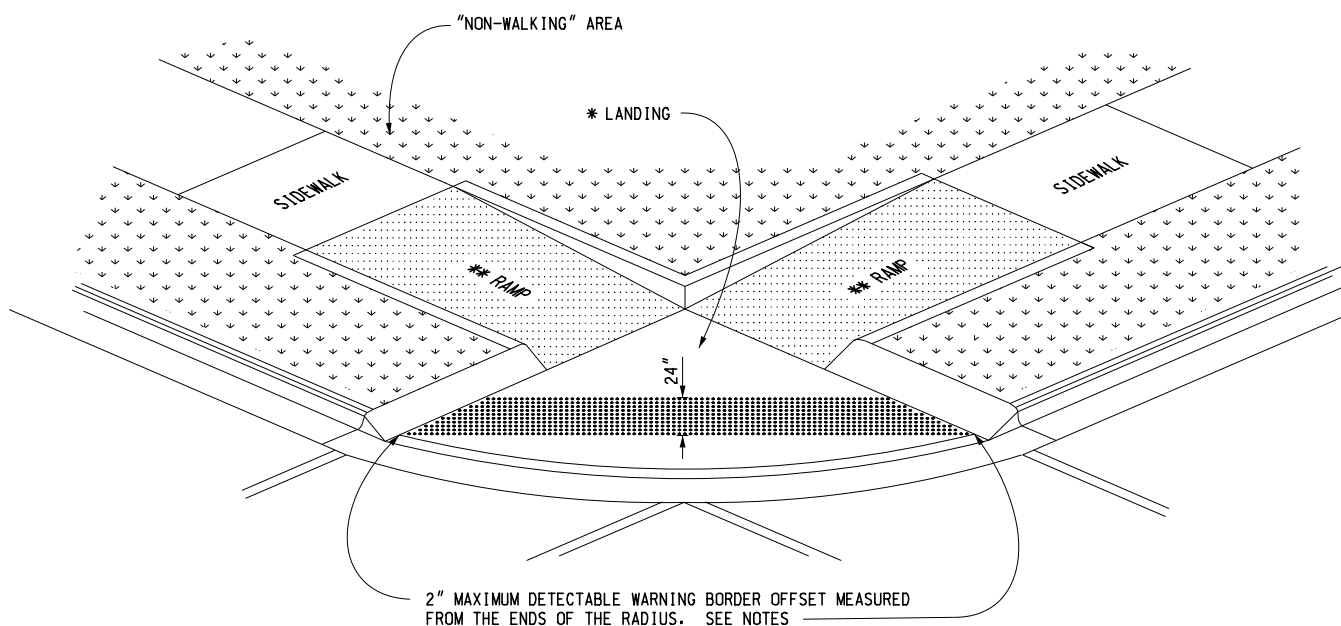
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3 OF 7

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. LANDING MINIMUM DIMENSIONS 5' x 5'. SEE NOTES.

** MAXIMUM RAMP CROSS SLOPE IS 2.0%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



(RADIAL DETECTABLE WARNING SHOWN)



(TANGENT DETECTABLE WARNING SHOWN)

SIDEWALK RAMP TYPE D

(DEPRESSED CORNER)

USE ONLY WHEN INDEPENDENT DIRECTIONAL RAMPS CAN NOT BE CONSTRUCTED FOR EACH CROSSING DIRECTION

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

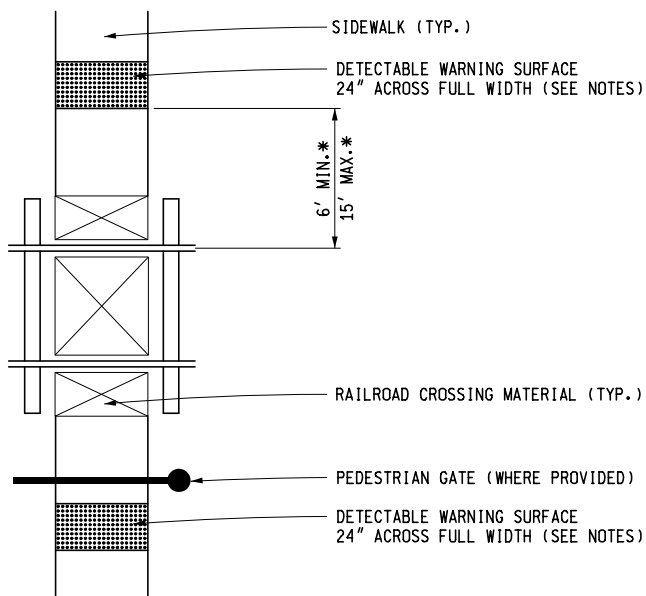
F.H.W.A. APPROVAL

7-26-2019
PLAN DATE

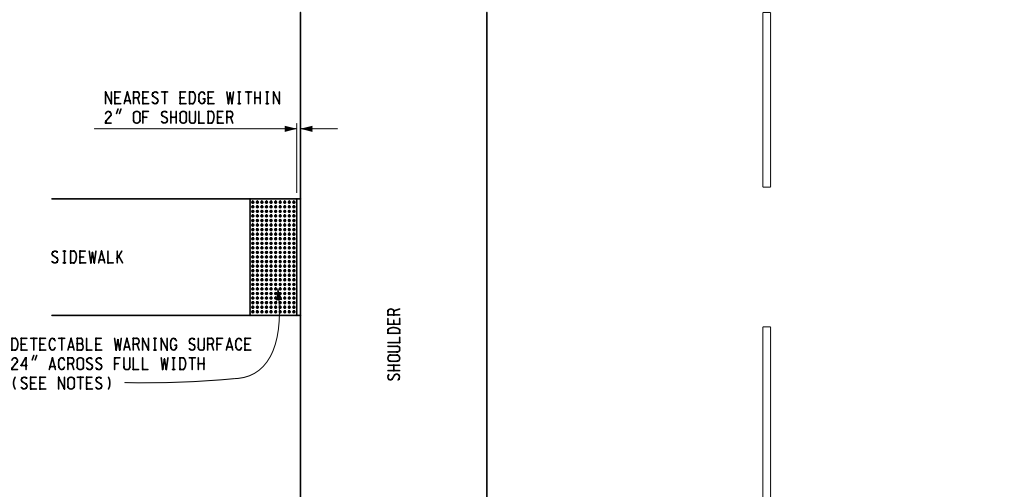
R-28-J

SHEET
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* THE DETECTABLE WARNING SURFACE SHALL BE LOCATED SO THAT THE EDGE NEAREST THE RAIL CROSSING IS 6' MINIMUM AND 15' MAXIMUM FROM THE CENTERLINE OF THE NEAREST RAIL. DO NOT PLACE DETECTABLE WARNING ON RAILROAD CROSSING MATERIAL.



DETECTABLE WARNING AT RAILROAD CROSSING



DETECTABLE WARNING AT FLUSH SHOULDER OR ROADWAY

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

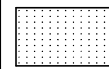
F.H.W.A. APPROVAL

7-26-2019
PLAN DATE

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5 OF 7

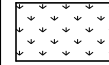
LEGEND



SLOPED SURFACE



DETECTABLE WARNING



"NON-WALKING" AREA



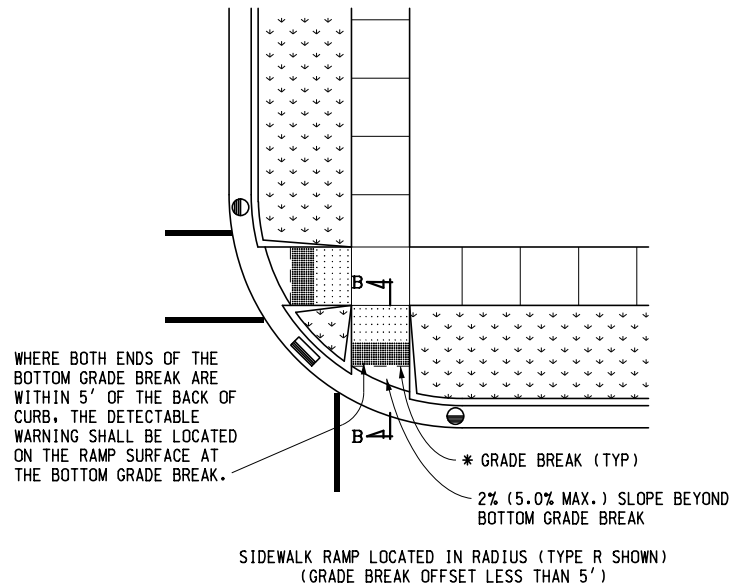
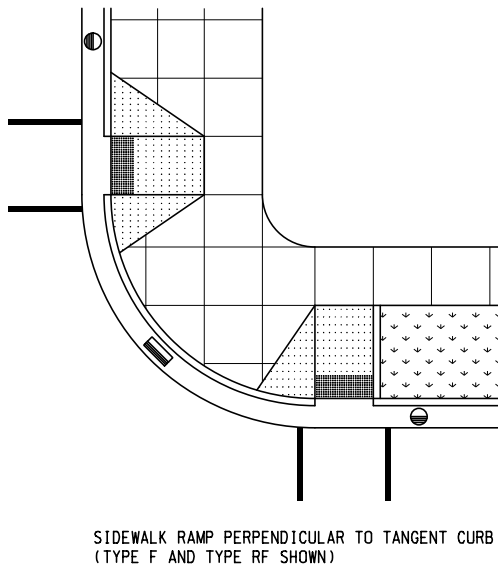
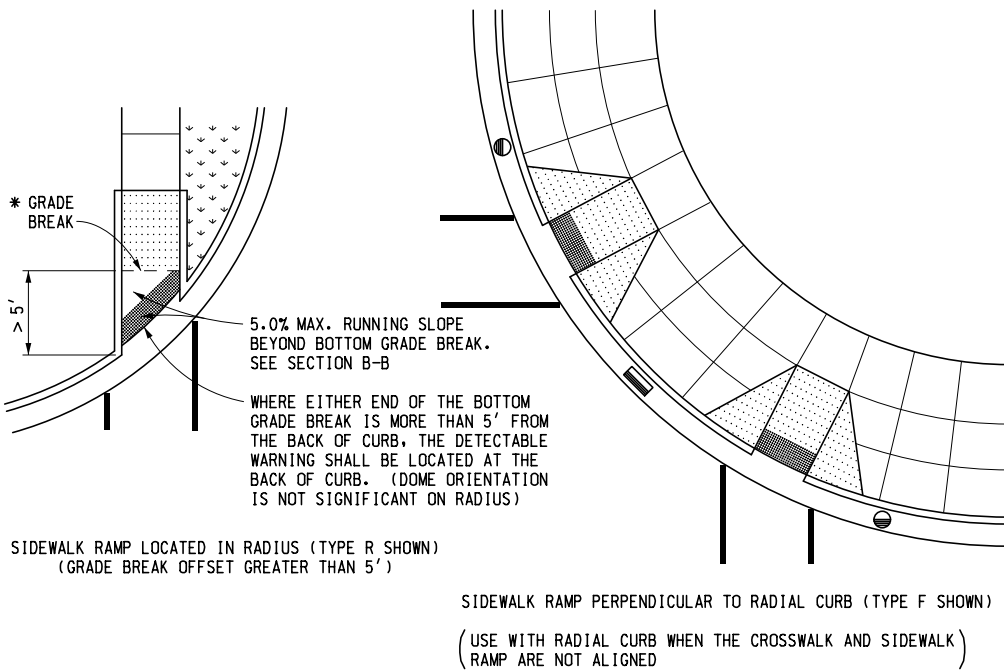
CROSSWALK MARKING



PREFERRED LOCATION OF DRAINAGE INLET (TYP.)



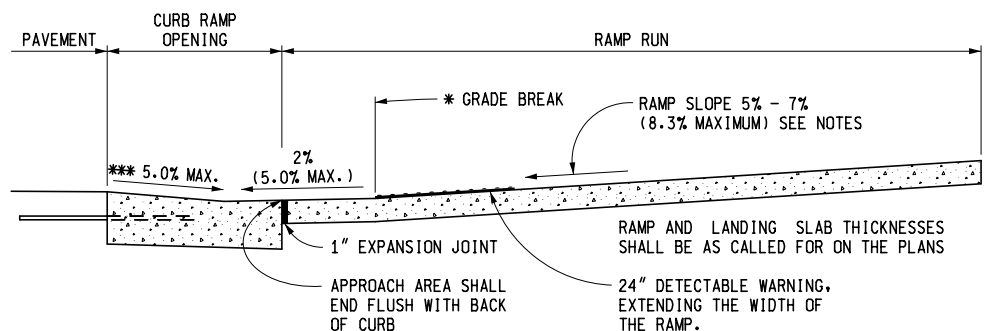
ALTERNATE LOCATION OF DRAINAGE INLET (TYP.)



* GRADE BREAKS AT THE TOP AND BOTTOM OF CURB RAMPS SHALL BE PERPENDICULAR TO THE DIRECTION OF TRAVEL.

*** TRANSITION ADJACENT GUTTER PAN CROSS SECTION TO PROVIDE 5.0% MAXIMUM COUNTER SLOPE ACROSS THE RAMP OPENING.

SEE SHEET 2 FOR CURB RAMP OPENING DETAILS.



SECTION B-B

SIDEWALK RAMP ORIENTATION

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

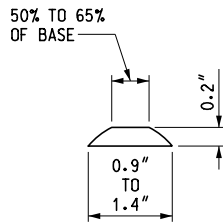
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL

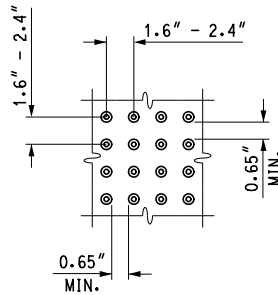
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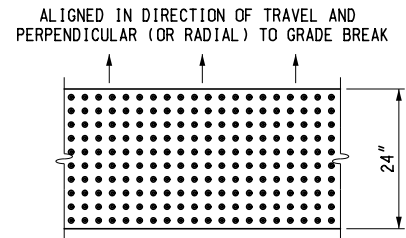
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6 OF 7



DOME SECTION



DOME SPACING



DOME ALIGNMENT

DETECTABLE WARNING DETAILS

NOTES:

DETAILS SPECIFIED ON THIS PLAN APPLY TO ALL CONSTRUCTION, RECONSTRUCTION, OR ALTERATION OF STREETS, CURBS, OR SIDEWALKS IN THE PUBLIC RIGHT OF WAY.

SIDEWALK RAMPS ARE TO BE LOCATED AS SPECIFIED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

RAMPS SHALL BE PROVIDED AT ALL CORNERS OF AN INTERSECTION WHERE THERE IS EXISTING OR PROPOSED SIDEWALK AND CURB. RAMPS SHALL ALSO BE PROVIDED AT MARKED AND/OR SIGNALIZED MID-BLOCK CROSSINGS.

SURFACE TEXTURE OF THE RAMP SHALL BE THAT OBTAINED BY A COARSE BROOMING, TRANSVERSE TO THE RUNNING SLOPE.

SIDEWALK SHALL BE RAMPED WHERE THE DRIVEWAY CURB IS EXTENDED ACROSS THE WALK.

CARE SHALL BE TAKEN TO ASSURE A UNIFORM GRADE ON THE RAMP. WHERE CONDITIONS PERMIT, IT IS DESIRABLE THAT THE SLOPE OF THE RAMP BE IN ONLY ONE DIRECTION, PARALLEL TO THE DIRECTION OF TRAVEL.

RAMP WIDTH SHALL BE INCREASED, IF NECESSARY, TO ACCOMMODATE SIDEWALK SNOW REMOVAL EQUIPMENT NORMALLY USED BY THE MUNICIPALITY.

WHEN 5' MINIMUM WIDTHS ARE NOT PRACTICABLE, RAMP WIDTH MAY BE REDUCED TO NOT LESS THAN 4' AND LANDINGS TO NOT LESS THAN 4' x 4'.

CURB RAMPS WITH A RUNNING SLOPE $\leq 5\%$ DO NOT REQUIRE A TOP LANDING. HOWEVER, ANY CONTINUOUS SIDEWALK OR PEDESTRIAN ROUTE CROSSING THROUGH OR INTERSECTING THE CURB RAMP MUST INDEPENDENTLY MAINTAIN A CROSS SLOPE NOT GREATER THAN 2% PERPENDICULAR TO ITS OWN DIRECTION(S) OF TRAVEL.

DETECTABLE WARNING SURFACE COVERAGE IS 24" MINIMUM IN THE DIRECTION OF RAMP/PATH TRAVEL AND THE FULL WIDTH OF THE RAMP/PATH OPENING EXCLUDING CURBED OR FLARED CURB TRANSITION AREAS. A BORDER OFFSET NOT GREATER THAN 2" MEASURED ALONG THE EDGES OF THE DETECTABLE WARNING IS ALLOWABLE. FOR RADIAL CURB THE OFFSET IS MEASURED FROM THE ENDS OF THE RADIUS.

FOR NEW ROADWAY CONSTRUCTION, THE RAMP CROSS SLOPE MAY NOT EXCEED 2.0%. FOR ALTERATIONS TO EXISTING ROADWAYS, THE CROSS SLOPE MAY BE TRANSITIONED TO MEET AN EXISTING ROADWAY GRADE. THE CROSS SLOPE TRANSITION SHALL BE APPLIED UNIFORMLY OVER THE FULL LENGTH OF THE RAMP.

THE MAXIMUM RUNNING SLOPE OF 8.3% IS RELATIVE TO A FLAT (0%) REFERENCE. HOWEVER, IT SHALL NOT REQUIRE ANY RAMP OR SERIES OF RAMPS TO EXCEED 15 FEET IN LENGTH NOT INCLUDING LANDINGS OR TRANSITIONS.

DRAINAGE STRUCTURES SHOULD NOT BE PLACED IN LINE WITH RAMPS. THE LOCATION OF THE RAMP SHOULD TAKE PRECEDENCE OVER THE LOCATION OF THE DRAINAGE STRUCTURE. WHERE EXISTING DRAINAGE STRUCTURES ARE LOCATED IN THE RAMP PATH OF TRAVEL, USE A MANUFACTURER'S ADA COMPLIANT GRATE. OPENINGS SHALL NOT BE GREATER THAN $\frac{1}{2}$ ". ELONGATED OPENINGS SHALL BE PLACED SO THAT THE LONG DIMENSION IS PERPENDICULAR TO THE DOMINANT DIRECTION OF TRAVEL.

THE TOP OF THE JOINT FILLER FOR ALL RAMP TYPES SHALL BE FLUSH WITH THE ADJACENT CONCRETE.

CROSSWALK AND STOP LINE MARKINGS, IF USED, SHALL BE SO LOCATED AS TO STOP TRAFFIC SHORT OF RAMP CROSSINGS. SPECIFIC DETAILS FOR MARKING APPLICATIONS ARE GIVEN IN THE "MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES".

FLARED SIDES WITH A SLOPE OF 10% MAXIMUM, MEASURED ALONG THE ROADSIDE CURB LINE, SHALL BE PROVIDED WHERE AN UNOBSTRUCTED CIRCULATION PATH LATERALLY CROSSES THE SIDEWALK RAMP. FLARED SIDES ARE NOT REQUIRED WHERE THE RAMP IS BORDERED BY LANDSCAPING, UNPAVED SURFACE OR PERMANENT FIXED OBJECTS. WHERE THEY ARE NOT REQUIRED, FLARED SIDES CAN BE CONSIDERED IN ORDER TO AVOID SHARP CURB RETURNS AT RAMP OPENINGS.

DETECTABLE WARNING PLATES MUST BE INSTALLED USING FABRICATED OR FIELD CUT UNITS CAST AND/OR ANCHORED IN THE PAVEMENT TO RESIST SHIFTING OR HEAVING.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

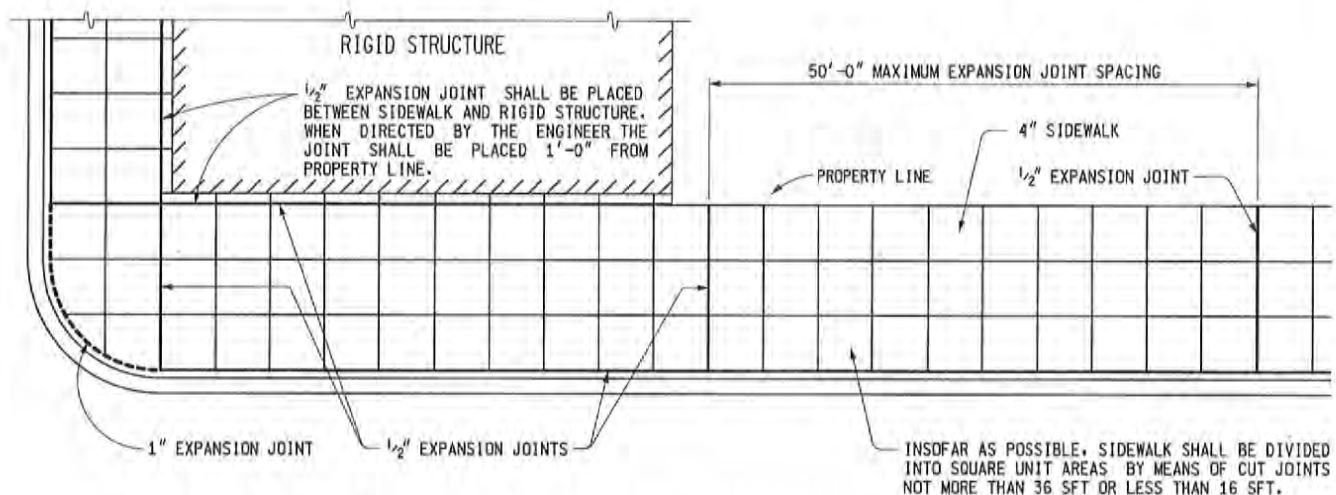
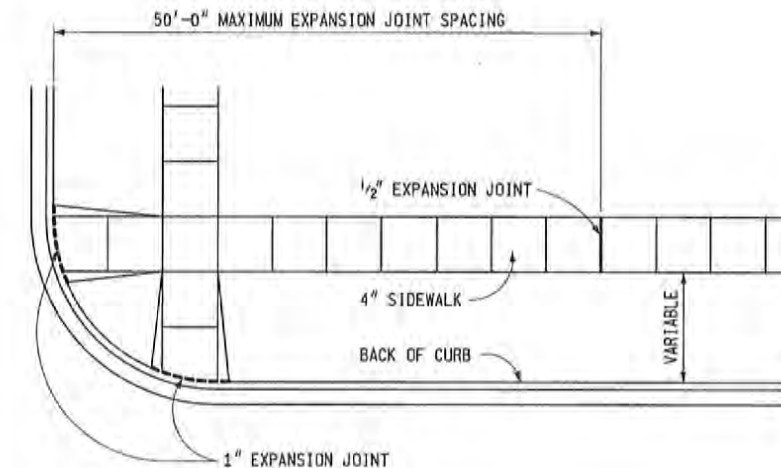
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL

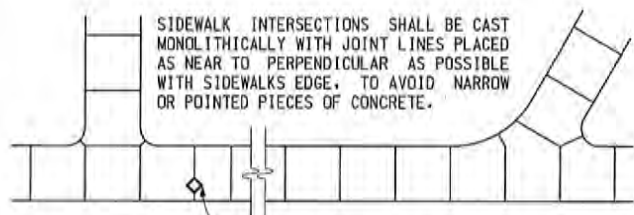
7-26-2019
PLAN DATE

R-28-J

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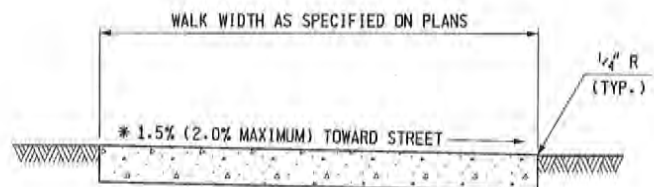


LOCATION OF JOINTS IN CONCRETE SIDEWALK



WHERE A PERMANENT STRUCTURE IS LOCATED IN SIDEWALK, PLACE EXPANSION MATERIAL AROUND STRUCTURE AND ADJUST JOINT PATTERN TO INTERSECT STRUCTURE AS ILLUSTRATED.

TYPICAL SIDEWALK JOINT LAYOUTS



* SEE NOTES

4" CONCRETE SIDEWALK



PREPARED
BY
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR
Kirk T. Staudle

APPROVED BY:

Randy C. Burtch
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY:

Mark A. Van Pelt
DIRECTOR, BUREAU OF HIGHWAY DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

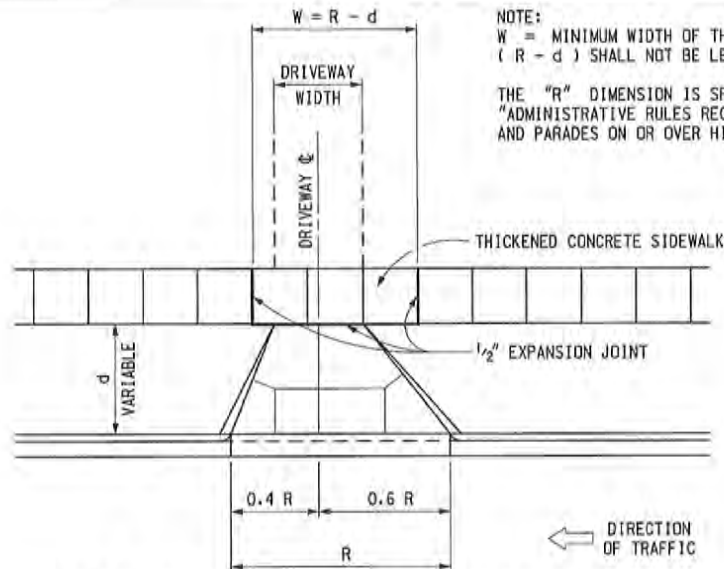
DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

9-30-2014
F.H.W.A. APPROVAL

7-1-2014
PLAN DATE

R-29-I

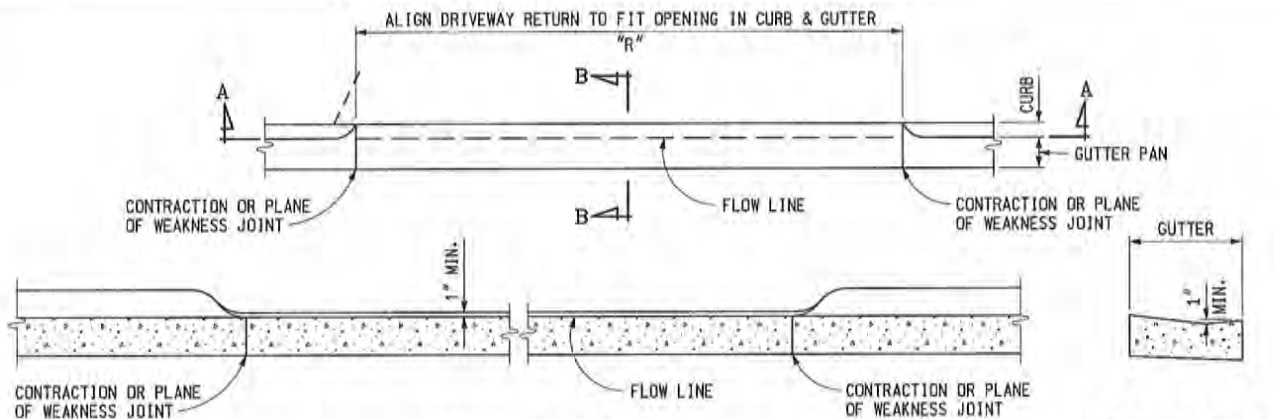
SHEET
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NOTE:
W = MINIMUM WIDTH OF THICKENED CONCRETE SIDEWALK.
(R - d) SHALL NOT BE LESS THAN DRIVEWAY WIDTH.

THE "R" DIMENSION IS SPECIFIED IN THE PUBLICATION
"ADMINISTRATIVE RULES REGULATING DRIVEWAYS, BANNERS
AND PARADES ON OR OVER HIGHWAYS".

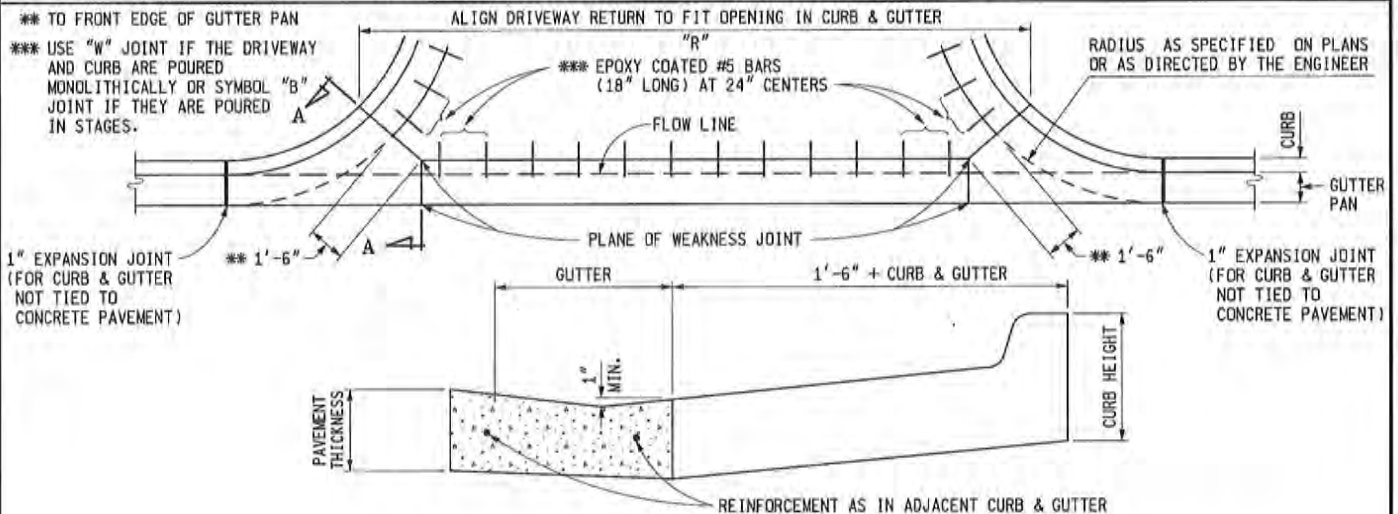
CONCRETE DRIVEWAY OPENING LAYOUT



SECTION A - A

SECTION B - B

CONCRETE DRIVEWAY OPENING, DETAIL L



SECTION A - A

CONCRETE DRIVEWAY OPENING, DETAIL M

NOTE:
FOR ROADWAYS WITH CONCRETE PAVEMENTS, LONGITUDINAL LANE TIES WILL
BE CONTINUOUS THROUGH THE DRIVEWAY OPENING AND THE SPACING OF THE
#5 BARS IN CONCRETE DRIVEWAYS SHALL BE ADJUSTED TO AVOID CONFLICT
WITH THE LONGITUDINAL LANE TIES.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

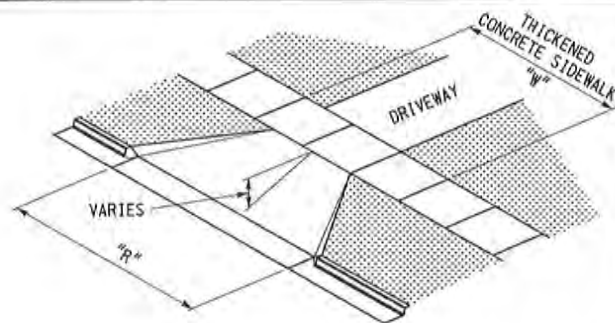
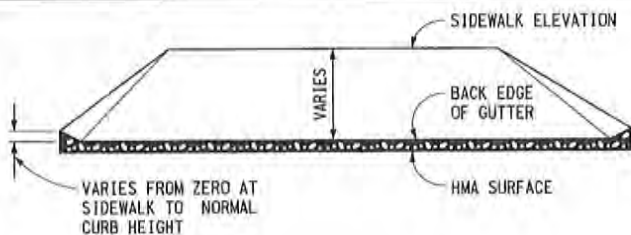
DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

9-30-2014
F.H.W.A. APPROVAL

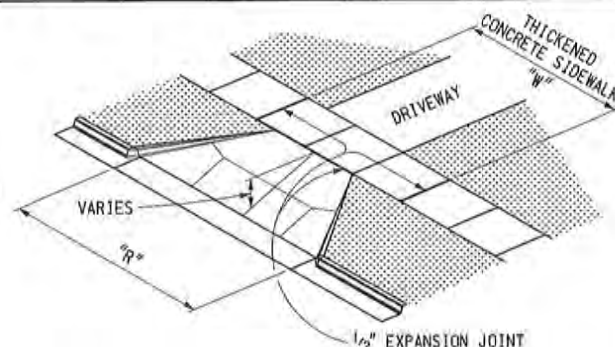
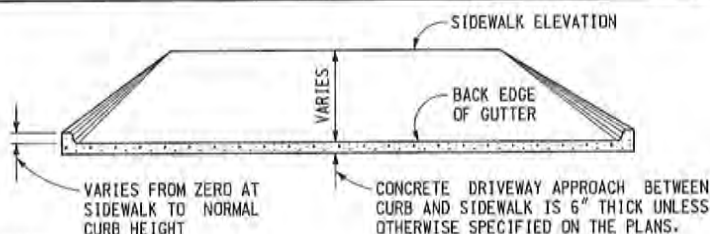
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HMA DRIVEWAY APPROACH (TO BE USED WITH DETAIL L)

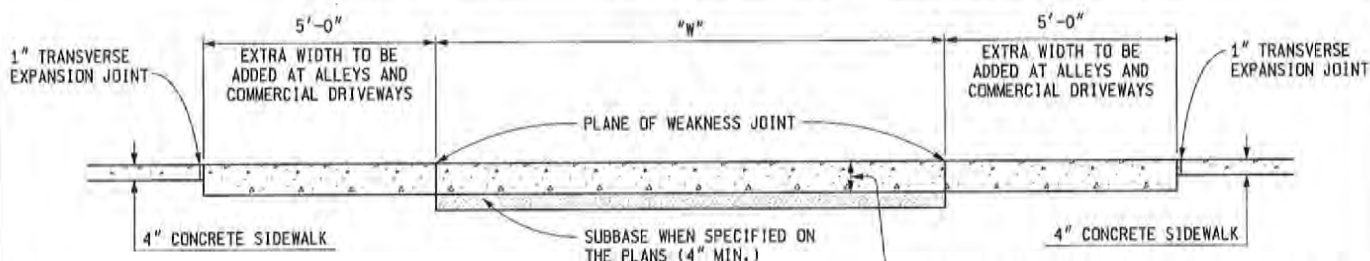


NOTES:

MONOLITHIC CURB IS INCLUDED IN THE CONCRETE DRIVEWAY APPROACH QUANTITY.

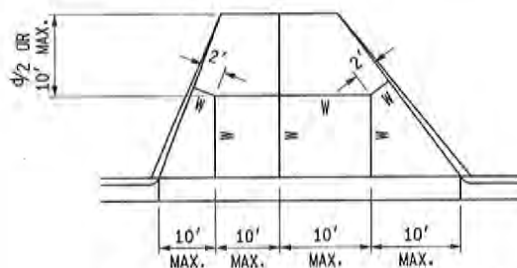
REINFORCEMENT IS NOT REQUIRED UNLESS SPECIFIED ON THE PLANS. WHEN REINFORCEMENT IS SPECIFIED, SEE CHART ON THIS SHEET.

CONCRETE DRIVEWAY APPROACH (TO BE USED WITH DETAIL L OR M)



WHEN CONCRETE DRIVEWAY APPROACH IS SPECIFIED, THE THICKENED CONCRETE SIDEWALK THICKNESS IS EQUAL TO THE THICKNESS OF THE CONCRETE DRIVEWAY APPROACH. WHEN HMA DRIVEWAY APPROACH IS SPECIFIED, THE THICKENED CONCRETE SIDEWALK THICKNESS IS 6" MIN.

THICKENED CONCRETE SIDEWALK



ADJUST DRIVEWAY JOINTS AS NEEDED TO ALIGN WITH ANY COINCIDING TRANSVERSE PAVEMENT JOINTS.

JOINT LAYOUT IS AS INDICATED OR AS DIRECTED BY THE ENGINEER.

INTERMEDIATE DRIVEWAY JOINT DETAILS

REINFORCEMENT FOR CONCRETE DRIVEWAYS

CONCRETE DRIVEWAY THICKNESS	WIRE SIZE (6" x 6" MESH)	AVERAGE WEIGHT (LBS/100 SFT)
LESS THAN 8"	W1.4	21
	W2.9	42
8" OR GREATER	USE WIRE FABRIC REINFORCEMENT SPECIFIED ON STANDARD PLAN R-37-SERIES	

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

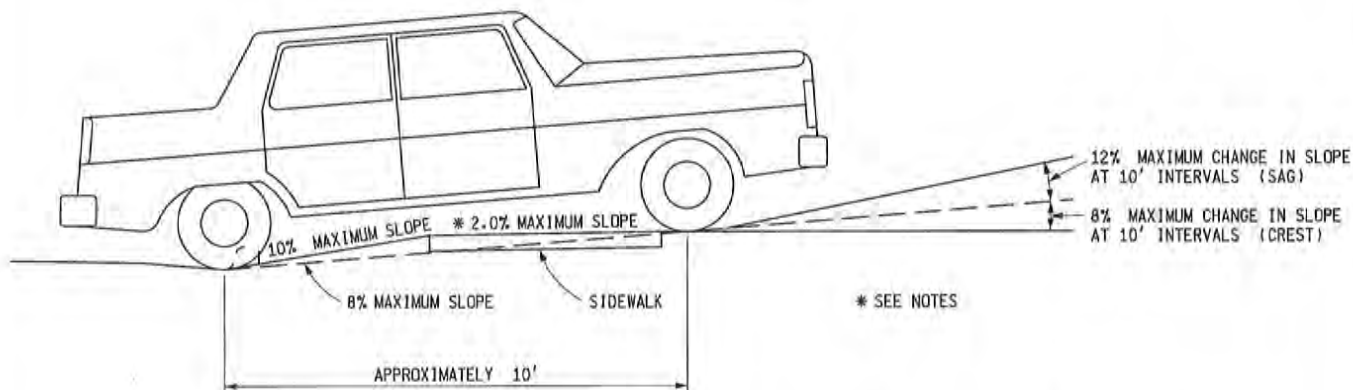
DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

9-30-2014
F.H.W.A. APPROVAL

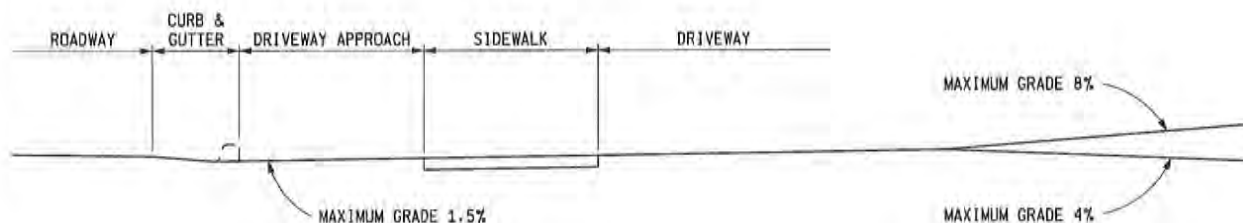
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LOW VOLUME COMMERCIAL OR RESIDENTIAL DRIVEWAY SLOPES



COMMERCIAL DRIVEWAY PROFILE FOR MAJOR TRAFFIC GENERATORS

NOTES:

FOR DRIVEWAY DESIGN REFER ALSO TO "ADMINISTRATIVE RULES REGULATING DRIVEWAYS, BANNERS, AND PARADES ON OR OVER HIGHWAYS" AND GEOMETRIC DESIGN G-680-SERIES, COMMERCIAL DRIVEWAYS.

FOR CURB AND GUTTER DETAILS, SEE STANDARD PLAN R-30-SERIES.

TRANSVERSE SIDEWALK SLOPES ARE TYPICALLY 1.5% (2.0% MAXIMUM). IN ORDER TO MEET SITE CONDITIONS, IF THE TRANSVERSE SLOPE IS REQUIRED TO BE LESS THAN 1.5%, LONGITUDINAL DRAINAGE MUST BE PROVIDED.

WHEN SETTING GRADES FOR COMMERCIAL DRIVES, THE TYPES OF VEHICLES USING THE DRIVE SHOULD BE CONSIDERED.

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

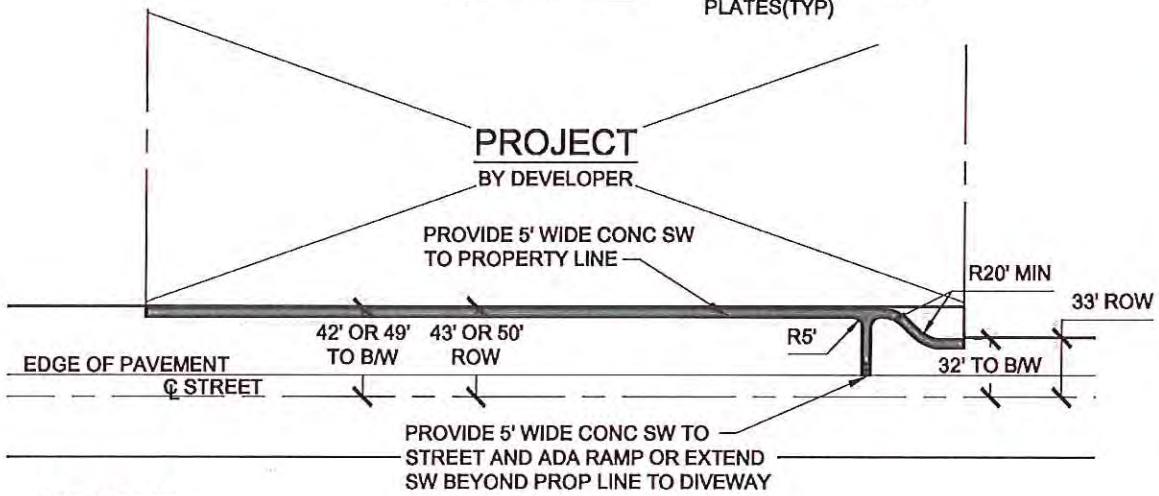
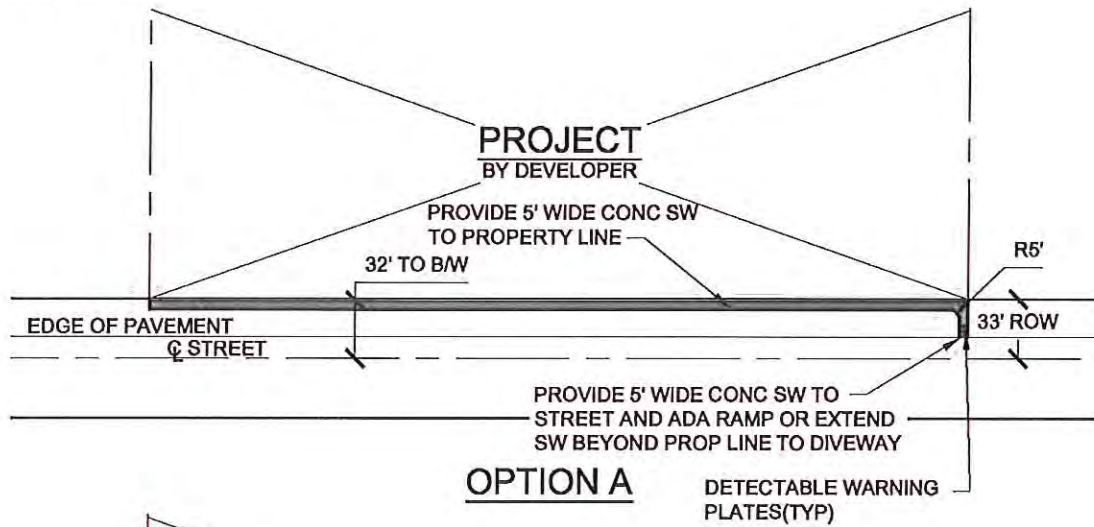
DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

9-30-2014
F.H.W.A. APPROVAL

7-1-2014
PLAN DATE

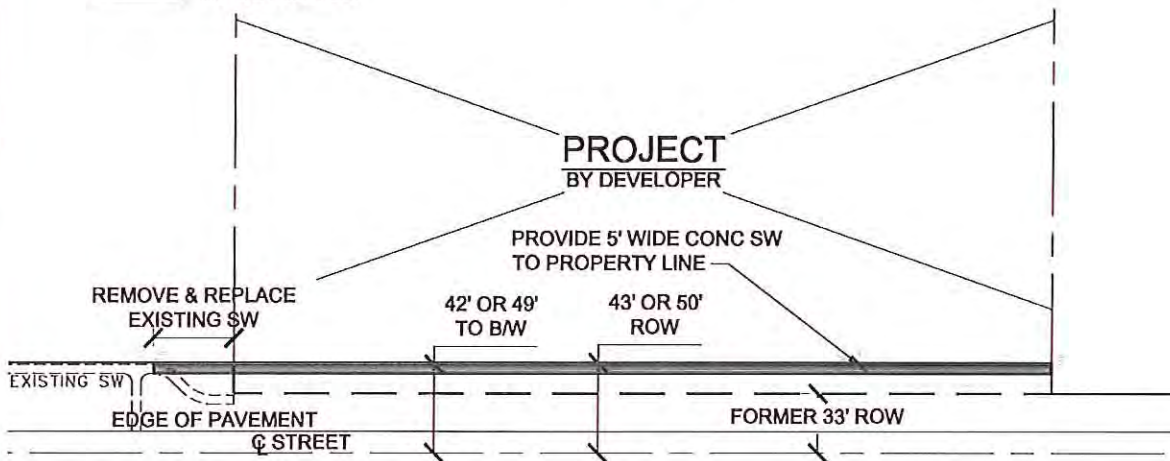
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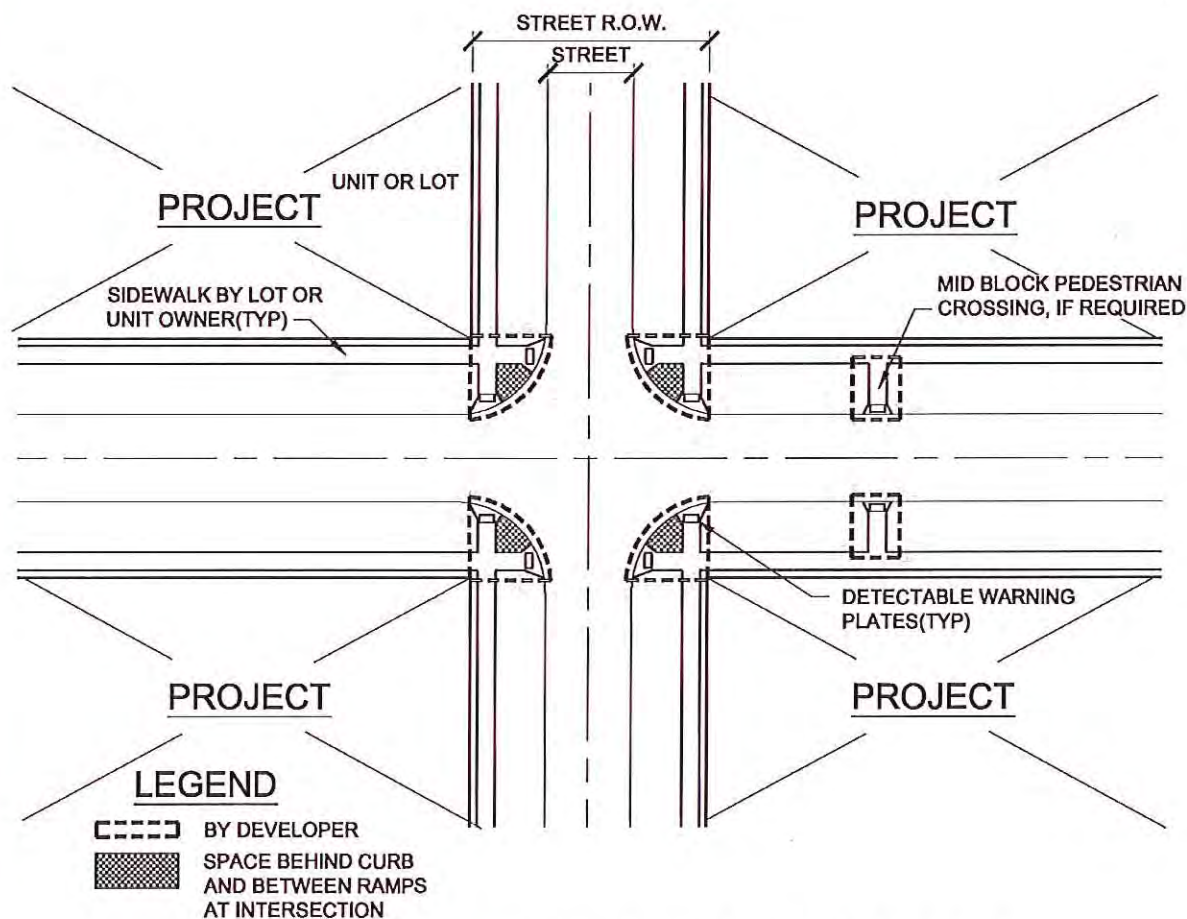
LEGEND

BY DEVELOPER



TYPICAL SIDEWALK REQUIREMENTS

NTS



NO SCALE
02501_SW

SECTION 02501.5
RESIDENTIAL SIDEWALK SPECIFICATIONS

All properties are required to have a concrete sidewalk, 5 feet in width, 1-foot in from the property line to any adjacent street.

All sidewalks shall be a minimum of 4-inches thick except through driveways where they shall be a minimum of 6 inches thick. The driveway approach shall also be a minimum of 6-inches thick.

Sidewalk grade height shall be set try the road curb height along the properties front line. The top of the back of the sidewalk, that side of the properties front line, shall be 8-inches higher than the top of the back of the curb on rolled curb roadway or 6 inches higher than the top of the back of the curb on standing curb roadways.

The sidewalk max slope is $\frac{1}{4}$ -inch per foot toward the street unless otherwise directed.

The sidewalk must pass through the driveway as shown in the graphic on the first page.

Control jointer shall be placed at 5-foot intervals.

- A. Joints shall be constructed to true line with their faces perpendicular to the surface of the sidewalk and shall not vary more than 1.4-inch for their designated position.
- B. All edges and joints must be rounded to $\frac{1}{2}$ -inch.

Expansion joints:

- A. Expansion joint filler shall extend the full depth of the joint with the top slightly below the finished sidewalk surface.
- B. $\frac{1}{2}$ -inch expansion joint must be used on both sides of walk through driveway.
- C. $\frac{1}{2}$ -inch expansion joint at all transitions between 4 inch and 6-inch sidewalk.
- D. $\frac{1}{2}$ -inch transverse expansion joints shall be placed at property lines and at intervals not exceeding 50 feet.
- E. Expansion joints must be placed when connecting to existing concrete.

Concrete mixture:

- A. Limestone aggregate
- B. Slump: 3 inches maximum
- C. Entrained air: 4 percent to 7 percent
- D. Strength: 3500 psi, at 28 days

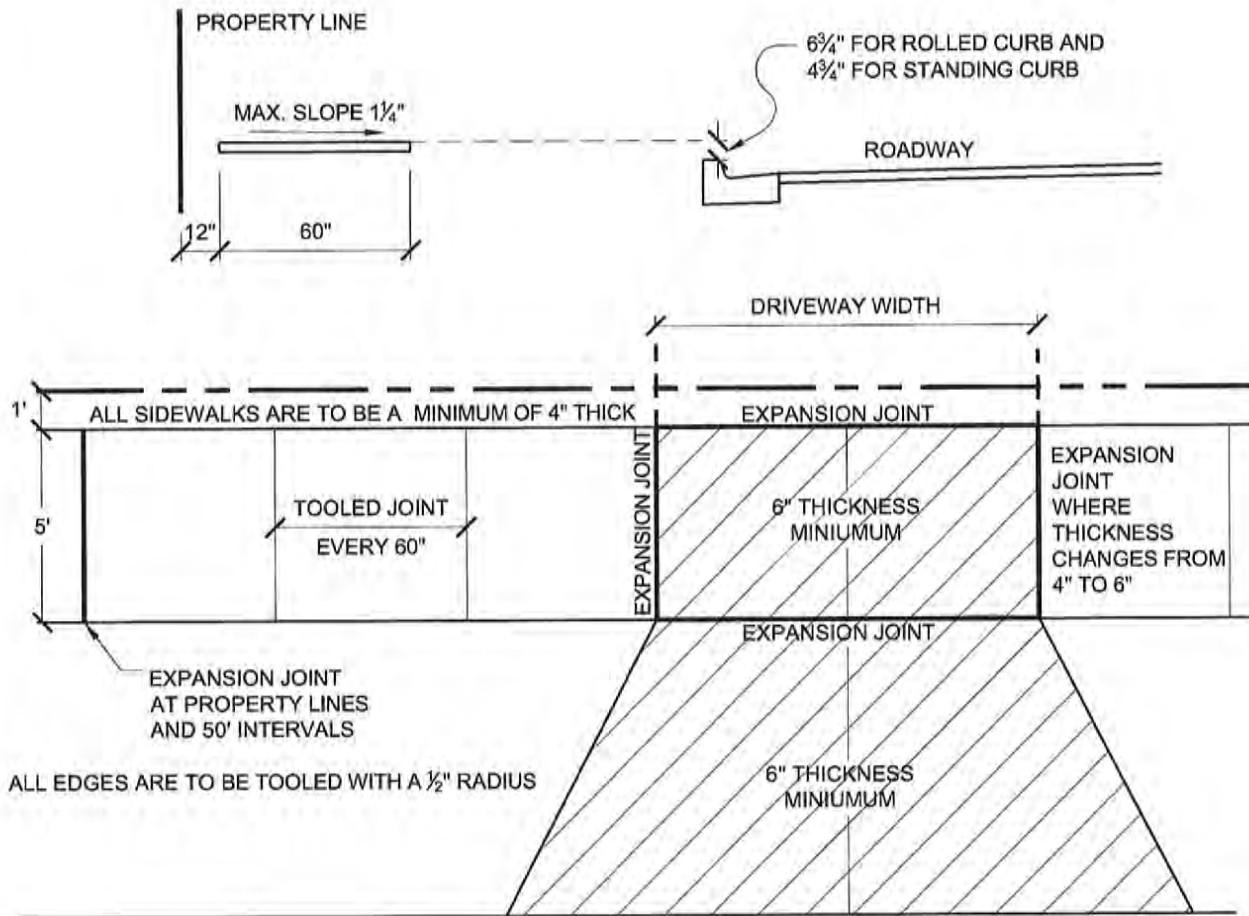
The subbase must be compacted to 95% maximum density.

All edges and joints must be rounded to ½-inch radius.

The surface shall be slightly broomed transversely.

Pouring of concrete shall not take place in temperatures of less than 40-degree Fahrenheit.

SIDEWALK SPECS



I am the building permit holder for _____

I have read the above sidewalk installation requirements and understand them and agree to install the sidewalk in accordance with them.

If I have any questions, prior to pouring the sidewalk, I understand I can call Mr. Larry Havemen, the Township's Maintenance Supervisor, at 616-895-6295 ext. 8 and get assistance.

Signed: _____ Date: _____

SECTION 02502
SHARED USE PATHS

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the work required for construction of a concrete or Hot Mix Asphalt (HMA) shared use path.
- B. Provide Shared Use Path is areas indicated on Township Master Plan.
- C. Definitions:
 - 1. Pavement Structure: All combinations of subbase, base course, and HMA or concrete surface course, including shoulders, placed on a subgrade. Pavement includes HMA or concrete surface.
 - 2. Subgrade: The portion of the earth grade upon which the pavement structure is placed.
 - 3. Subbase: The layer of specified material of designed thickness placed on the subgrade as a part of the pavement structure.
 - 4. Base Course: The layer or layers of specified material of designed thickness placed on a subbase or subgrade to support a surface course.
 - 5. Leveling Course: The layer of specified material of designed thickness placed on the base course in preparation for the surface course.
 - 6. Surface Course: The top layer of a pavement structure.
 - 7. Bond Coat: Asphalt emulsion used to enhance the adhesion between HMA courses.

1.02 REFERENCES:

- A. MDOT - Michigan Department of Transportation, "*Standard Specifications for Construction*", 2012 Edition.
- B. MDOT – Road Design Manual.
- C. AASHTO – 2012 Guide for the Development of Bicycle facilities
- D. ASTM - American Society of Testing Materials, latest edition.
- E. ADAAG – Americans with Disabilities Act Accessibility Guidelines.
- F. MTM – Michigan Test Methods, latest edition.

1.03 SUBMITTALS:

- A. Certification of quality by producer for the following:
 - 1. Cement
 - 2. Aggregates
 - 3. Asphalt cement
 - 4. Bond coat

- B. Test Specimens and samples: Deliver to the place of inspection and testing.
- C. Mix Design: Provide job-mix formula prepared by independent lab or approved by MDOT one week prior to placement.
- D. Submittal of as-built plans to the Township upon completion of project.

1.04 JOB CONDITIONS:

A. Weather and Seasonal Limitations:

1. Concrete shall not be placed between November 1 and April 1, unless authorized by the TOWNSHIP. Concrete shall not be placed when the air temperature in the shade is less than 40 degrees Fahrenheit and falling. Concrete shall not be placed if portions of the base, subbase, or subgrade are frozen, or if the grade exhibits poor stability from excessive moisture levels. Chemicals shall not be added to reduce the freezing point. Any deviation from the above, when authorized, will require protection from freezing until the concrete has attained a compressive strength of at least 1,000 psi (1,000 psi strength will typically be attained after 2 days of curing). Concrete damaged by frost action shall be removed and replaced.

2. HMA: Comply with MDOT 501.

- B. Clean-up promptly following pavement installation.
- C. Maintenance of Temporary Surfaces: Maintain temporary surfaces until permanent pavement installation is completed.
- D. Driveway Closing: 24-hour maximum, plus an additional 96 hours (4 days) for curing of concrete, if applicable. Provide proper notice to property owner. Maintain access to property with aggregate or bituminous millings as necessary until the driveway is restored.
- E. Protect areas under construction with lighted barricades and reflectorized fencing in accordance with applicable MDOT, MIOSHA and ASHA regulations.
- F. Number of Crosswalks: two-way intersections are required to have 2 crosswalks, three-way intersections to have 3 crosswalks, and four-way intersections to have 4 crosswalks.
- G. Provide hot mix asphalt verification of mix proportions, aggregate gradation, and temperatures upon request.
- H. Provide easement to TOWNSHIP from public road right-of-way to minimum 2 feet from back edge of path.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Subbase: Granular material MDOT Class II, MDOT 902.
- B. Aggregate Base: Aggregate 22A, MDOT 302 and 902.

- C. Hot Mix Asphalt (HMA): Mix LVSP, MDOT 501.
- D. Bond Coat: SS-1h, MDOT 501.
- E. Concrete: Limestone aggregate, 5½ sack minimum, 4% to 7% entrained air, five (5) gallons per sack maximum water/cement ratio, 3-inch slump maximum, 3,500 psi minimum compressive strength at 28 days.
- F. Concrete Curing Material: MDOT 903.
- G. Concrete Joint Filler: MDOT 914.03.
- H. Forms: Rigid in accordance with MDOT 803.03B, except at curved sections which shall utilize a bendable material to provide a uniform radius, supported at adequate intervals.
- I. Detectable Warning Surfaces:
 - 1. Cast ductile iron plate with anchor lugs.
 - 2. Slip resistant textured surface.
 - 3. Color and finish: Black asphalt dip.
 - 4. Provide width to match path width.
 - 5. Meet ADAAG.
 - 6. Manufacturer: East Jordan Iron Works or Neenah Foundry Company.

PART 3 - EXECUTION

3.01 EQUIPMENT:

- A. MDOT 806.

3.02 PREPARATION:

- A. Removal: Remove or saw cut at the existing joint or line marked by OWNER's ENGINEER in area of removal.
- B. Disposal of all removed material shall be performed by the CONTRACTOR. Keep all removed material off private property at all times.
- C. For concrete path crossing asphalt drives: Saw cut and remove existing asphalt at specified path location and width, and use the saw cut pavement edges as forms, unless a clean straight edge of adequate thickness is not feasible. If the existing drive is concrete within 3 feet of the path edge, remove existing asphalt and replace with concrete.
- D. Cut and protect tree roots as directed by the OWNER's ENGINEER and TOWNSHIP.
- E. Excavation: Form subgrade by trenching, excavating or filling to the required elevation. Prepare base in accordance with MDOT 806.
- F. Notify OWNER's ENGINEER and TOWNSHIP if unsuitable material exists below subgrade. Remove unsuitable material as directed by OWNER's ENGINEER and TOWNSHIP and replace with subbase to elevation required for bottom of aggregate base course or concrete. If depth of unsuitable material is greater than 2 feet, consult with OWNER'S ENGINEER and TOWNSHIP to obtain instructions on how to proceed.

- G. Compact subbase to 95% maximum density.
- H. Scheduling: Maximum time between removal and replacement, or between excavation and placement, shall be 7 days.

3.03 PERFORMANCE (HMA PATH): MDOT 806 and these specifications.

A. Shared Use Path and Ramp Requirements:

1. All shared use paths shall be 10 feet minimum width, with the cross slope of $\frac{1}{4}$ inch per foot from the back of path towards the street, unless otherwise directed.
 - a. Provide minimum 2-foot wide graded shoulders.
 - b. Provide minimum 2-foot horizontal and 8-foot vertical clearance of obstructions.
2. The elevation at the back of path shall be 6-inches above the road centerline, unless otherwise approved.
3. All HMA shared use paths shall be a minimum of 250 lbs/syd HMA over 6 inches of aggregate base over 10 inches of subbase.
4. Ramps shall have a uniform grade except as necessary for short grade changes and shall be in conformance with ADAAG and these specifications. Detectable warning surfaces shall be provided.
5. Ramps shall be 8-inch thick concrete with WW mesh reinforcement.
6. The space behind the curb and between ramps at intersection corners shall be concrete (8-inch thick with WW mesh reinforcement), brick pavers (concrete brick over sand bedding over 6-inch thick concrete with WW reinforcement) or pre-approved landscaping.
7. Detectable warning surfaces:
 - a. Provide for tactile and visual warning that contrast visually with adjacent walking surfaces, either light-on-dark or dark-on-light.
 - b. Provide cast ductile iron detectable warning plates embedded into newly cast concrete. Provide same width as path, minimum. Install in accordance with manufacturer's recommendations, ADAAG and these specifications. Surface applied products will not be allowed. Do not construct detectable warnings by forming or stamping in newly cast concrete.
 - c. Provide detectable warning plates on all ramps for path crossings of public roads, private roads that are stop sign controlled, and commercial driveways that are stop sign controlled or experience high traffic volumes that would warrant a safe path crossing of the drive. Ottawa County Road Commission requirements for providing detectable warning surfaces on ramps on public roads and at commercial drives shall be met.

B. Subbase:

1. Thickness: Conform to design cross section.
2. Construction method:
 - a. Place in equal layers not exceeding 15-inches loose measure.
 - b. Spread evenly and compact to not less than ninety-five percent (95%) maximum density according to Michigan Sand Cone Test.
3. Tolerance: Construct subbase to plan grade within a tolerance of ± 0.5 inch.

C. Aggregate Base:

1. Thickness: Conform to design cross section.
2. Construction Method: MDOT 302.03.
3. Tolerance: Shape the aggregate base course plan grade and cross section within a tolerance of 0.25 inch.

D. Bond Coat:

1. Construction Method: MDOT 501.03.D.
2. Application Rate: Provide 0.15 gallon per square yard.

I. Hot Mix Asphalt Leveling and Surface:

1. Cutting: Saw vertically in straight lines parallel or perpendicular to pavement centerline.
2. Thickness: Do not place hot mixed asphalt surface course mixture in lifts exceeding 2 inches unless otherwise approved. Provide design thickness.
3. Construction Methods:
 - a. Paving: Conform method of paving to MDOT 501.03.
 - b. Prior to placement of hot mixed asphalt surface, verify crowns and grades of path for positive drainage. Any deficiencies in grade or crown shall be corrected prior to placement of surface course.

J. Hot Mix Asphalt (HMA) Patching:

1. Preparation: Saw cut vertically in straight lines parallel or perpendicular to pavement centerlines. Minimum dimension of area to be patched shall be 2 feet for placement and compaction of materials.
2. Aggregate Base: Provide a minimum of 6 inches of Aggregate 22A compacted in place.
3. HMA Mixture: MDOT Mix LVSP.
 - a. Thickness: Match existing pavement thickness (minimum 2 inches).

3.04 PERFORMANCE (CONCRETE PATH): MDOT 806 (except for joint spacing) and these specifications.

A. Shared Use Path and Ramp Requirements:

1. All shared use paths shall be 10 feet minimum width, with the cross slope of $\frac{1}{4}$ inch per foot from the back of path towards the street, unless otherwise directed.
 - a. Provide minimum 2-foot wide graded shoulders.
 - b. Provide minimum 2 foot horizontal and 8-foot vertical clearance of obstructions.
 - c. Slope beyond the edge of path shoulder shall not exceed a 1:4 slope (1 vertical foot, 4 horizontal feet).
2. The elevation at the back of path shall be 6 inches above the road centerline, unless otherwise approved.
3. All concrete shared use paths shall be a minimum of 5-inch thick over 10 inches of subbase. The concrete path thickness shall be 6 inches across all residential drives and 8 inches across all commercial/industrial drives.
4. Ramps shall have a uniform grade except as necessary for short grade changes and shall be in conformance with ADAAG and these specifications. Detectable warning surfaces shall be provided.
5. Ramps shall be 8-inch thick concrete with WW mesh reinforcement.
6. The space behind the curb and between ramps at intersection corners shall be concrete (8-inch thick with WW mesh reinforcement), brick pavers (concrete brick over sand bedding over 6-inch thick concrete with WW reinforcement) or pre-approved landscaping.
7. Detectable warning surfaces:
 - a. Provide for tactile and visual warning that contrast visually with adjacent walking surfaces, either light-on-dark or dark-on-light.
 - b. Provide cast ductile iron detectable warning plates embedded into newly cast concrete. Provide same width as path, minimum. Install in accordance with manufacturer's recommendations, ADAAG and these specifications. Surface

applied products will not be allowed. Do not construct detectable warnings by forming or stamping in newly cast concrete.

- c. Provide detectable warning plates on all ramps for path crossings of public roads, private roads that are stop sign controlled, and commercial driveways that are stop sign controlled or experience high traffic volumes that would warrant a safe path crossing of the drive. Ottawa County Road Commission requirements for providing detectable warning surfaces on ramps on public roads and at commercial drives shall be met.

B. Concrete Mixing and Delivery: Transit mix concrete conforming to MDOT 601.03E.

C. Placing and Finishing Concrete:

1. Place concrete on a moist base in one (1) lift to the specified thickness. The concrete shall be thoroughly spaded along the faces of the forms before finishing operations are started. The concrete shall be struck off to the required grade and cross section.
2. The surface shall be slightly broomed transversely to roughen the surface after the concrete has received a float finish. Ramps shall be textured with a coarse broom transversely to the ramp slope.
3. All edges and joints shall be rounded to ½-inch radius.

D. Curing and Protection:

1. Concrete shall be cured and protected as specified under MDOT 602.03M and 602.03T except that pedestrian traffic may be allowed after 48 hours.

E. Joints:

1. Joints shall be constructed to true line with their face's perpendicular to the surface of the path and shall not vary more than ¼ inch from their designated position. Transverse joints shall be constructed at right angles to centerline of the path and longitudinal joints shall be constructed parallel to the centerline unless otherwise required.
2. The concrete at the faces of all joints shall be thoroughly spaded or vibrated and compacted to fill all voids and the surface shall be finished smooth and substantially true to grade.
3. One-half (½) inch transverse expansion joints shall be placed in line with all expansion joints in abutting curb, gutter or combination curb and gutter. When the path is not adjacent to such pavement, ½ inch transverse expansion joints shall be placed at intervals not exceeding 100 feet and at all transitions between 4-inch and 6-inch thick path. Expansion joint filler shall extend the full depth of the joint with the top slightly below the finished path surface. The filler shall be supported temporarily until concrete is poured against it.
4. One-half (½) inch longitudinal expansion joints shall be placed between the path and the back of abutting parallel curb or gutter, between the path and buildings, or other rigid structures.
5. Contraction joints shall be placed at 10-foot intervals. They shall divide sidewalk into areas not more than 100 square feet nor less than 30 square feet. Contraction joints will be produced by slab division forms extending to the full depth of concrete or by cutting joints in the concrete after floating to a depth of not less than ¼ the thickness of the concrete. The cut joints shall not be less than 1/8-inch or more than ¼ inch in width and shall be finished smooth and substantially true to line.

F. Backfilling:

1. After concrete has gained sufficient strength (70% of design), all rails, forms, stakes and supports shall be removed in a manner as not to injure finished concrete and all

exposed edges of the concrete shall be backfilled, compacted and leveled immediately.

G. HMA Patching: See Paragraph 3.03 above.

H. Concrete curb and gutter: TOWNSHIP's, Ottawa County Road Commission's or MDOT's Standard.

1. Match existing curb and gutter.
2. Construction methods: MDOT 802.03.

3.05 TESTING AND INSPECTION (HMA PATH): MDOT 501 and these specifications.

A. Observation: By TOWNSHIP, TOWNSHIP's ENGINEER or designated representative.

B. Aggregates:

1. Sampling and Analysis: Michigan Testing Methods, Series 100.
2. Exception: Provide certification of approved stockpiled material.

C. Hot Mix Asphalt Pavement Density:

1. Density acceptance of HMA mixtures will be measured with a nuclear density gauge using the Gmm from the approved Job-Mix Formula for the density control target.
2. The Contractor is responsible for determining Quality Control Density and establishing a rolling pattern that will achieve the required in place density.

D. Hot Mix Asphalt Mix Composition:

1. Sampling:
 - a. Acceptance sampling shall include a minimum of two samples per mix type for each day of production with no less than three samples for each mix type per project.
 - b. Method of sampling shall be determined by the ENGINEER.
2. Extraction: ASTM D2172
3. Sieve Analysis: ASTM C117 and ASTM C136

3.06 TESTING AND INSPECTION (CONCRETE PATH):

A. Observation: By TOWNSHIP, TOWNSHIP's ENGINEER or designated representative.

1. Inspection of forms is required prior to pouring concrete.

B. Acceptance Testing:

1. Cement: Certification of quality by producer.
2. Concrete:
 - a. Sample: ASTM C172
 - b. Frequency: Once for each 50 cubic yards of each class of concrete placed.
 - c. Perform following from sample:
 - (1) Mold three 6-inch cylinder compressive strength specimens: ASTM: C31
 - (2) Slump test: ASTM C143
 - (3) Air test: ASTM C231
 - (4) Yield test: ASTM C138
 - (5) Strength test: ASTM C139
3. If initial testing indicates failure or nonconformance to specifications, additional testing shall be paid for by the CONTRACTOR. Replace nonconforming material.

C. Aggregates: Provide certification of approved stockpiled material.

D. Concrete:

1. Limestone aggregate.
2. Slump: 3-inches maximum.
3. Entrained Air: 4 percent to 7 percent.
4. Strength: 3500 psi, at 28 days.

3.07 TREE ROOT CUTTING:

A. The following information shall be used as a guide when trimming tree roots:

1. Excavate as shallow as possible in the area adjacent to the tree root.
2. Make clean cuts with a saw or sharp chisel. Do not bury jagged or torn roots.
3. Do not allow the exposed root ends to dry out. If exposed for more than a day, they can dry out. Cover all exposed roots with soil at the end of the day.
4. Avoid cutting roots larger than 3.5 inches.

3.08 TREE ROOT BARRIER:

A. Install tree root barrier along the path adjacent to trees to reduce future damage by tree roots in areas determined by the TOWNSHIP or TOWNSHIP ENGINEER. Installation shall be in accordance with manufacturer's recommendations.

B. Install in 4-inch wide trench (with roots removed) adjacent to the path between the path and tree to a minimum depth of 30 inches. Secure with pins. Backfill carefully to avoid dislodging the barrier, and compact firmly.

C. Manufacturer: Typar Biobarrier or approved equal.

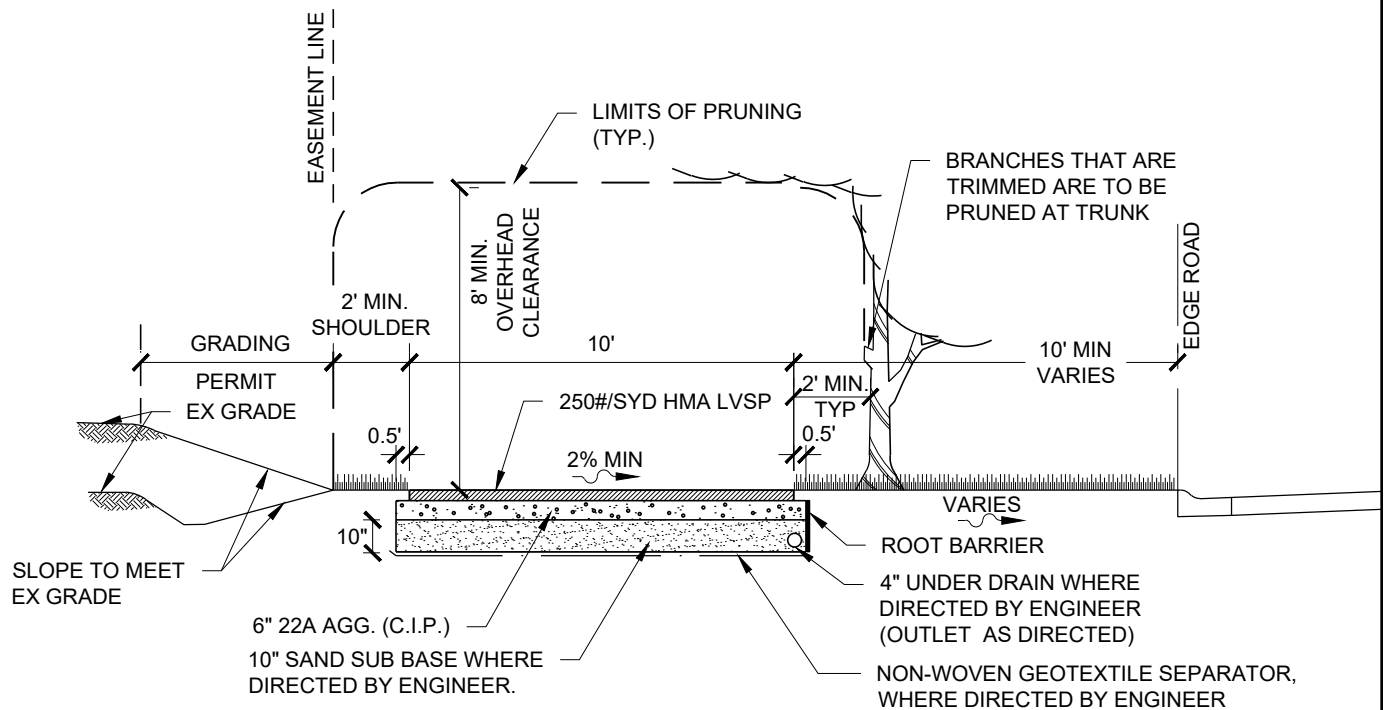
3.09 SCHEDULES:

A. MDOT Standard Plan R-28-J SIDEWALK RAMP AND DETECTABLE WARNING DETAILS (7 sheets).

B. Typical Cross-Section for HMA Shared Use Path.

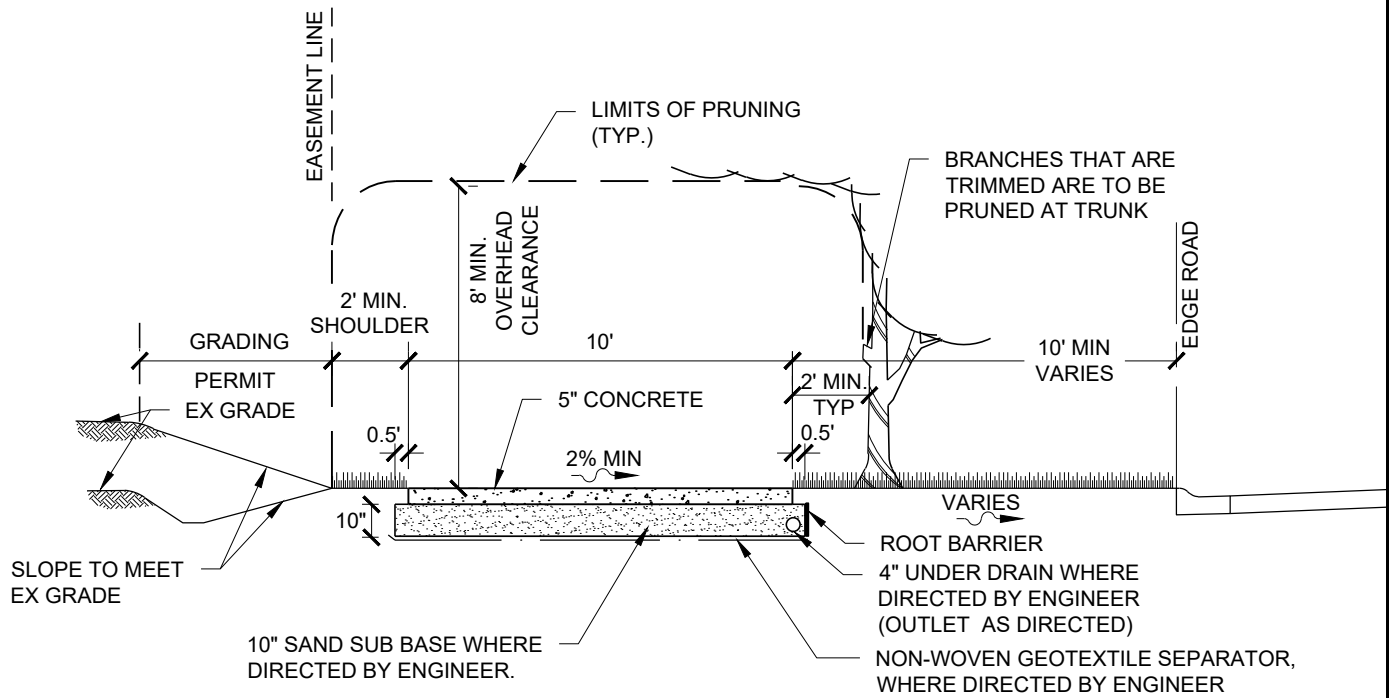
C. Typical Cross-Section for Concrete Shared Use Path.

END OF SECTION



TYPICAL CROSS-SECTION HMA SHARED USE PATH

SCALE: NOT TO SCALE



TYPICAL CROSS-SECTION CONCRETE SHARED USE PATH

SCALE: NOT TO SCALE

SECTION 02660

WATER MAINS

***Existing valve operation shall be by TOWNSHIP employees or TOWNSHIP representative only. Valves improperly operated by Contractor resulting in resident notifications, additional flushing or chlorination, shall have costs back charged to Contractor. Improper operation of Township valves may result in a monetary fine. ***

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the work required for water mains, structures and appurtenant work.

1.02 REFERENCES:

- A. AWWA - American Waterworks Association, latest edition.
- B. ANSI - American National Standards Institute, latest edition.
- C. ASTM - American Society Testing Materials, latest edition.
- D. Recommended Standards for Water Works – Ten State Standards, latest edition.

1.03 SUBMITTALS:

- A. Submit the following for review by TOWNSHIP or TOWNSHIP'S ENGINEER:
 - 1. Product Data on Valves, Hydrant and service fittings.
 - 2. Details for each connection to existing water main.
 - 3. Proposed equipment and method for flushing, pressure testing, leakage testing and chlorination.
 - 4. Submittals must be approved by ACT Department of Public Utilities prior to construction.
- B. Report witness measurements on valves, fittings, deflections and curb boxes.
 - 1. Provide measurements from two permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.
- C. Provide certifications on pipe and fittings indicating conformance to specifications prior to installation.
- D. Submittal of drawings of record plans to:
 - 1. Provide the Public Utility Department with two (2) printed sets (24x36) and one (1) electronic file (PDF)
 - 2. Provide the Township Engineer (2) two electronic file with as-constructed dimensions and witnesses(PDF and DWG).
 - 3. Provide Township Utilities Superintendent (1) one electronic file

1.04 JOB CONDITIONS:

- A. Interrupting Water Service:
 - 1. Scheduling: Obtain TOWNSHIP's approval prior to interruption of service.

2. Provide notice of twenty-four (24) hours to affected occupants and twenty-four (24) hours to Fire Department of time and duration.
 3. Provide stand-by service as required; outage not to exceed four (4) hours.
 4. Existing valve operation shall be by TOWNSHIP employees or TOWNSHIP representative only. Valves improperly operated by Contractor resulting in resident notifications, additional flushing or chlorination, shall have costs back charged to Contractor
 5. Prevent contamination of existing water mains.
- B. Install service lines after pressure and bacteriological testing is accepted.
 - C. Clean up promptly following pipe installation within maximum of 600 feet behind pipe laying operation. Clean up shall include backfill and rough grading.
 - D. Installation not allowed when air temperature is 25 degrees F or colder, or when determined too cold by Allendale Township field inspector.
 - E. Salvage all existing valve boxes, curb boxes and hydrants removed and deliver to the TOWNSHIP's yard. Hydrants shall be removed carefully without causing damage to the hydrant and fittings.
 - F. The Township Inspector or Township Engineer shall be provided notice and allowed three (3) work days to perform major inspections for water mains. Major inspections include the following;
 1. Substantial Completion
 - a. Initial inspection and follow-up inspection will be at no charge. Any subsequent inspections will be charged to the developer.
 2. Completion
 - a. Initial inspection and follow-up inspection will be at no charge. Any subsequent inspections will be charged to the developer.
 3. Fire Protection System Inspection

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Cement Lining: ANSI A21.4 standard thickness for ductile iron pipe and fittings.
- B. Hydrant Leads: Ductile iron pipe with mechanical joints.
 1. Hydrant leads longer than 10 feet or tapped hydrant leads shall be minimum 8-inch diameter.

2.02 PIPE:

- A. Ductile Iron: ANSI A21.50 and ANSI A21.51; Class 52.
- B. High density polyethylene (HDPE) pipe: HDPE pipe shall be made from a high density, extra high molecular weight material designated as PE3408 with an SDR of 11 or less with working pressure of at least 160 psi. ASTM D3350-83 cell class 345434C. The pipe shall meet current AWWA C906 (4-63 inches). Materials must be listed and approved for

use with potable water under ANSI/NSF Standards. Use of HDPE pipe is not permitted unless specified by the TOWNSHIP.

C. Service Tubing:

1. Copper: ASTM B88, Type K annealed and soft temper.
2. Water services shall be 1-inch diameter for residential uses (i.e. single-family dwellings) and 1 ½ inch diameter or larger for commercial, industrial or multi-family uses. All runs under 100-feet shall be free of couplings.

2.03 JOINTS:

A. Ductile Iron Pipe and Fittings:

1. Mechanical: ANSI A21.11. (i.e. – Iron Megalugs)
2. Push-on ANSI A21.11.
3. Glands: ANSI A21.11 – (i.e. – Iron Megalugs)
4. Rubber-Gasket: ANSI 21.11
5. Electrical Continuity: Provide bronze wedges (3 per joint) or thermite welded sockets and cables.

B. HDPE

1. Sections of polyethylene pipe shall be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment and an interfacial fusion pressure of 75 psi. The butt fusion jointing will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All welds will be made using a Data Logger to record temperature, fusion pressure, with graphic representation of the fusion cycle. This log shall be part of the Quality Control records.
2. Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.
3. Mechanical joining will be used where the butt fusion method cannot be used. Mechanical jointing will be accomplished by either using a HDPE flange adapter with Ductile Iron back-up ring or HDPE Mechanical Joint adapter with Ductile Iron back-up ring.
4. Socket fusion, hot gas fusion threading, solvents and epoxies will not be used to join HDPE pipe.

C. Service Tubing and Fittings:

1. Copper: Match TOWNSHIP's standard. Provide electrically conductive fittings.
2. Provide compression joints.

2.04 FITTINGS:

- A. Ductile Iron: ANSI A21.10, or ANSI A21.53, Class 54, 250 psi working pressure through 12 inches and 150 psi above. Mechanical joint solid sleeves, Clow Corporation #F1012 or equal.

B. HDPE

1. Butt Fusion Fittings – Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99 and approved for AWWA use. Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261. Molded and fabricated fittings shall have a pressure rating equal to the pipe unless otherwise specified in the plans. Fabricated fittings are to be manufactured using Data Loggers, Temperature, fusion pressure and a graphic representation of the fusion cycle shall be part of the quality control records. All fittings shall be suitable for use as pressure conduits and per AWWA C906.
2. Electrofusion Fittings – Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans. All electrofusion fittings shall be suitable for use as pressure conduits per AWWA C906.
3. Flanged and Mechanical Joint Adapters – Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99. Flanged and Mechanical Joint Adapters shall have a manufacturing standard of ASTM D3261. Fittings shall have a pressure rating equal to the pipe unless otherwise specified on the plans.

2.05 VALVES (OPEN RIGHT):

- A. Gate: AWWA C515 Resilient seated, epoxy coated surfaces, rubber encapsulated gate, bronze non-rising stem with double o-ring seal. Provide full diameter unobstructed flow. End connections shall match pipe.
 1. Manufacturer(s): East Jordan, American Flow Control, US Pipe Metroseal 250 or American Darling.
- B. Butterfly: AWWA C504, Class 150-B, cast iron short body, cast iron disc, mechanical joint, worm gear traveling nut operator for direct burial.
- C. Boxes: Three (3) section cast iron with lid marked WATER: All sections must have threaded ends for screw on connection.
 1. Upper section: Screw on adjoining center section and full diameter throughout. Place geotextile fabric around threaded joint of risers, if used.
 2. Center section: Minimum 5 inch inside diameter.
 3. Base section: Fit over valve bonnet and shaped round for valves through 10 inch and oval for 12-inch and over. Place geotextile fabric around valve bonnet.

2.06 HYDRANTS (OPEN RIGHT):

- A. Provide City of Grand Rapids standard to match TOWNSHIP's existing hydrants.
 1. Compression Type Fire Hydrants - Compression type fire hydrants shall be in strict conformity with the ANSI/AWWA C502 and the following specifications:
 - a. Compression type fire hydrants shall be 5BR-250 by East Jordan.
 - b. The hydrant shall be painted with a zinc chromate primer and finish coat of Rust Oleum #944 chrome yellow above grade after installation and after turning / height adjustment and with two coats of asphalt varnish below grade. Painting shall be in strict accordance with ANSI / AWWA C502.
 - c. Barrel and stem extensions shall be made at or above the ground line and without digging.
 - d. The hydrant shall be supplied with a tapped drain. The drain shall be plugged, if below water table.
 - e. When the drain is to be utilized, the drain shall be backfilled with drain field stone and wrapped with soil separating fabric.

- B. Barrel length shall be properly sized, so the centerline of the pumper nozzle is 21" to 27" above grade at a minimum 5' depth of cover over the pipe.
- C. Provide Hydrant Flag: 3/8-inch Ultimate Hydrant Marker, 48", ej#99840079
- D. Hydrant Extension: 36-inch maximum, limited to 1 per hydrant.
 - 1. Install breakaway coupling in new extension.
- E. A clear space of not less than ten feet (10') shall be provided in front of and around all fire hydrants. A clear space is required to be free of all obstructions such as parked cars, landscaping, utilities, service vehicles, construction work, snow and all other blockages.

2.07 SERVICE FITTINGS:

- A. Corporation Stops:
 - 1. Copper tubing: Inlet AWWA CC thread; outlet electrical conductivity fitting, Ford B 44-G series or A.Y. McDonald 74701-22 Series.
- B. Curb Stops: Inlet electrical conductivity fitting, Ford F1000-G series or A.Y. McDonald 76100-22 Series.
- C. Curb Stop Boxes: M&E Manufacturing, or approved equal, adjustable 50 inches to 68 inches with stationary rod to within 1 foot of surface grade. Provide 1 1/4-inch top, and arch and pattern base. Embed stationary rod into the cotter pin saddle. **NOTE – The stationary rod must be East Jordan.**

2.08 MISCELLANEOUS:

- A. Service Clamps: Cast, or ductile iron strap, brass or bronze with stainless steel parts, AWWA C800 threads. Four corner fasteners
- B. Plastic Seamless Encasement Tubing: Required in areas of corrosive soils.
 - 1. Material: ASTM D-1248 Polyethylene, Type I, Class C, 8 mils thick. AWWA C105.
 - 2. Closing Tape: 2-inch wide Poly Ken #900 Or Scotchwrap #50.
- C. Mechanical Joint Restraint: Megalug Joint Restraints meeting Paragraphs 2.01, 2.02, 2.03 and 2.04 requirements.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Alignment and Grade:
 - 1. Deviations: Notify OWNER's ENGINEER and obtain instructions to proceed where there is a grade discrepancy, or an obstruction not shown on plans.
 - a. Verify location and depth of existing utilities in advance of construction and provide adjustments in alignment and grade of water main.
 - 2. Depth of pipe: Minimum cover over pipe below finished grade shall be 5 feet.
 - 3. When the minimum clearance (18-inches) and cover (5-feet) can be obtained, the watermain is to be located above the sanitary sewer. Otherwise, any sanitary sewer joints within 10-feet of watermain shall be encased in concrete (Ref Section 02220, Paragraph 2.01.A.3)

- B. Bedding:
 - 1. Method: See Article 3.06 SCHEDULES.
 - 2. Provide bedding area backfill in accordance with MDOT Standard Plan R-83C.
 - 3. Provide continuous bearing supporting entire length of pipe barrel evenly.
- C. Cleaning Pipe and Fittings:
 - 1. General: Provide interior free of foreign material and joint surfaces free of lumps and blisters.

3.02 INSTALLATION:

- A. General: Meet requirements of AWWA C600 and these specifications.
- B. Laying Pipe:
 - 1. Prevent entrance of foreign material and plug watertight when left unattended.
 - 2. Provide pipe length and bedding as a unit in a frost free, dry trench.
 - 3. Special supports and saddles: See Article 3.06 SCHEDULES.
 - 4. Provide minimum vertical and horizontal separation between parallel water main and sanitary sewer or force main of 18 inches and 10 feet, respectively, unless otherwise approved.
 - 5. TOWNSHIP's approval required for pipe lengths less than 6 feet.
 - 6. Joint deflection shall not exceed the following values or as recommended by pipe manufacturer.

Maximum Joint Deflection

Nominal Pipe Size (inches)	Push-On Joint		Mechanical Joint	
	Deflection Angle (Deg-Min)	Maximum Offset (inches)*	Deflection Angle (Deg-Min)	Maximum Offset (inches)*
8	3° - 30'	14	4° - 00'	15
12	3° - 30'	14	4° - 00'	15
16	2° - 15'	8 ¼	2° - 40'	10
24	2° - 15'	8 ¼	1° - 45'	7

*Offsets are based upon 18-foot lengths of pipe

- C. Cutting Pipe:
 - 1. Ductile iron: Power saw.
- D. Jointing:
 - 1. Mechanical:
 - a. Lubricate as recommended by manufacturer.
 - b. Tighten bolts evenly per manufacturing recommendations.
 - 2. Push-on:
 - a. Lubricate as recommended by manufacturer.
- E. Setting Valves, Fittings and Fire Hydrants:
 - 1. General: See Article 3.06 SCHEDULES.
 - 2. Valves: Set plumb.
 - 3. Valve boxes:

- a. Base section: Center and plumb over operating nut and 2 inches above bonnet.
 - b. Upper section: Set cover ¼-inch below finished grade.
 - c. Witnesses: Provide 2 measurements to permanent surface features. Provide GPS measurement – coordinates.
4. Hydrants:
- a. Connection: With ductile iron pipe and auxiliary valve.
 - b. Positioning: Plumb with pumper nozzle facing curb or street and nozzle centerline 21 to 27 inches above finished grade. Finished grade shall be as dictated by street construction or as directed by Township.
 - c. Provide necessary length of 6-inch pipe for hydrant leads.
 - d. Locate at 8 feet from right-of-way line within road right-of-way, unless otherwise directed by TOWNSHIP or TOWNSHIP ENGINEER.
 - e. Provide access to all hydrants by providing Hydrant Berm, if needed.
5. Provide joint restraint using Megalug retainer glands (Paragraph 2.03.A.3) in accordance with the pipe restraint table referenced in Paragraph 3.02.H.1 and Schedule 3.06. A.4. Locking rubber gaskets will not be allowed.
- F. Connections:
1. Existing water mains:
- a. Provide temporary support during cut-in.
 - b. Disinfect by swabbing pipe, valves and fittings with four percent (4%) chlorine solution.
 - c. Pressure off: Install mechanical joint solid sleeve.
 - d. Pressure on: Install tapping sleeve, valve and box.
2. Service lines:
- a. Watermain must be situated along the lot's road frontage for service to be provided. All service lines must be located in 10' utility easement (if available) or within road right of way. Easements will not be allowed to obtain service to a residence.
 - b. Align at right angles to street or easement line. Maintain minimum 5 feet separation from sewer laterals. Locate 10 feet from left property line (facing lot) unless otherwise directed by TOWNSHIP or TOWNSHIP ENGINEER.
 - c. Minimum depth shall be same as pipe. Minimum size shall be 1-inch in diameter for residential uses and 1 ½-inch or larger for all other usage (multi-family and commercial) based on REU's.
 - d. **Install after acceptable pressure test, chlorination of water main and acceptable bacteriological testing. 24 hour notice shall be given to the Public Utilities Inspector when installation of water services will occur for Drip Testing.**
 - e. Curb stop boxes: Set plumb and provide 2 measurements to surface features with GPS coordinates.
 - (1) Locate at easement line within easement or at road right-of-way line within road right-of-way, unless otherwise directed by TOWNSHIP.
 - (2) Cover with 4' long section of 4-1/2" I.D. PVC pipe buried 1'.
 - (3) Set cover ¼-inch below finished grade.
 - f. Tapping shall be at 45° above center and shall provide horizontal loop at corporation stop.
 - g. Maximum tap sizes shall be as follows:

<u>Type of Pipe</u>	<u>Pipe Size</u>								
	6"	8"	10"	12"	14"	16"	18"	20"	24"
	<u>Maximum Direct Tap Size</u>								
Ductile:	1"	1½"	2"	2"	2"	2"	2"	2"	2"

G. Dead-end water main stubs longer than 20 feet:

1. Install standpipe with shutoff at dead-ends to aid in chlorinating, testing and flushing. Remove standpipe upon approval of water main.

H. Pipe Joint Restraint:

1. Provide mechanical joint restraint for the minimum lengths shown in joint restraint detail (i.e. Schedule 3.06.A.4).

* The length of restrained pipe required shown in joint restraint detail is based on trench backfill being compacted to 95% of the maximum density according to the Modified Proctor Method. The joint restraint detail does not consider polyethylene wrapped pipe. If the pipe is wrapped with polyethylene, a greater length of restrained pipe will be required. Unless otherwise specified, a multiplier of 1.5 shall be used to determine the required length when the pipe is wrapped with polyethylene.

** If straight run of pipe on small side of reducer exceeds this value, then no restrained joints are necessary.

- a. Tees: Pipe restraint length shown in the joint restraint detail shall be provided in the branch direction. Also, the minimum length of pipe restraint in the straight through (run) direction shall be 10 feet on both sides of the tee.
- b. Bends: Pipe restraint length shown in the joint restraint detail shall be provided on both sides of the bend.
- c. Dead End: Pipe restraint length shown in the joint restraint detail shall be provided back from the dead-end plug.
- d. All joints shall be restrained for pipe within casings.
- e. All joints between bends on water main offsets shall be restrained.
- f. See Joint Restraint Requirements detail for restrained joint pipe details.

I. Reaction Backing (Only allowed when approved by the Township ENGINEER):

J. Polyethylene Encasement:

1. In corrosive soils: install over ductile iron pipe and tape seams in accordance with AWWA C105.

K. Water Meters:

1. General: Water service line must have twelve (12) inches of clearance above finished floor and twelve (12) inches away from any adjacent wall, partition or foundation. If not provided, Contractor is responsible to rectify.

3.03 FIELD QUALITY CONTROL:

A. Testing and Inspection:

1. General:
 - a. **Observation:** By TOWNSHIP or TOWNSHIP's ENGINEER – measurements by contractor.

- b. Notification: Pretest and arrange for observation of test – 24 hours required for observation – 48 hours required for testing.
 - c. Notification: The Township Inspector or Township Engineer shall be provided notice and allowed three (3) work days to perform major inspections for water main.
 - d. Equipment and assistance: Contractor is responsible for providing equipment and conducting tests.
 - e. Required water: By TOWNSHIP where available from municipal system.
(1) Provide backflow prevention device on connection to existing water system.
 - f. Opening of valve to existing water main: After passing pressure / leakage and chlorination tests.
 - g. Meet requirements of AWWA C600 and these specifications. Meet requirements of AWWA C600 for ductile iron pipe, AWWA M55 for HDPE pipe, and these specifications.
2. Electrical continuity: Test ductile iron pipe for continuity and repair breaks.
3. Pressure/Leakage Test:
- a. **Observation:** By TOWNSHIP DPU or TOWNSHIP's ENGINEER – Contractor is responsible for conducting the test.
 - b. Notification: The Township Inspector or Township Engineer shall be provided notice and allowed three (3) work days to perform major inspections for water main.
 - h. Equipment and assistance: Contractor is responsible for providing equipment and conducting tests.
 - c. Conditions: Air or air-water methods of applying pressure prohibited.
 - d. Sequence: After flushing, prior to Chlorination.
 - e. Procedure: Fill system slowly, expel air through corporation stop at high points and apply pressure.
 - f. Pressure: Maintain water pressure of 150 psi.
 - g. Duration: Two (2) hours.
 - h. Make-up water: From measurable source.
 - i. Leakage: Quantity of water supplied to maintain test pressure.
 - h. Allowable: Less than:
- $$L = \frac{SD \times \text{square root of } P}{148,000}$$
- where,
- L = leakage (gallons per hour).
 - S = length of pipe (feet).
 - D = nominal pipe diameter (inches).
 - P = average test pressure (pounds per square inch gauge).
- i. Correction: Repair defects and repeat test until acceptable.
 - j. Maximum length of pipe to be tested shall be 2000 feet.
 - k. Testing is in accordance with ASTM F2164.
4. Dead-end water main stubs longer than 20 feet:
- a. Install standpipe with shutoff at dead-ends to aid in chlorinating, testing and flushing. Remove standpipe upon approval of water main.
5. Testing valves only: Maintain pressure on main and check all valves as follows:
- a. Need to maintain an air pressure of 120 psi for 5 minutes on tapping valve.
 - b. Need to maintain a water pressure of 150 psi.
 - c. Correction: Repair defects and repeat test until acceptable.

3.04 FLUSHING:

- A. Flushing: Shall be performed in accordance with ANSI/AWWA C651-14

1. Observation: By TOWNSHIP or TOWNSHIP's ENGINEER.
2. Sequence: Prior to pressure testing and chlorination.
3. Maximum intervals: 2,000 feet.
4. Required water: By TOWNSHIP where and when available from municipal system. Maintain 20 psi residual pressure in existing water system.
5. Minimum velocity: 3.0 feet per second at pipe wall. See table below for size and number of Taps required to achieve minimum velocity:

Required flow and openings to flush pipelines (with 40 psi residual pressure in water main)

Pipe Diameter <i>inches</i>	Flow Required to Produce 3.0 ft/s Velocity in Main <i>gpm</i>	Number of 2 ½-in. Hydrant Outlets	Number of 4 ½" Hydrant Outlets
4	120	1	1
6	260	1	1
8	470	1	1
10	730	1	1
12	1060	2	1
16	1880	2	1

- The internal scouring velocity must be a minimum of 3.0 feet per second throughout the entire length of water main being flushed. This velocity of water, flowing through an eight-inch pipe will yield 470 gallons per minute.
- During the procedure, the residual water pressure must not be less than 20 pounds per square inch.
- No more than 2,000 lineal feet of water main can be flushed at any one time.
- Discharged water shall be directed into the nearest storm drain system.
- Flushing must be observed by Township DPU staff or by the Township Engineer/Inspector.
- Discharge hoses shall not be used.

3.05 DISINFECTION:

A. Chlorination:

1. Meet the requirements of ANSI/AWWA C651-92 (AWWA Standard for Disinfecting Water mains), continuous-feed method.
2. Observation: By TOWNSHIP or TOWNSHIP's ENGINEER.
3. Required water: By TOWNSHIP where available from municipal system.
4. Equipment and Assistance: Contractor is responsible for providing equipment and conducting disinfection.
5. Chlorine gas: Not permitted on job-site.
6. Sequence: Following pressure tests and flushing and prior to connection to existing water main.
7. Retention time: Twenty-four (24) hours.
8. Procedure: Inject chlorine solution at constant rate to produce residual-free chlorine concentration of not less than 25 mg/l or more than 100 mg/l in all portions of the main at the end of the 24-hour retention period. Operate valves and clear line of residual chlorine after retention period.
9. Sampling: By TOWNSHIP, a minimum of two (2) samples shall be taken fifteen (15) minutes apart.
10. Correction: Re-chlorinate sections not meeting MDEQ bacteriological requirements.
 - a. Retesting shall be paid by CONTRACTOR.

11. Disposing of heavily chlorinated water directly to open drains: Discharge water through de-chlorinated tablets in mesh sack.

3.06 HYDROSTATIC TESTING OF HDPE:

- A. The pipe shall be hydrostatically tested before being connected to other piping systems in accordance to ASTM F2164. The pipe shall be tested independently of other hydrostatic tests.
- B. Hydrostatic testing will consist of filling the constructed pipeline with water taking care to bleed off trapped air. The CONTRACTOR shall pressurize the pipe to 150 psi for a minimum of 4 hours to give the pipe time to expand. During this initial 4 hours, make-up water shall be added as-needed to maintain the pressure within 5 psi of the specified pressure. At the end of the first 4 hours, the pipe shall be pressurized to the specified pressure and the test commences. The pipeline shall be maintained under the test pressure for a continuous period of between 1 and 3 hours, as determined by the TOWNSHIP ENGINEER, by pumping water into the line at frequent intervals. The volume of water so added to maintain pressure within 5 psi of the specified pressure shall be measured and considered to represent the "leakage" from the line during the interval.

The allowable "leakage" for the pipeline shall not exceed the allowances given in the following table.

Nominal Pipe Size (In)	Allowable "Leakage" (Gal/100' of Pipe)		
	1-Hour Test	2-Hour Test	3-Hour Test
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.5
10	0.75	1.3	2.1
11	1.0	2.0	3.0
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
28	5.5	11.1	16.8
32	7.0	14.3	21.5
36	9.0	18.0	27.0
40	11.0	22.0	33.0
48	15.0	27.0	43.0

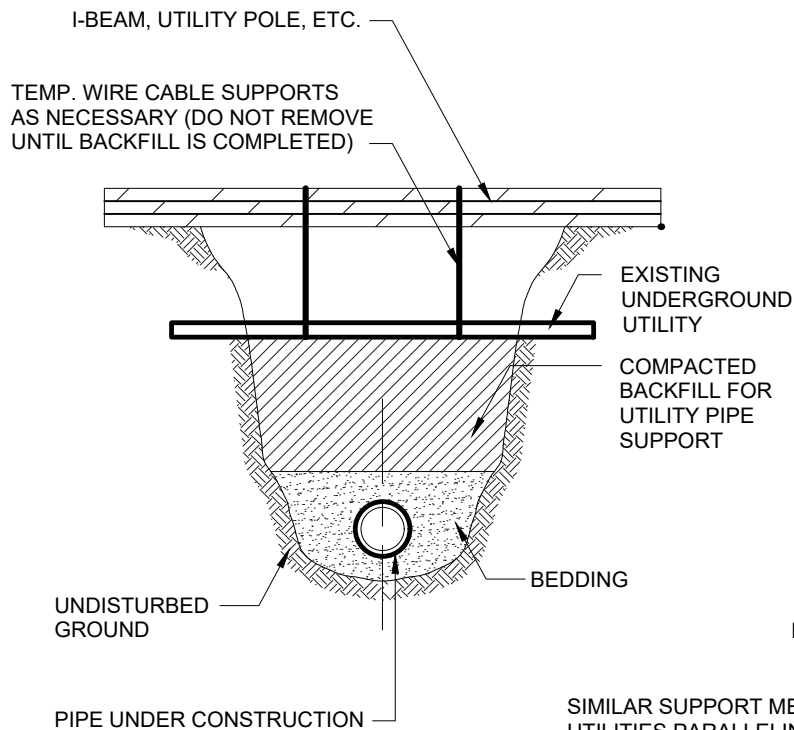
It is understood that the pipe will continue to expand after the initial 4 hours under pressure and throughout the 1 to 3-hour test period. The allowable "leakage" presented in the table above accounts for this expansion and no additional allowable "leakage" will be considered.

- C. Under no circumstances shall the total time under the specified test pressure exceed 8 hours. If the test is not completed due to leakage, equipment failure, etc., the test shall be terminated, and the pipeline shall be de-pressurized and permitted to "relax" for a minimum of 8 hours prior to the next testing sequences.
- D. If there are no visual leaks or significant pressure drops during the final test period, and the measured "leakage" is less than allowable, the pipeline passes the hydrostatic test.
- E. In the event that the "leakage", as determined by the TOWNSHIP or its AGENT, exceeds the specified allowable, the CONTRACTOR shall be responsible to repair or replace the pipeline until the pipeline passes the hydrostatic test, as determined by the ENGINEER.

3.06 SCHEDULES:

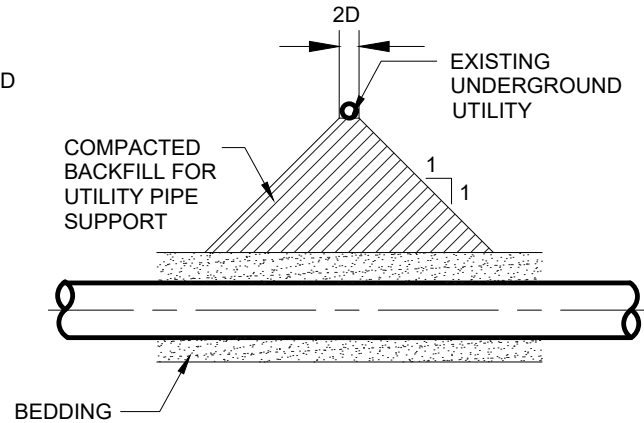
- A. Standard Details:
 - 1. Special supports for underground utilities / pipe saddles
 - 2. Methods of bedding pipe
 - 3. Water main offset / relocation detail
 - 4. Joint restraint requirements
 - 5. Hydrant Detail
 - 6. Hydrant berm
 - 7. Standard Straight Fire Hydrant Installation
 - 8. Standard 90 Degree Fire Hydrant Installation
 - 9. Hydrant berm
 - 10. Fire hydrant detail
 - 11. Copper service lead connection / sample point.
 - 12. Joint adapter detail
 - 13. Underground utilities detail
 - 14. H.D.P.E. to D.I.P. connection
- B. Water / Sewer Leakage & Pressure Testing Report Form.

END OF SECTION



SECTION

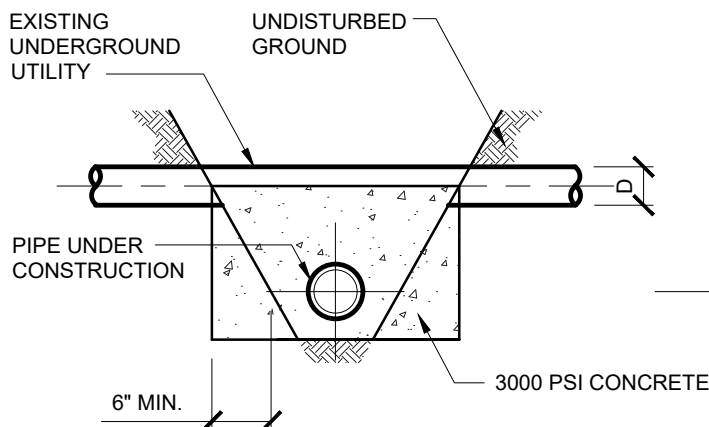
NOTE: MAINTAIN EXISTING
COATING ON UTILITY



ELEVATION

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

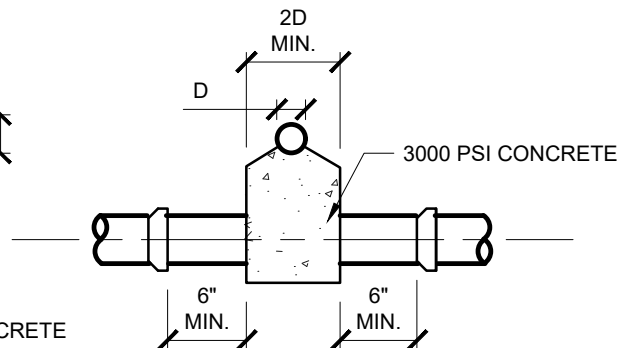
SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES



NOTE:

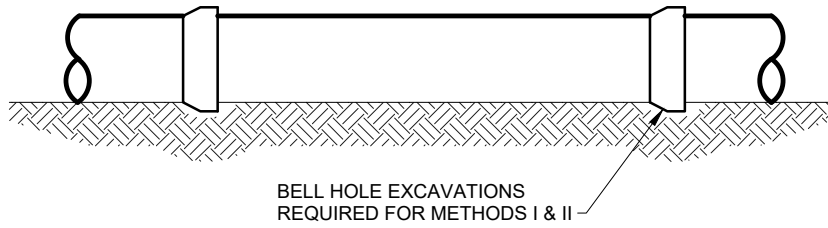
1. PIPE SADDLE IS NOT REQUIRED FOR PLASTIC,
STEEL, LEAD OR COPPER PIPE 2" OR SMALLER.

SECTION

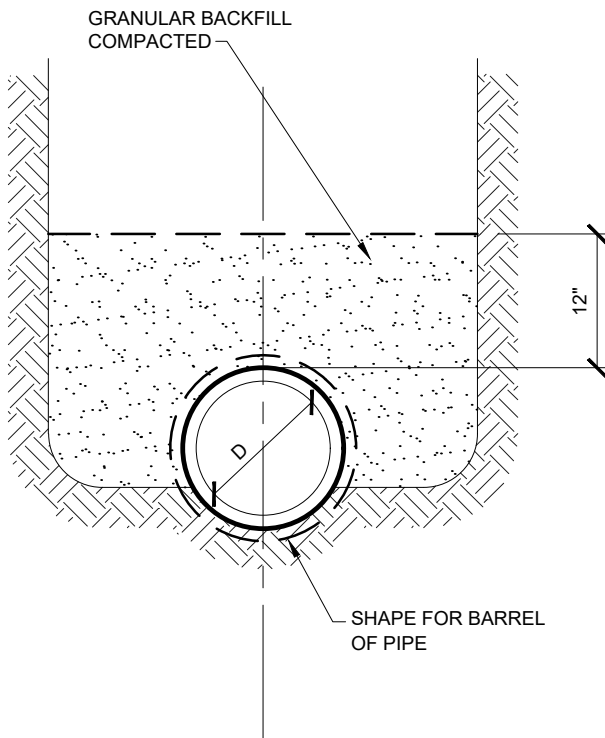


ELEVATION

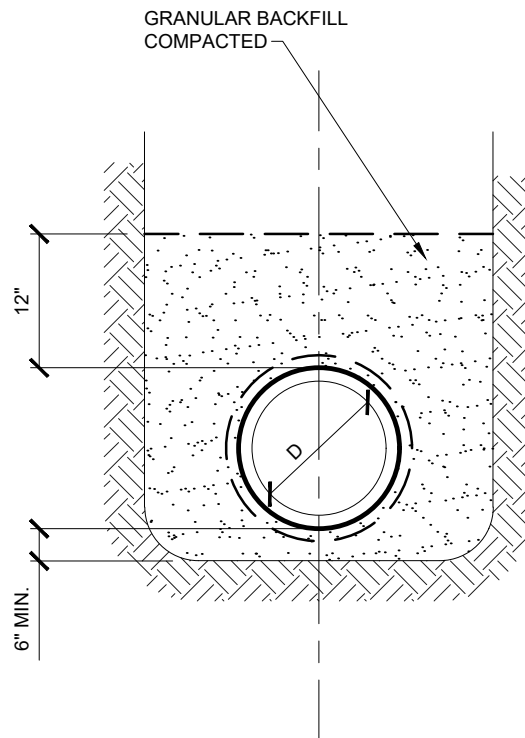
PIPE SADDLES



EXCAVATION FOR BELLS



METHOD I

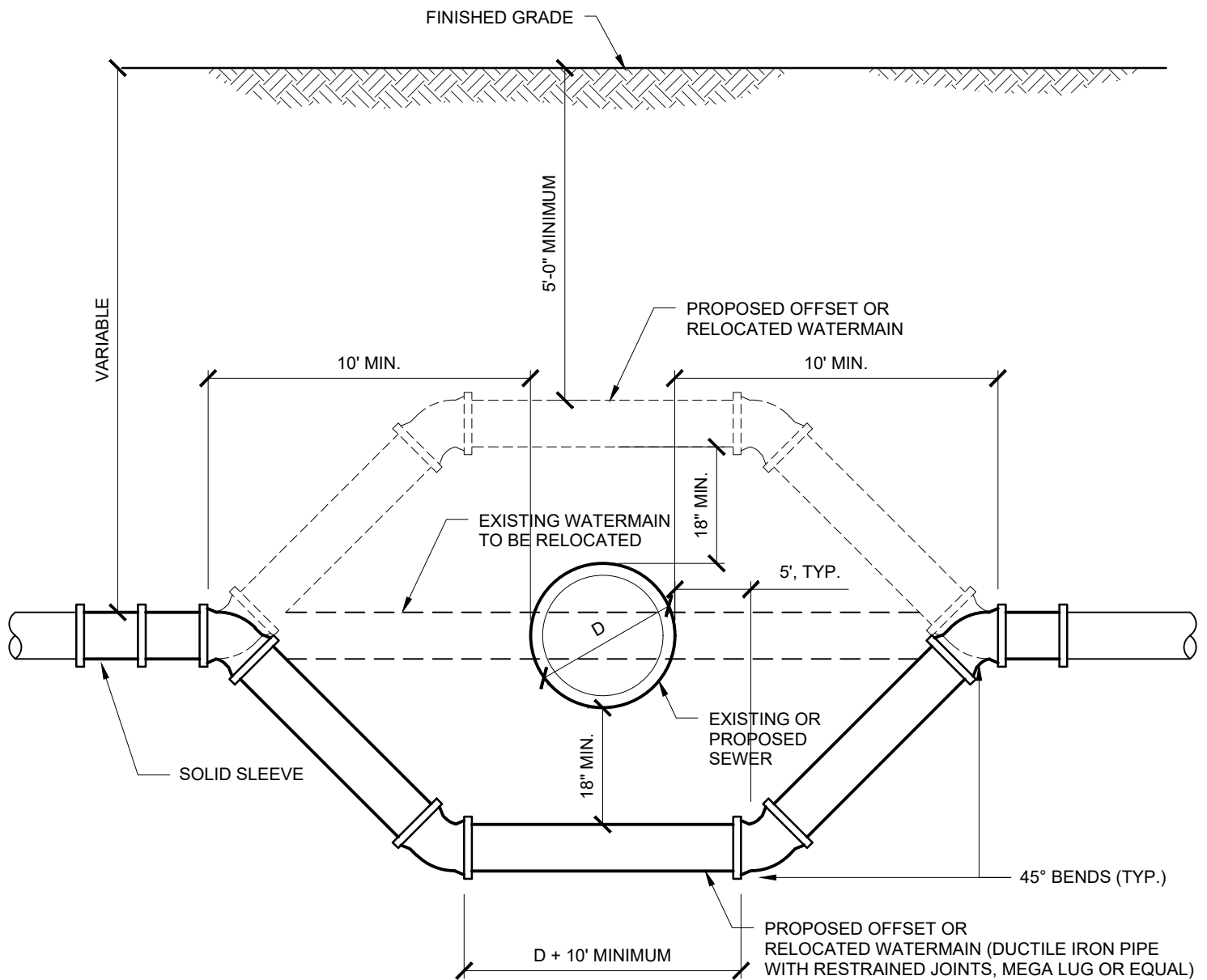


METHOD II

NOTES:

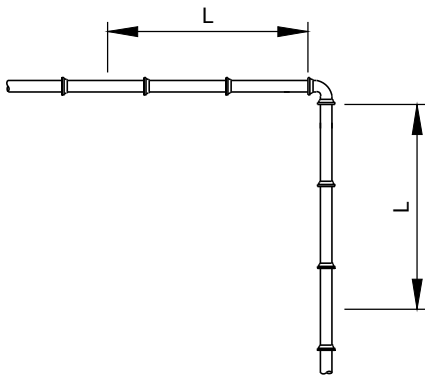
1. METHOD I. IN AREAS OF UNCONSOLIDATED SOILS
(SAND, GRAVEL, ETC.)
2. METHOD II: IN AREAS OF CONSOLIDATED SOILS
(CLAY, HARDPAN, ROCK, ETC.)

METHODS OF BEDDING PIPE

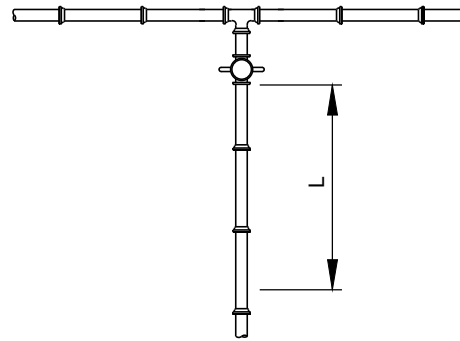


NOTE: WHEN THE MINIMUM CLEARANCE AND COVER CAN BE OBTAINED, THE WATERMAIN IS TO BE RELOCATED ABOVE THE SEWER. OTHERWISE, ANY SANITARY SEWER JOINTS WITHIN 10 FEET OF WATERMAIN SHALL BE ENCASED IN CONCRETE (REF. SECTION 02220, PARAGRAPH 2.01.A.3).

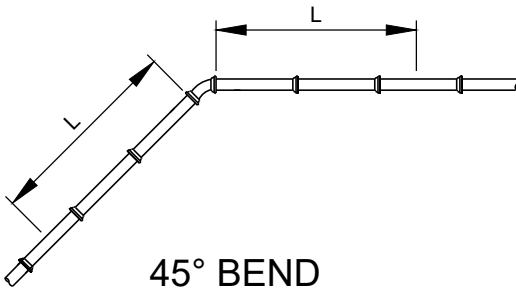
WATERMAIN OFFSET / RELOCATION DETAIL



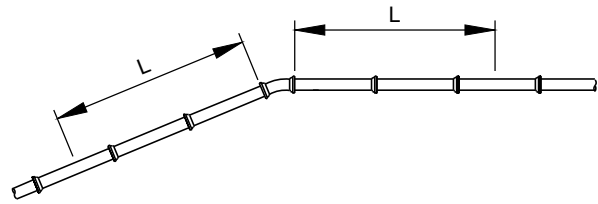
90° BEND



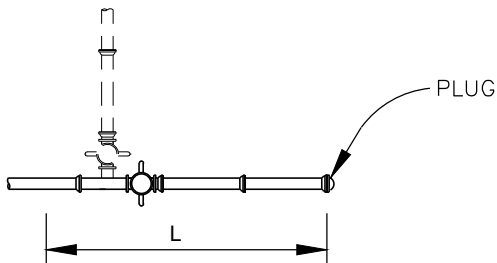
TEE



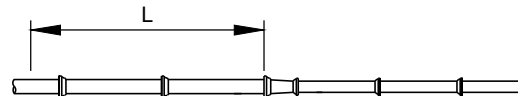
45° BEND



22 1/2° BEND OR LESS



DEAD END



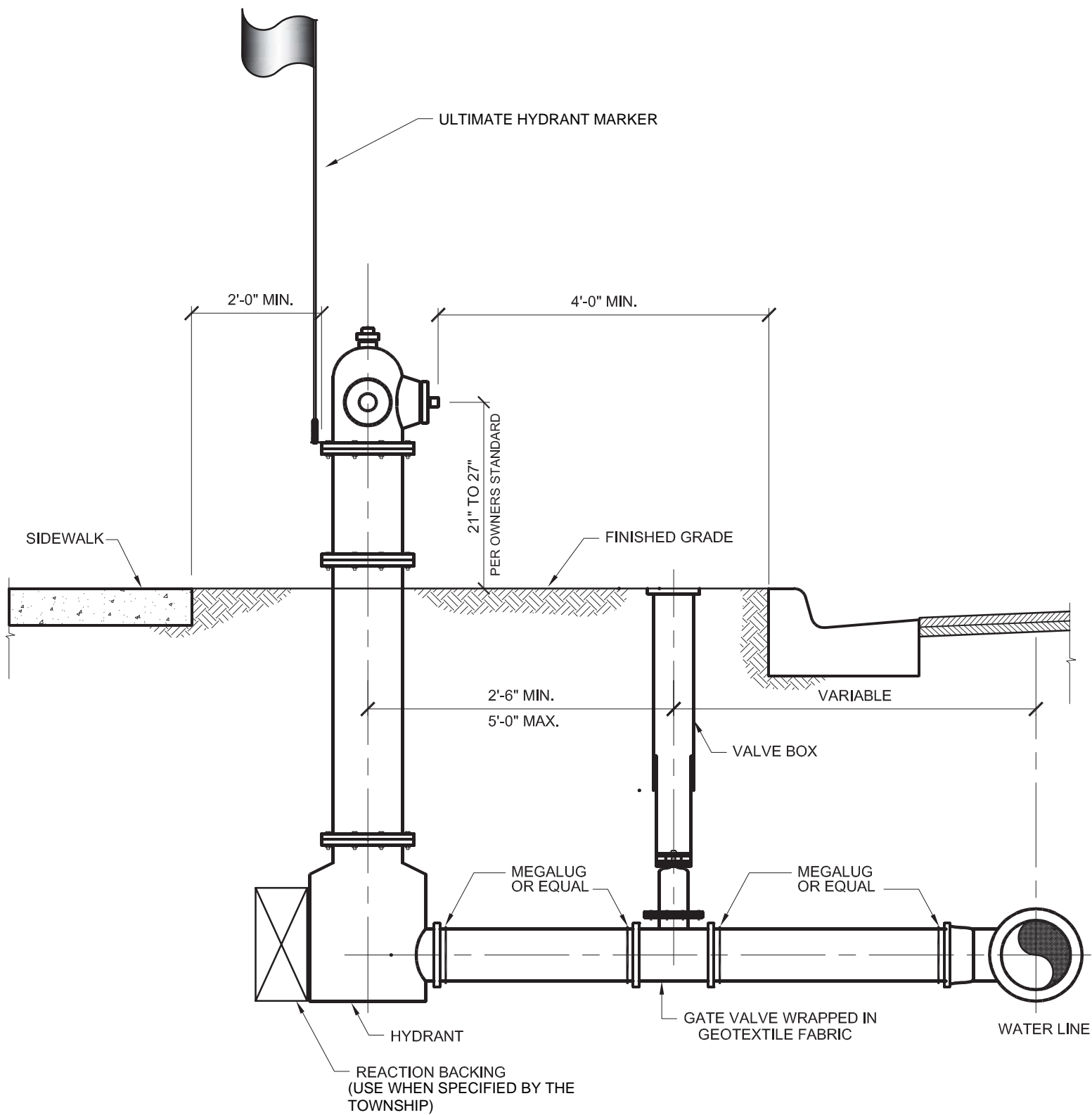
REDUCERS

"L" = MINIMUM LENGTH OF MECHANICAL JOINT
RESTRAINT SHOWN IN TABLE

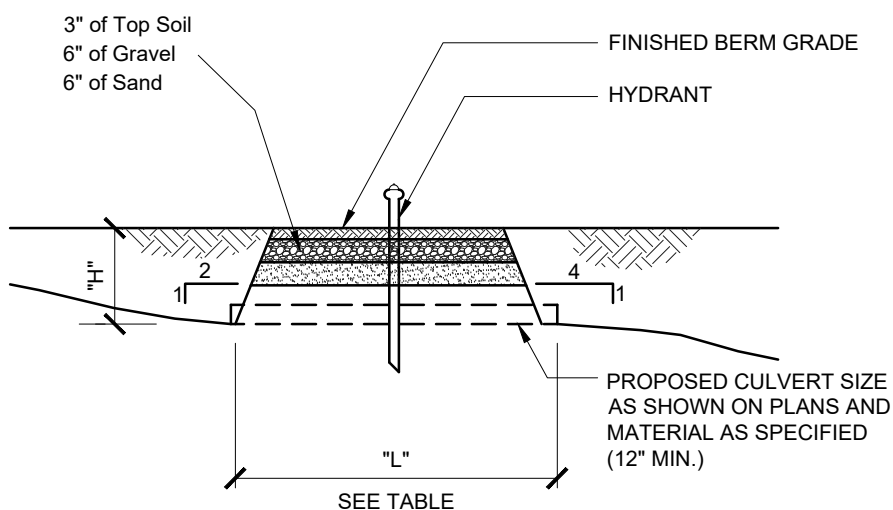
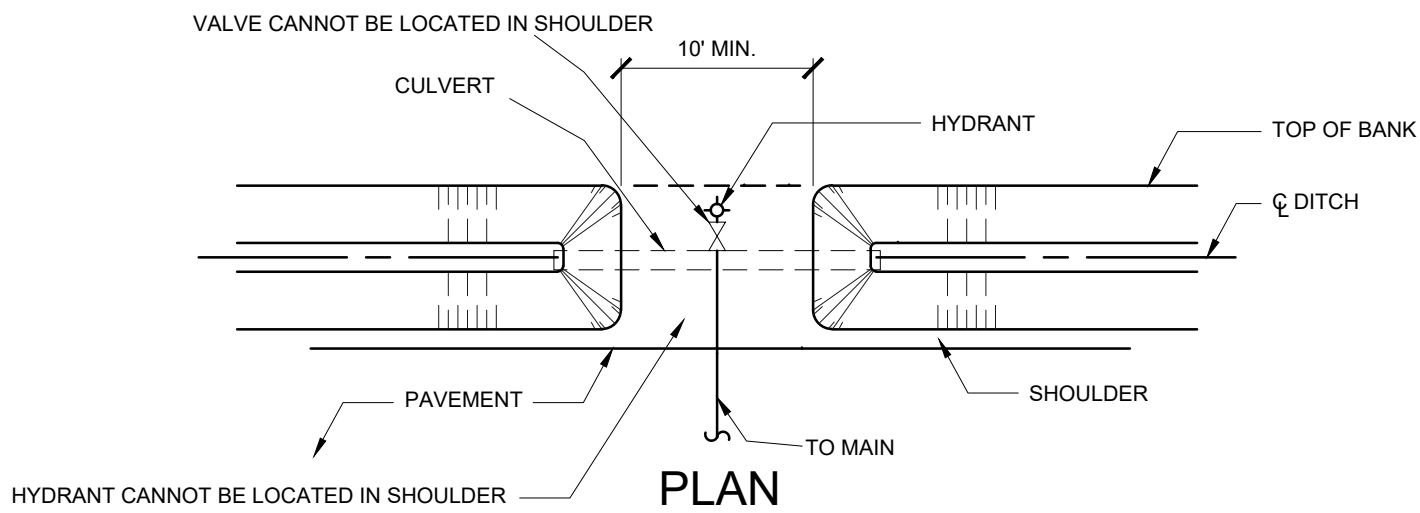
PIPE RESTRAINT LENGTH (L) REQUIRED, FEET*							
Pipe Dia.	Tees, 90° Bends	45° Bends	22-1/2° Bends	11-1/4° Bends	Dead Ends	Reducers (one size)	**
4"	23	9	5	2	57		
6"	32	13	6	3	82	43	63
8"	41	17	8	4	104	43	55
12"	58	24	12	6	149	80	120
16"	74	31	15	7	192	82	110

* AND ** - SEE PARAGRAPH 3.02H OF SPECIFICATION SECTION 02660
***VERTICAL BENDS REQUIRE 50% OF ADDITIONAL RESTRAINT.

JOINT RESTRAINT REQUIREMENTS



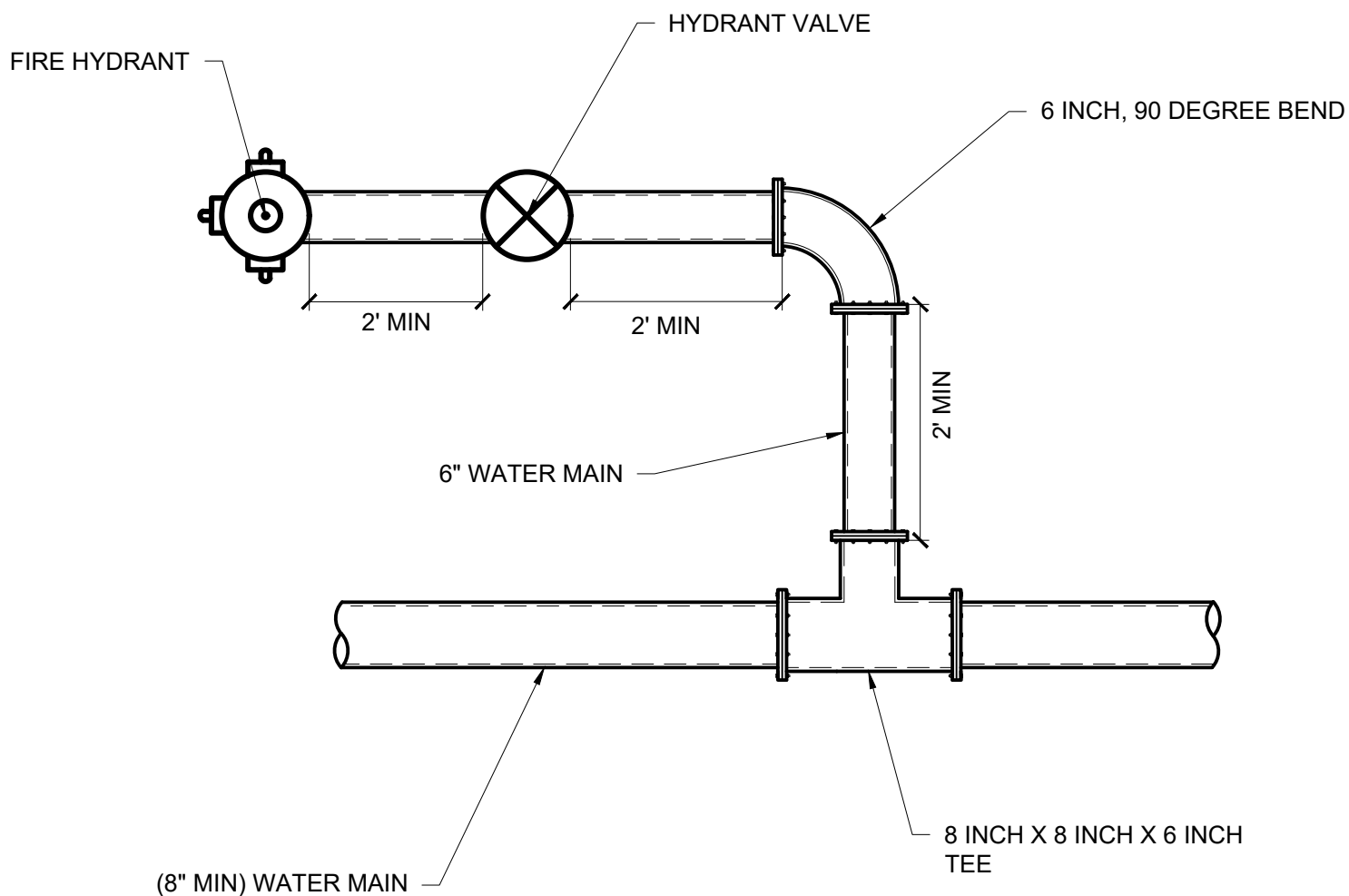
HYDRANT DETAIL



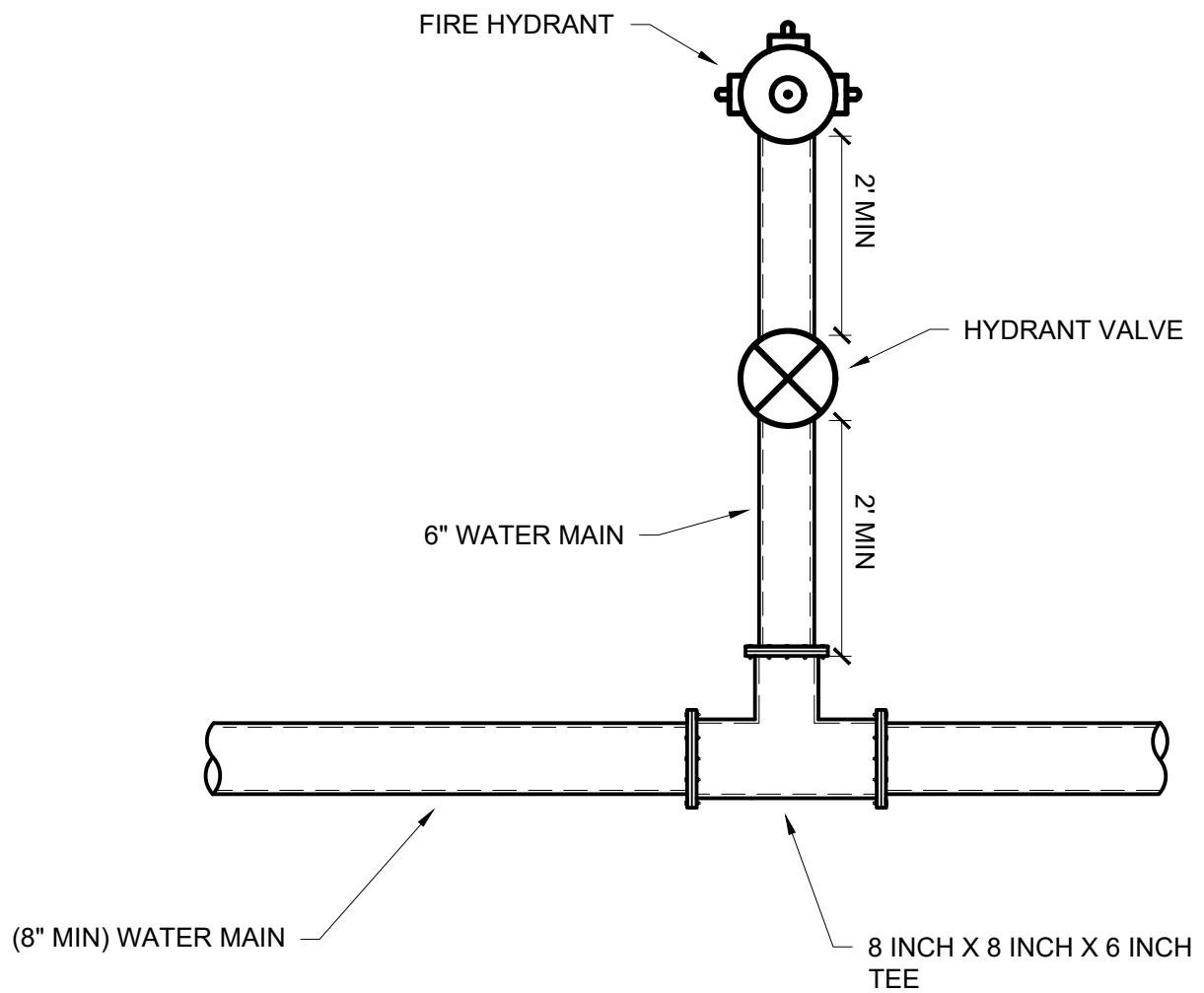
ELEVATION

1:2 SIDE SLOPE		1:4 SIDE SLOPE
SODDED		SEEDED
"H"	"L" (MIN.)	"L" (MIN.)
2'	18'	26'
3'	22'	34'
4'	26'	42'
5'	30'	50'
6'	34'	58'

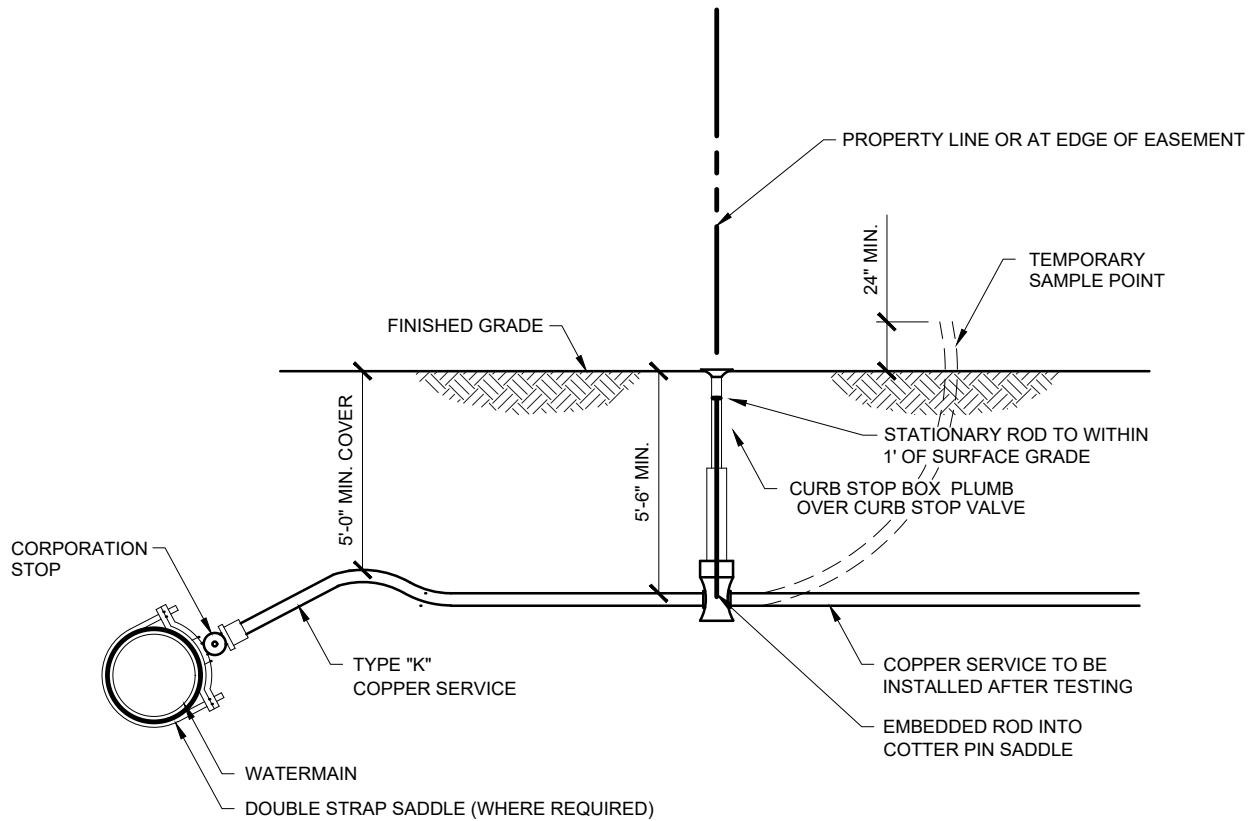
HYDRANT BERM



STANDARD 90 DEGREE FIRE HYDRANT INSTALLATION



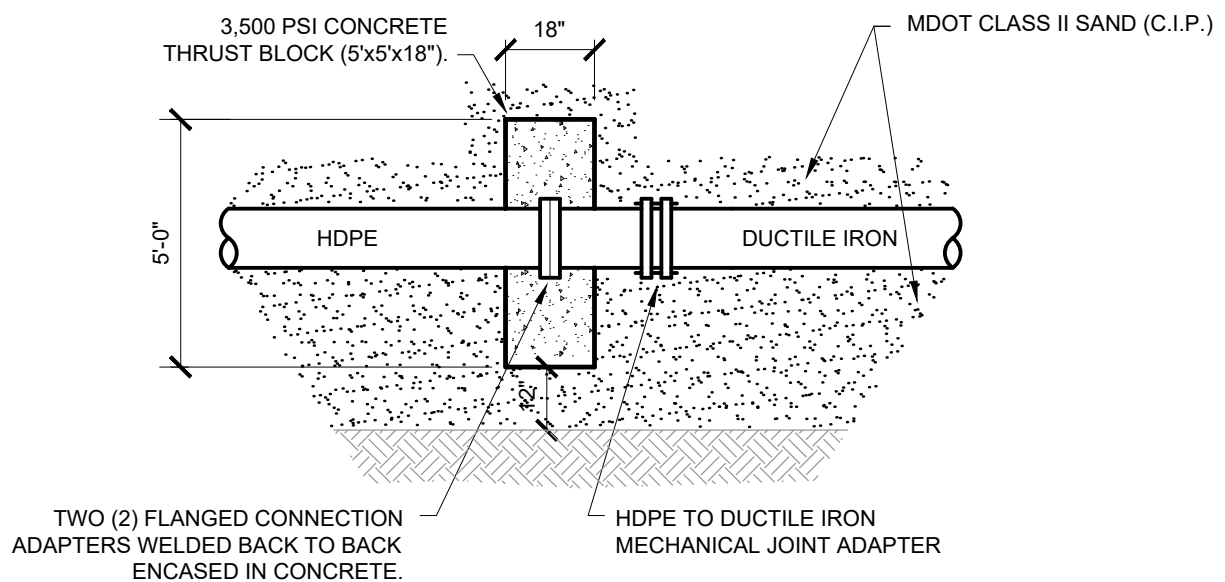
STANDARD STRAIGHT FIRE HYDRANT INSTALLATION



NOTES:

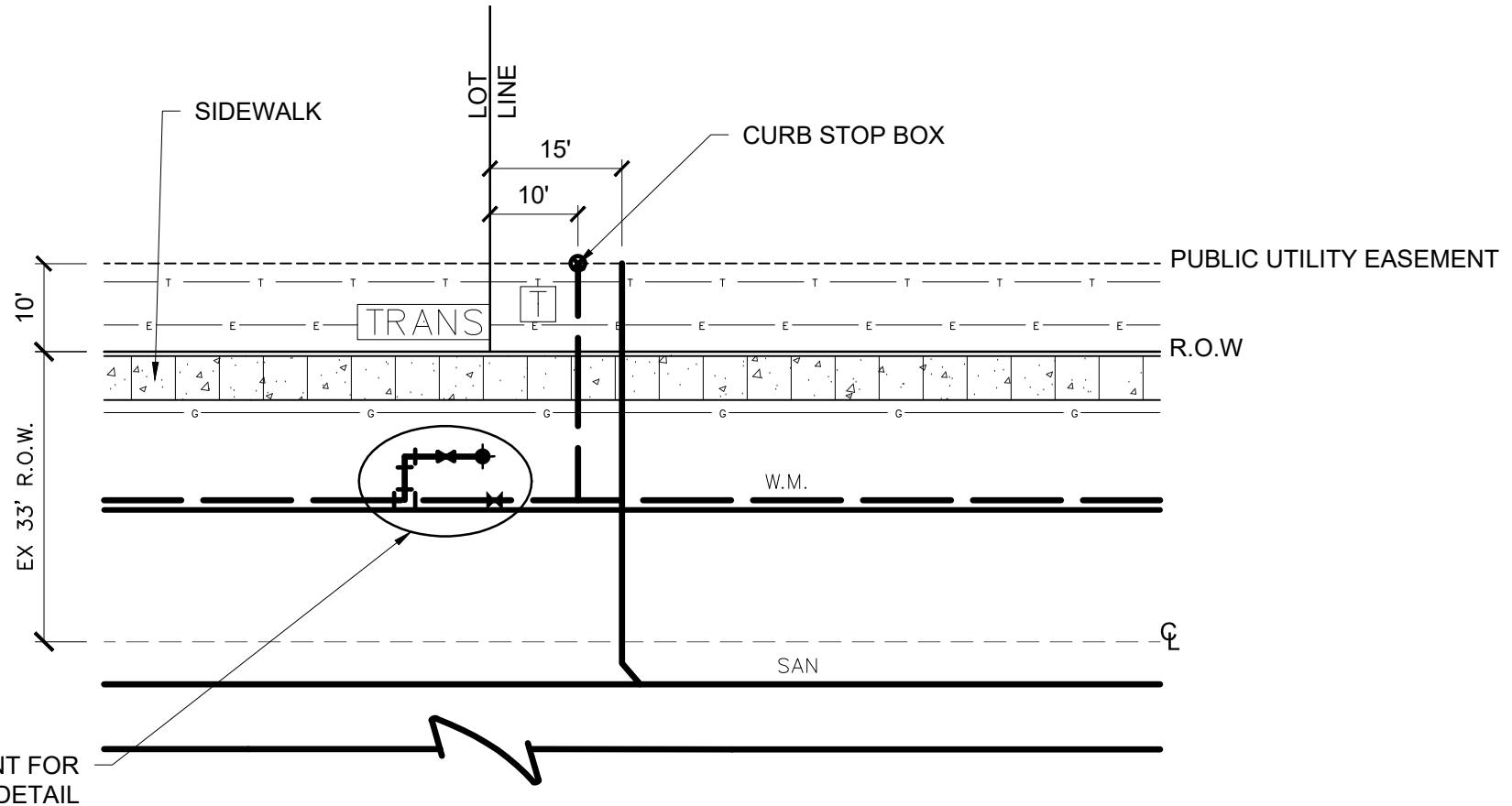
1. SAMPLE POINT TO BE USED FOR FUTURE SERVICE LEAD.
2. NO TAP SHALL BE MADE CLOSER THAN 18" TO ANY COUPLING OR JOINT IN THE PIPE.

COPPER SERVICE LEAD CONNECTION/SAMPLE POINT



HDPE TO DUCTILE IRON MECHANICAL JOINT ADAPTER DETAIL

NOT TO SCALE



UNDERGROUND UTILITIES

DRAWING TO SCALE

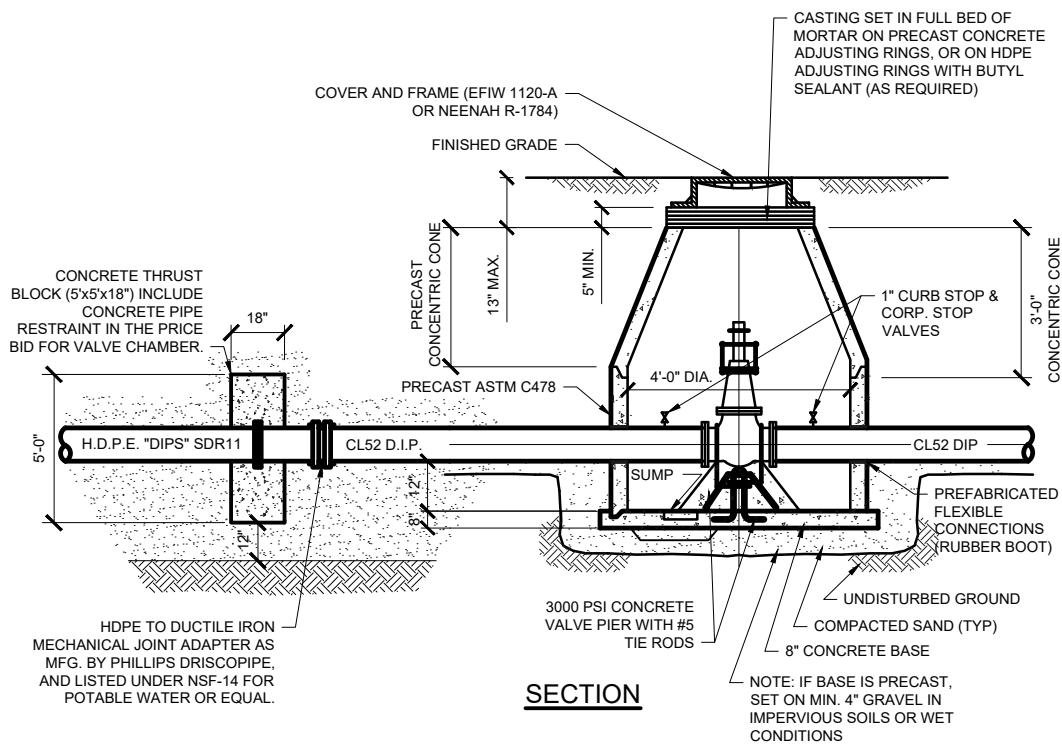
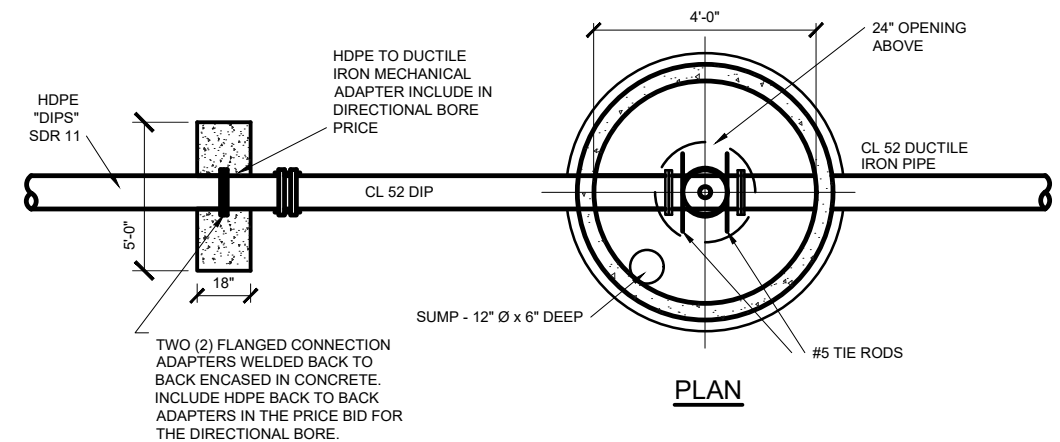


LEGEND

— E — E — Electrical
— T — T — Telephone
— G — G — Gas

T Telephone Pedestal

TRANS Transformer



HDPE TO DIP CONNECTION

WATER/SEWER LEAKAGE & PRESSURE TESTING REPORT

PROJECT: _____
 PROJECT NO.: _____
 LOCATION: _____

DATE: _____
 INSPECTOR: _____
 REPORT NO.: _____

LOCATION	TEST NO.	PIPE SIZE (IN.)	LENGTH OF PIPE (LFT.)	PRESSURE AT START OF TEST (PSI)	PRESSURE AT COMPLETION OF TEST (PSI)	ALLOWABLE LOSS (GAL/HR)	ACTUAL LOSS (GAL/HR)	TIME REQUIRED FOR TEST	ACTUAL TIME OF TEST	APPROVED	REJECTED	REMARKS

WATERMAINS:

- PRESSURE TEST: DURATION = 1 HR.
140 TO 150 PSI @ LOWEST POINT
- LEAKAGE TEST: DURATION OF TEST = 2 HRS.
ALLOWABLE LOSS:

$$L = \frac{SD \times \text{square root } (P)}{148,000}$$

148,000

L = LEAKAGE (GALLONS PER HOUR)

S = LENGTH OF PIPE (FEET)

D = NORMAL PIPE DIAMETER (INCHES)

P = AVERAGE TEST PRESSURE (PSI GAUGE)

- VALVES: ALLOWABLE LEAKAGE = LESS THAN 10 PSI IN 5 MINUTES W/PUMP OFF

(120 psi air, 150 psi water)
 LEAKTST.XLS

SEWERS:

- EXFILTRATION AIR TEST: DURATION = (SEE CHART ON BACK)
 3.5 PSI AFTER STABILIZATION OF PRESSURE
 PRESSURE LOSS FROM 3.5 TO 2.5 PSI MUST NOT EXCEED TIME LIMITS
 TIME FOR 2 OR MORE SIZES IN SAME RUN SHALL BE COMPUTED AND
 ADDED TOGETHER

SECTION 2661

REMOVAL/ABANDONMENT OF WATER SERVICES

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the work required for the removal of one or more water service(s) from the water main to the curb stop valve and box and appurtenant work.
- B. This Section includes the work required for the abandonment of one or more water service(s) from the water main to the curb stop valve and box and appurtenant work.

1.02 REFERENCES:

- A. AWWA - American Waterworks Association, latest edition.
- B. ANSI - American National Standards Institute, latest edition.
- C. ASTM - American Society Testing Materials, latest edition.
- D. Recommended Standards for Water Works – Ten State Standards, latest edition

1.03 SUBMITTALS:

- A. Submit the following for review by TOWNSHIP DPU or TOWNSHIP'S ENGINEER:
 - 1. Product Data on material used to plug/seal at the corporation stop at the Water Main and/or at the Curb Stop Valve and Box.
 - 2. Proposed equipment and method for flushing, pressure testing, leakage testing and chlorination as needed to ascertain Water Main meets TOWNSHIP Standards for potability.
 - 3. Submittals must be approved prior to construction.
- B. Report witness measurements on valves, fittings and curb boxes that are exposed and left in place (in-situ) during removal/abandonment.
 - 1. Provide measurements from two permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.
- C. Provide certifications on material used to plug/seal Water Main, Corp Stop and/or Curb Stop indicating conformance to specifications prior to installation.
- D. Submittal of drawings of record plans to:
 - 1. Provide the Township Hall two (2) printed sets and one (1) electronic file
 - 2. Provide the Township Engineer (1) one electronic file with as-constructed dimensions and witnesses.
 - 3. Provide Township Utilities Superintendent (1) one electronic file

1.04 JOB CONDITIONS:

- A. Interrupting Water Service(s):
 - 1. REF SECTION 02660 – WATER MAINS 1.04
 - 2. Where removal of the water service to the water main is required, the existing water main shall be sealed in such a manner as to prohibit dirt and foreign material from

entering. Materials used shall be approved by the TOWNSHIP. The plug/seal shall be provided and installed by the Contractor, as directed by the TOWNSHIP.

3. Prevent contamination of existing water mains.
- B. Clean up promptly upon completion or safely secure site if work not completed in one (1) work day. Clean up shall include backfill, rough grading and restoration of grounds. REF SECTION 02220 – EXCAVATING, BACKFILLING AND COMPACTING.
- C. Contractor is solely responsible for confirming actual soil conditions and depth of water table.
- D. Pavement, sidewalk, curbs or gutters removed or destroyed in connection with performance of the work shall be saw cut as directed by the TOWNSHIP and shall be replaced with pavement, sidewalks, curbs, gutters of the same kind, or better by the Contractor in accordance with TOWNSHIP Standards.
- E. Granular Subbase and Aggregate Base shall be placed beneath the restored pavement to TOWNSHIP Standards.
- F. All materials, salvaged or furnished by Contractor, shall meet TOWNSHIP Standards.
- G. Areas of work shall be restored to conditions prior to water service removal or better.
- H. No water services are to be abandoned in place unless directed by the TOWNSHIP or TOWNSHIP Engineer.
- I. Removal/Abandonment not allowed when air temperature is 25 degrees F or colder or when determined too cold by TOWNSHIP.
- J. Salvage all existing water meter, transponder, if applicable, and meter valves {inlet & outlet} (either side of water meter) and curb boxes removed and deliver to the TOWNSHIP's yard.
- K. Demolition Permit
 1. Contractor to have at least \$500,000 personal injury and property damage insurance.
- L. Ownership of debris
 1. TOWNSHIP has first right to surplus materials.
 2. The Contractor is directly and solely responsible for disposal of surplus and unsuitable material.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. REFER TO SECTION 02660 – WATER MAINS
- B. REFER TO SECTION 02220 – EXCAVATING, BACKFILLING AND COMPACTING
- C. All materials must conform to TOWNSHIP, OTTAWA County Health Department and the Michigan Department of Environmental Quality (MDEQ).

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Contractor shall make proper provisions for the maintenance and continuation of utility services to surrounding properties as directed by the TOWNSHIP or TOWNSHIP Engineer, unless otherwise specified.
- B. Properties may have more than one water service. Determine their locations prior to excavation.
- C. Alignment:
 - 1. Notify TOWNSHIP DPU or TOWNSHIP's ENGINEER and to obtain instructions to proceed where there is a discrepancy, or an obstruction not shown on plans.
 - 2. Verify location and depth of existing utilities in advance of removal/abandonment. Provide the Township with GPS coordinates to all abandoned corporation stops.
- D. Bedding:
 - 1. Method: See Article 3.06 SCHEDULES.
 - 2. Provide bedding area backfill in accordance with MDOT Standard Plan R-83C.
 - 3. Provide continuous bearing supporting entire length of exposed water main evenly, when exposed.
- E. Cleaning Pipe and Fittings:
 - 1. Provide interior free of foreign material and joint surfaces free of lumps and blisters.

3.02 REMOVAL/ABANDONMENT:

- A. General: Meet requirements of AWWA C600 and these specifications.
- B. Determine status of property:
 - 1. Occupied – contact TOWNSHIP to report status and receive instructions on how to proceed.
 - 2. Unoccupied – proceed with removal/abandonment.
- C. REF SECTION 02660 – WATER MAINS
- D. Provide and place traffic and pedestrian traffic barriers, as necessary.
- E. For water service removal from water main to curb stop box:
 - 1. Remove existing water service and leave corporation stop in place.
 - 2. Use a Ford or equivalent Tube Nut, Copper Gasket and Brass Corp Stop Plug. Prior to backfilling the abandoned corporation, the Township must inspect and give approval. Should the corp leak, the corp must be removed and the water main should be plugged using a plug/seal approved by the Township.
 - 3. If the corp is located within a saddle on the water main and requires removal, a Smith-Blair (or equivalent) repair clamp must be furnished by the contractor and installed.
 - 4. If shutting down the water main is necessary to complete the disconnect, the Township and residents must be notified at least 24 hours in advance.
 - 5. Excavate and remove water service and Curb Valve Stop and Box to five (5) feet outside of the ROW.
 - 6. Witness location of plugged service tap.

7. Backfill in accordance with MDOT Standard Plan R-83C prior to starting water service removal/abandonment on private property.
 8. Salvage water meter, transponder, if applicable, and meter valves {inlet & outlet} (either side of water meter). Return to TOWNSHIP.
 9. Backfill and grade in accordance with MDOT Standard Plan R-83C and SECTION 02220 – EXCAVATING, BACKFILLING AND COMPACTING
- F. Remove and dispose of abandoned pipe, valves and boxes, or other appurtenances, as necessary for the removal/abandonment of the water service at no cost to the TOWNSHIP.
- 3.03 FIELD QUALITY CONTROL: REF SECTION 02660 – WATER MAINS 3.03
- A. Contractor performing the work shall give the Township 48 hours' notice of water service abandonment/removal for inspection.
- 3.04 FLUSHING: REF SECTION 02660 – WATER MAINS 3.04
- 3.05 DISINFECTION: REF SECTION 02660 – WATER MAINS 3.05
- 3.06 SCHEDULES:
- A. Standard Details:
1. Methods of bedding pipe
 2. Copper service lead connection / sample point
 3. Underground utilities detail
- B. Water/Sewer Leakage & Pressure Testing Report Form.

The unit price includes the cost of structure repairs to remove water service, sawing, removal and disposal; providing, placing and compacting backfill and providing and placing replacement soil or base material(s) as determined by the TOWNSHIP.

END OF SECTION

SECTION 02720

STORM SEWERS

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes work required for storm sewer pipe, culverts, structures, drain excavation/cleanout and related work.

1.02 REFERENCES:

- A. MDOT - Michigan Department of Transportation, *"Standard Specifications for Construction", Current Edition.*
- B. ASTM - American Society Testing Materials, latest edition.

1.03 SUBMITTALS:

- A. Submit the following for review by TOWNSHIP or TOWNSHIP's ENGINEER:
 - 1. Shop Drawings on radius pipe.
- B. Notify TOWNSHIP on presence of wastewater.
- C. Line and grade control method other than Laser Beam shall be approved by TOWNSHIP or TOWNSHIP's ENGINEER.
- D. Report witness measurements and "as-built" elevation on end of footing drains.
 - 1. Provide measurements from two permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.

1.04 JOB CONDITIONS:

- A. Maintain existing storm sewer operational.
- B. Install service lines, catch basins and inlet leads as pipe laying progresses and within maximum of 600 feet of mainline sewer installation.
- C. Clean up promptly following pipe installation and within maximum of 400 feet behind pipe laying operation. Cleanup shall include backfill and rough grading.

PART 2 - PRODUCTS

2.01 PIPE:

A. Concrete Pipe Classification Table:

Type & Size	Design Depth (feet)	
	<u>3' - 19'</u>	<u>Over 19'</u>
Reinforced Concrete 12" - 54"	ASTM C-76 Class III	ASTM C-76 Class IV
Reinforced Concrete 60" - 90"	ASTM C-76 Class III	ASTM C-76 Class IV

1. Concrete Pipe shall be circular.

B. Corrugated Steel: MDOT 909.05.

C. Polyethylene (PE):

1. ADS N-12 corrugated exterior, smooth interior: ASTM F-405
2. Hi-Q.

D. Footing Drains:

1. Footing and sump pump drain laterals shall not be connected directly to storm sewer, sanitary sewer or under drain within existing or proposed public roadways. Connections shall only be allowed to rear and/or side yard drainage systems outside of public roadways.

2.02 PREMIUM JOINTS:

A. Concrete: ASTM C443, modified to include "O" rings on grooved pipe ends.

B. Corrugated Metal:

1. Coupling bands: Same as standard joints.
2. Waterproofing materials: $\frac{3}{8}$ -inch Neoprene, solid.
3. Neoprene width: 7 inch for 12 inch bands and 12 inch for 24 inch bands.

C. Plastic: Rubber O-Rings.

2.03 MANHOLES, CATCH BASINS AND INLETS:

A. Precast Units: ASTM C478 and ASTM C76 Class III.

1. Joints: Cement mortar, preformed bituminous rope or "O" ring gaskets.
2. Pipe openings: Pipe diameter plus 6 inches, maximum.

B. Concrete: 3500 psi 28 day, 4-inch maximum slump.

C. Concrete Radial Units: ASTM C139. For repair of existing units only.

D. Grade Rings: ASTM C478.

- E. Manhole Steps shall be one of the following:
 - 1. Cast iron: 10 inches deep by 10 inches wide, 5-inch tread depth, 1 inch by 1 inch tread section, with 2-inch rail height.
 - 2. Plastic: Reinforced with $\frac{3}{8}$ -inch steel rod and dimensioned as cast iron.
- F. Manhole Castings: East Jordan 1120, B cover, Neenah 1764 perforated cover.
- G. Catch Basin and Inlet Castings: MDOT C, E OR K as follows:
 - 1. Concrete rolled curb and gutter: Cover C.
 - 2. Bituminous valley gutter: Cover C.
 - 3. Ditch centerline: Cover E.
 - 4. Concrete standard curb and gutter: Cover K. Cover KK where called for on plans. Cover KK shall be East Jordan Iron Works #7030 T1 or T3, Neenah Grate r-3246 or equal.
 - 5. Catch basin backs / grates shall be marked with lettering "Dump No Waste, Drains to Waterways".

2.04 RIP RAP:

- A. Rip Rap: MDOT 916.01.
- B. Geotextile Fabric: Mirafi 600X.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Alignment and Grade:
 - 1. Deviations: Notify OWNER's ENGINEER and obtain instructions to proceed where there is a grade discrepancy or an obstruction not shown on the drawings.
 - 2. Expose existing utilities at crossings of proposed storm sewer in advance of laying pipe to verify existing depth. Advise OWNER's ENGINEER of conflicts in grade and provide adjustments in grade of storm sewer.
- B. Laser Beam Control:
 - 1. Check grade at set-up point, 25 foot, 50 foot, 100 foot and 200 foot points thereafter to the next set-up point.
 - 2. Projector advancement: Reset at each manhole.
- C. Bedding:
 - 1. Provide minimum 3 inches granular material bedding in areas of consolidated soils (i.e. clay, hardpan, bedrock, etc.).
 - 2. Provide bedding area backfill in accordance with SECTION 02220 EXCAVATING, BACKFILLING AND COMPACTING.
 - 3. Provide continuous bearing by supporting entire length of pipe barrel evenly. Excavate for bells of pipe joints.

3.02 INSTALLATION:

- A. Laying pipe:
 - 1. Direction shall be upstream with spigot or tongue end downstream and bell end upstream.
 - 2. Joints shall be smooth and clean.
 - 3. Place pipe length and bedding as a unit in a frost free, dry trench.

4. Special supports and saddles: See Article 3.05 SCHEDULES.
- B. Jointing:
1. Premium:
 - a. Solvents, adhesives and lubricants shall be furnished by Manufacturer.
 - b. Seating: Fully.
 - c. Gasket position: Check.
 2. All pipe 24-inches in diameter or larger shall have joints wrapped with geotextile fabric.
- C. Manhole, Catch Basins and Inlets:
1. General: See Article 3.05 SCHEDULES.
 2. Base bedding: Provide 4-inch pea stone with full and even bearing in impervious or wet conditions. Otherwise provide on undisturbed frost-free dry subgrade.
 3. Precast: Fill joint space completely and trowel.
 4. Block: Set in full bed of mortar with key slots filled, joints maximum $\frac{1}{2}$ inch at inside face and wipe joints. Plaster coat complete interior of structure with $\frac{1}{2}$ inch coat of cement mortar.
 5. Provide manhole casting grade setting as follows:
 - a. Existing pavement: Finish grade.
 - b. Gravel road surface: 6 inches below.
 - c. Unpaved lawn areas: Finished grade.
 6. Provide catch basin casting grade setting as follows:
 - a. Gutter grade: $\frac{1}{2}$ inch below nearest asphalt or concrete
 - b. Unpaved areas: 6 inches below finished grade.
- D. Connections:
1. Existing storm sewer:
 - a. Structures: Relay and repoint loose blocks and bricks.
 2. Future Storm Sewer:
 - a. Plug: Pipe 4 inch through 21 inch with standard disc.
 - b. Bulkhead: Pipe 24 inch and larger with brick and mortar, $\frac{1}{2}$ inch plaster outside.
 - (1) 24 inch - 36 inch: 4 inch thick.
 - (2) 42 inch - 60 inch: 8 inch thick.
 - (3) 60 inch and larger: 12 inch thick.
- E. Drain Excavation/Cleanout:
1. Section: 4-foot flat bottom with 1 on 2 maximum side slopes.
 2. Remove trees and brush as required, unless otherwise indicated.
 3. Excess excavated material:
 - a. Drain excavation of 2 feet or less: Spread, level and grade to drain along top of banks.
 - b. Drain excavation in excess of 2 feet: Remove from site and place in an upland disposal site.

3.03 TESTING AND INSPECTION:

- A. General:
1. Observation: By TOWNSHIP OR TOWNSHIP'S ENGINEER.
 2. Testing: All polyethylene pipe shall have a mandrell pulled through to confirm no deformation of circular pipe.
 3. Completion: Before connecting to active system.
 4. Notification: Clean and arrange for inspection.

B. Line and Grade: Allowable drift between structures from proposed alignment will be as follows:

1. Line:
 - a. Through 36 inch: 0.40 foot.
 - b. Over 36 inch: 0.80 foot.
2. Grade:
 - a. Through 36 inch: 0.05 foot.
 - b. Over 36 inch: 0.10 foot.

3.04 ADJUST AND CLEAN:

A. General:

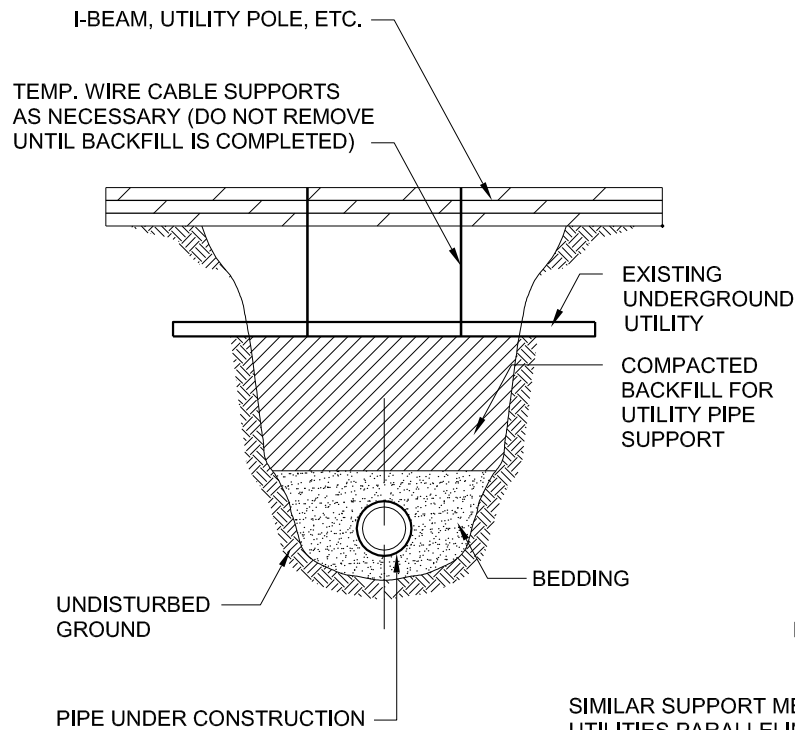
1. Structures to be checked at project completion per Ottawa County Water Resources Commission Standards.

3.05 SCHEDULES:

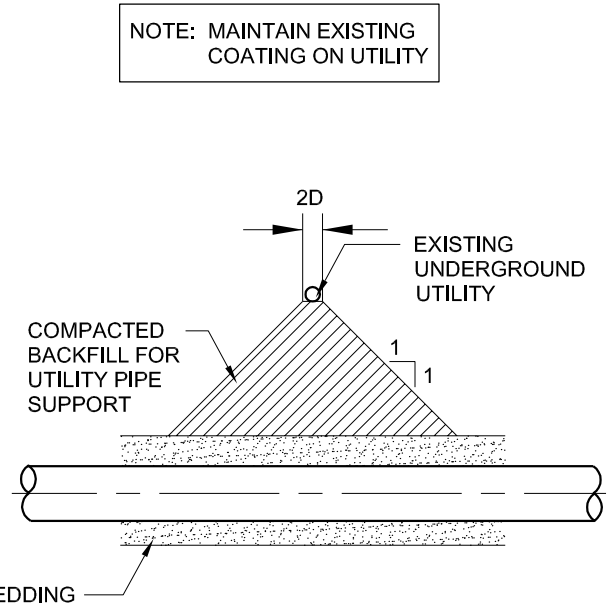
A. Standard Details:

1. Special supports for underground utilities / pipe saddles.
2. Methods of bedding pipe.
3. Standard storm manhole.
4. Standard storm tee manhole.
5. Standard catch basin.
6. Standard inlets.
7. Special curb / yard inlet.

END OF SECTION



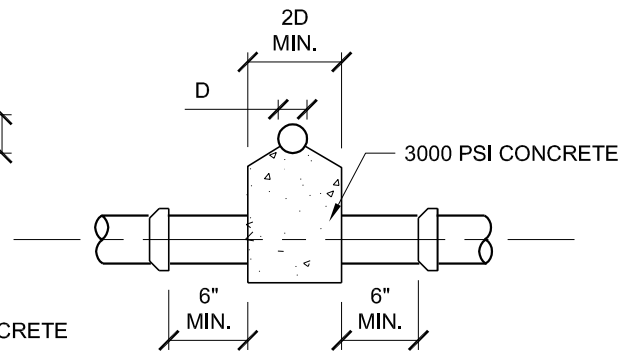
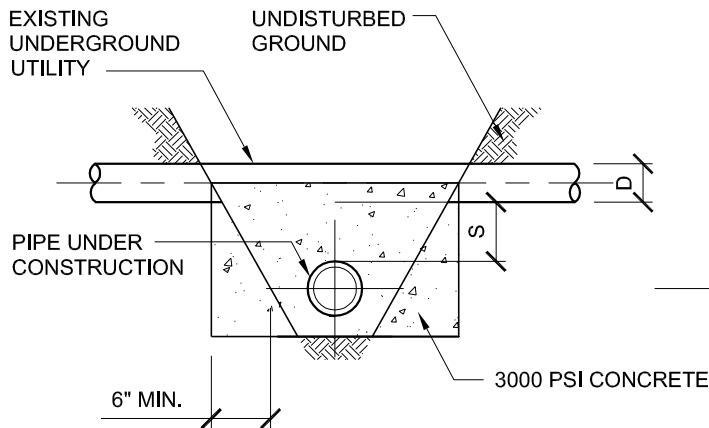
SECTION



ELEVATION

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

SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES



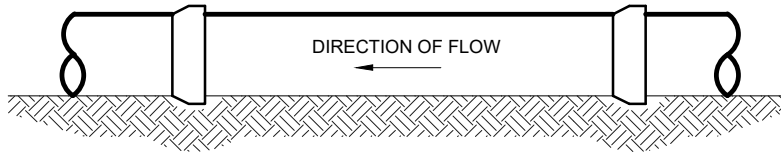
NOTES:

1. PIPE SADDLE REQUIRED WHEN SEPARATION (S) IS 12 INCHES OR LESS UNLESS OTHERWISE DIRECTED OR SHOWN ON PLANS
2. PIPE SADDLE IS NOT REQUIRED FOR PLASTIC, STEEL, LEAD OR COPPER PIPE 2" OR SMALLER.

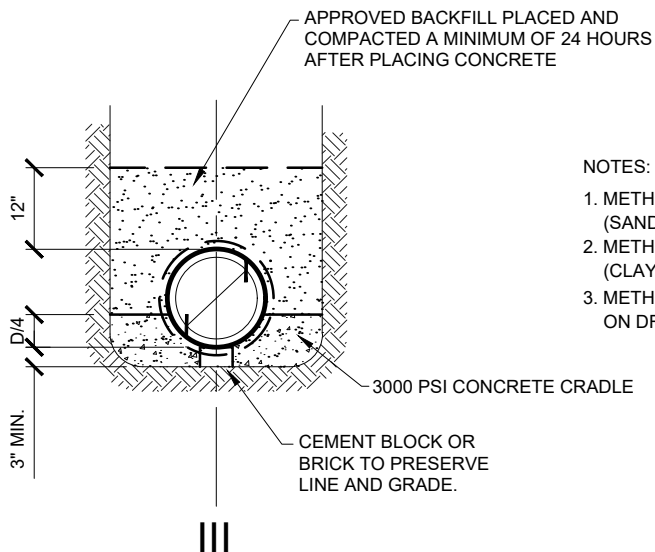
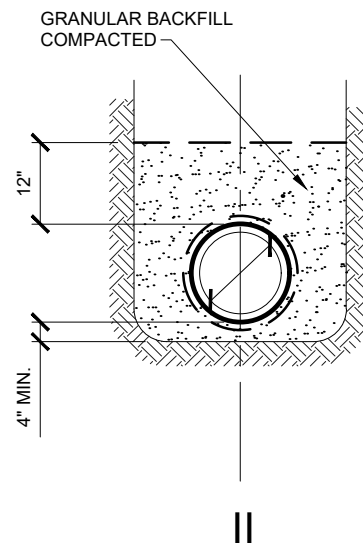
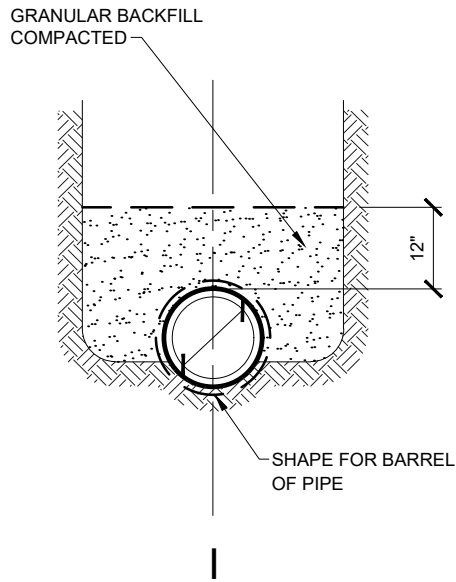
SECTION

ELEVATION

PIPE SADDLES



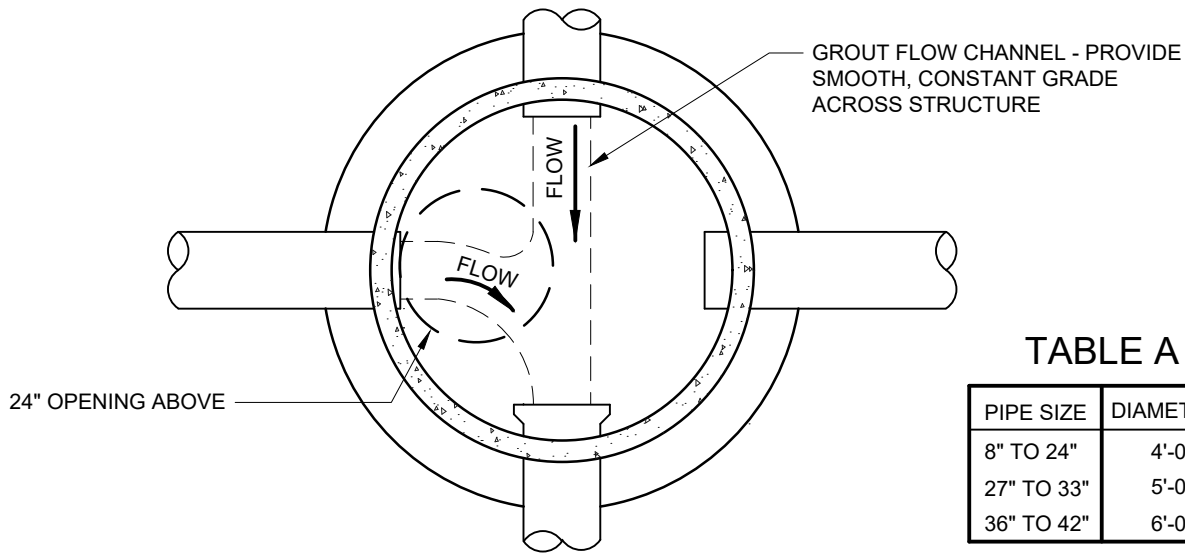
EXCAVATION FOR BELLS



NOTES:

1. METHOD I: IN AREAS OF UNCONSOLIDATED SOILS (SAND, GRAVEL, ETC.)
2. METHOD II: IN AREAS OF CONSOLIDATED SOILS (CLAY, HARDPAN, ROCK, ETC.)
3. METHOD III: IN AREAS INDICATED ON DRAWINGS

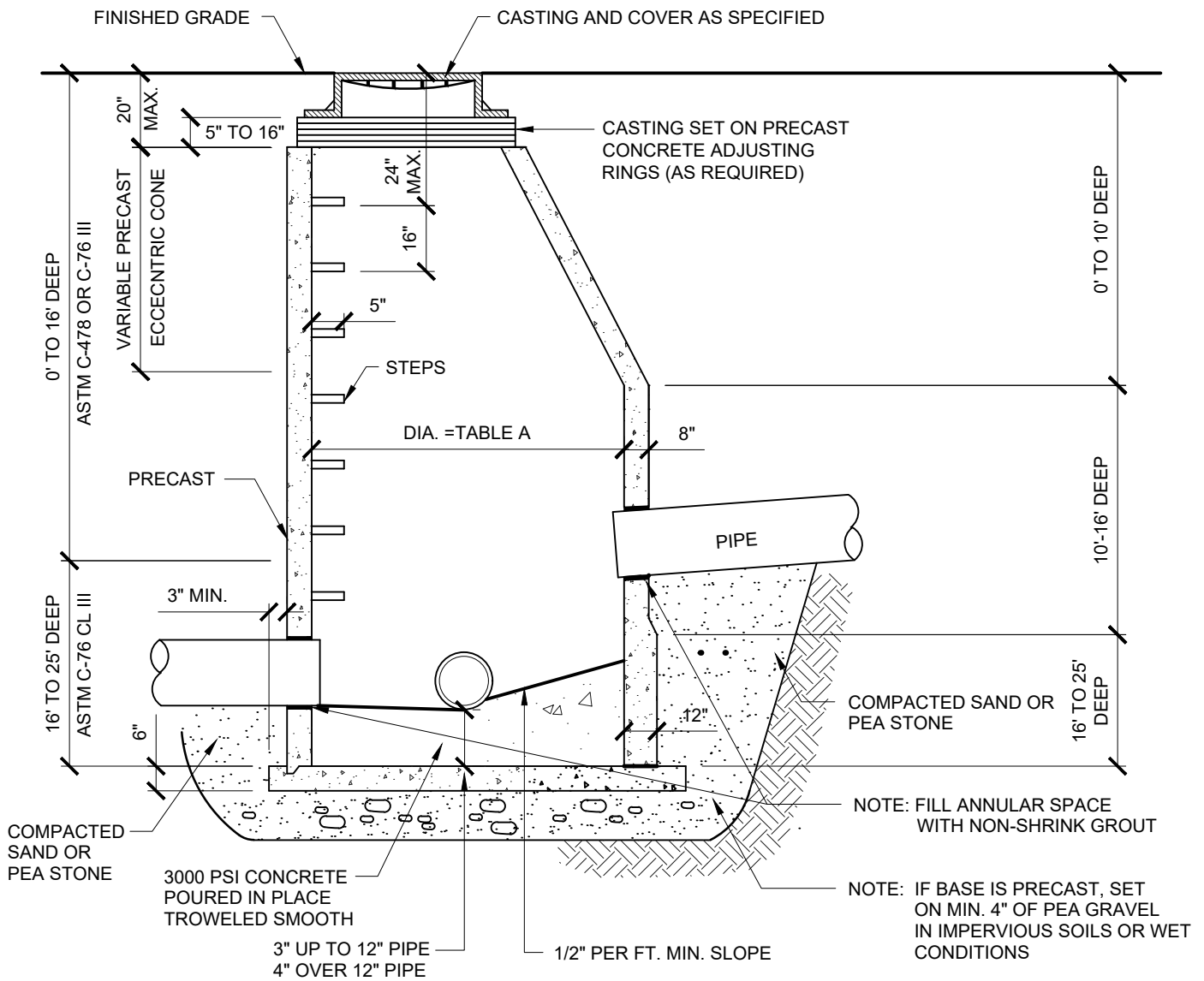
METHODS OF BEDDING PIPE



PLAN

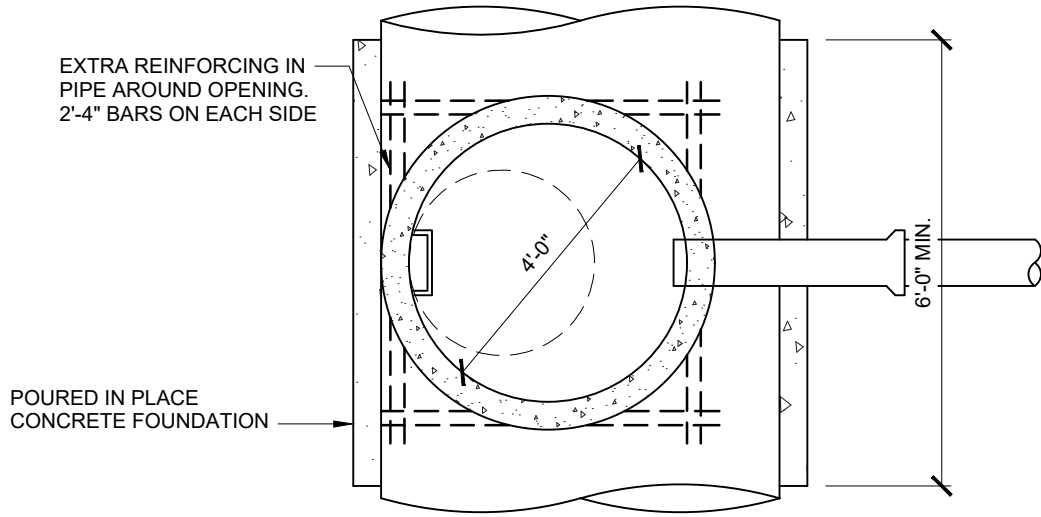
TABLE A

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

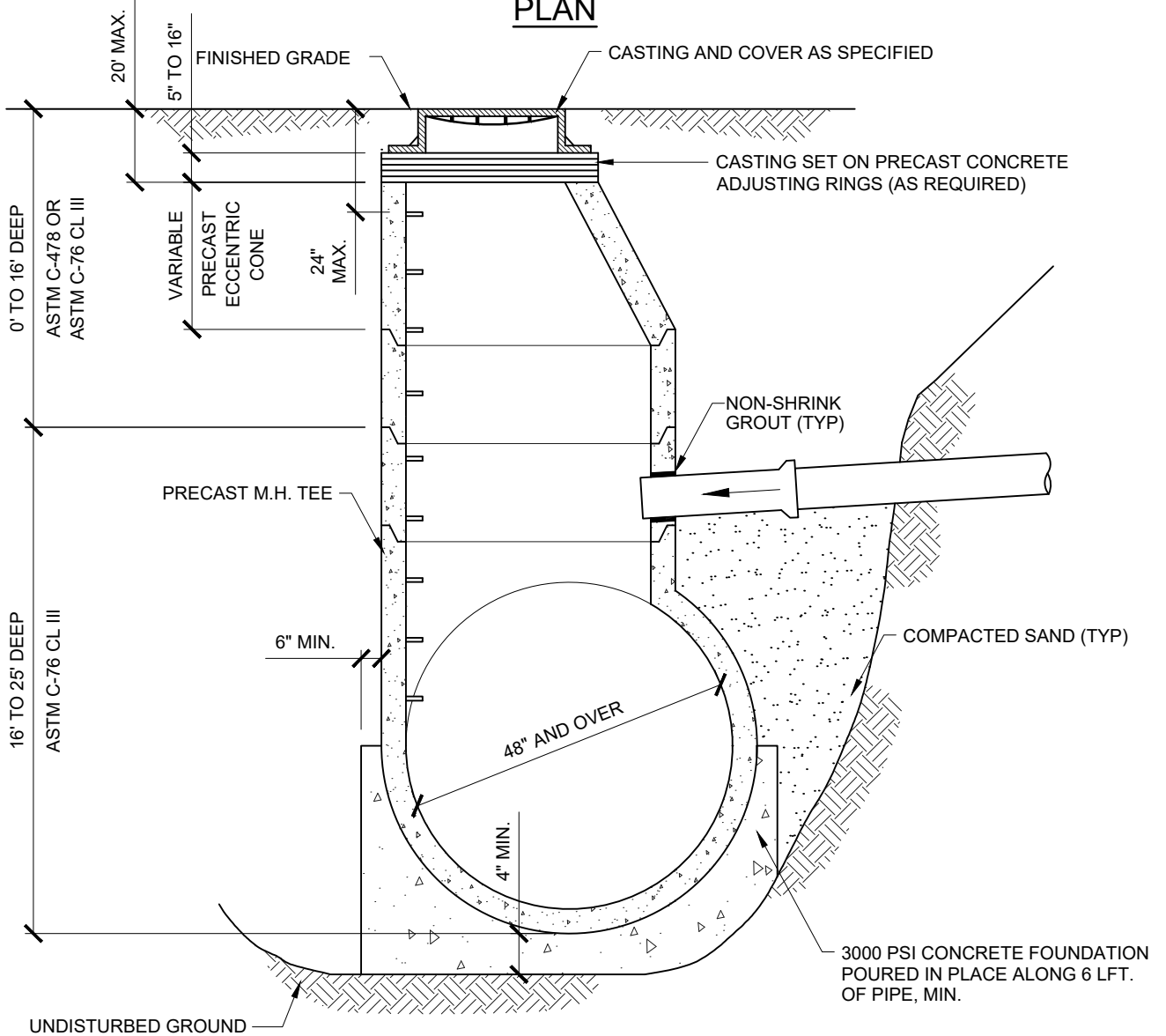


SECTION

STANDARD STORM MANHOLE

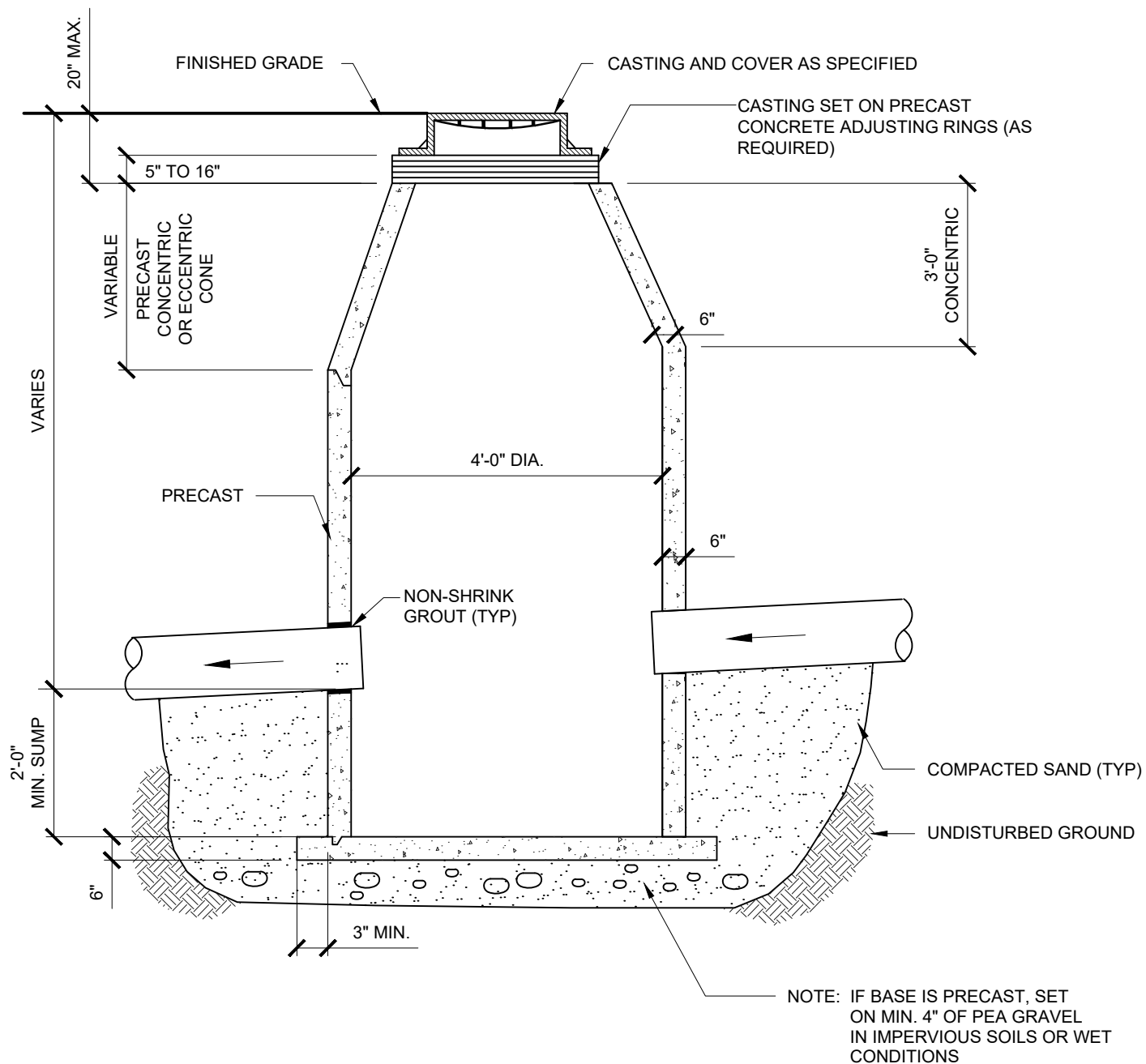


PLAN

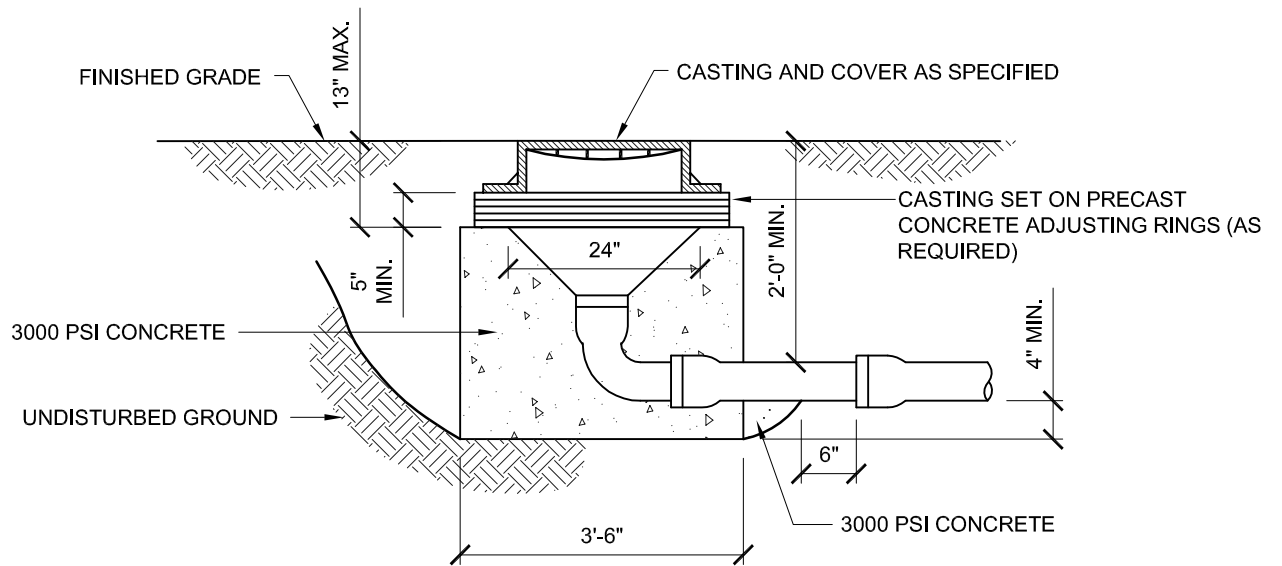


SECTION

STANDARD STORM TEE MANHOLE



STANDARD CATCH BASIN



SPECIAL CURB / YARD INLET

SECTION 02730
SANITARY SEWERS

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes work required for sanitary sewer pipe, structures and appurtenant work.

1.02 REFERENCES:

- A. ASTM - American Society Testing Materials, latest edition
- B. NCPI - National Clay Pipe Institute.

1.03 SUBMITTALS:

- A. Submit the following for review by TOWNSHIP or TOWNSHIP's ENGINEER:
 - 1. Manufacturer's certifications for all pipe and fittings.
 - 2. Plan of proposed equipment and method for leakage testing.
 - 3. Details of connection to sanitary sewer system.
 - 4. Submittals must be approved by ACT DPU prior to construction.
- B. Report witness measurements and "as-built" elevation on end of service lines.
 - 1. Provide measurements from two permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.
 - 2. Provide invert measurements at all manholes.
- C. Report presence of underground utilities and drains.
- D. Line and grade control method other than Laser Beam shall be approved by TOWNSHIP or TOWNSHIP's ENGINEER.
- E. Submittal of drawings of record plans:
 - 1. Provide the Public Utility Department two (2) printed sets (24 x 36) and one (1) electronic file (PDF).
 - 2. Provide the Township Engineer two (2) electronic files with as-constructed dimensions and witnesses(PDF and DWG).

1.04 JOB CONDITIONS:

- A. Existing sanitary sewer system shall remain operational. Contractor is required to provide bypass pumping as needed for construction.
- B. Do not bypass wastewater to ground or surface waters.
- C. Clean up promptly following pipe installation and within maximum of 400 feet behind pipe laying operation. Cleanup includes backfill and rough grading.

- D. The Township Inspector or Township Engineer shall be provided notice and allowed three (3) work days to perform major inspections for sanitary sewer. Major inspections include the following;
 - 1. Substantial Completion
 - a. Initial inspection and follow-up inspection will be at no charge. Any subsequent inspections will be charged to the developer.
 - 2. Completion
 - a. Initial inspection and follow-up inspection will be at no charge. Any subsequent inspections will be charged to the developer.

PART 2 - PRODUCTS

2.01 PIPE:

- A. Sanitary sewer pipe 8" – 15" shall be plastic truss (PVC), ASTM D2680 or plastic (PVC), ASTM D3034-SDR35 for depths up to 19 feet and SDR26 for depths over 19 feet unless otherwise approved by TOWNSHIP and TOWNSHIP's ENGINEER. Pipes larger than 15" shall be plastic (PVC) solid wall, ASTM F679 or Vylon closed profile, ASTM D1784.
- B. Service Pipe: Provide minimum 6-inch, same classification as mainline pipe.
 - 1. ASTM D3034-SDR35 or 26, or ASTM D2680.
- C. Plastic Pipe: Provide seating marks where couplings are used for jointing.
 - 1. Joints: Provide rubber "O" ring.
- D. Joint Repair or Connecting to Existing Sewer Pipe of Different Material:
 - 1. Provide gasketed slip coupling or ROMAC XR-501. Flexible couplings shall not be used.
- E. Provide Joint Materials as Indicated for the following Pipes:
 - 1. Plastic (PVC): ASTM D3034.
 - 2. Plastic (PVC) truss pipe: ASTM D2680.
 - 3. Plastic (PVC) solid wall pipe: ASTM F679.
 - 4. Vylon closed profile pipe: ASTM D3212.
 - a. Lateral connections shall be made with InsertaTee at top of pipe.
- F. Use hydraulic cement for flow channel work.

2.02 MANHOLES:

- A. Manholes shall be precast units or cast-in-place concrete – no brick allowed.
- B. Maintain uniform diameter from manhole base to cone section.
- C. Precast Units: ASTM C76 Class III or ASTM C478 with circular reinforcement, modified for "O" ring gaskets.
 - 1. Pipe Openings: Provide flexible, watertight rubber boot using mechanically compressed flexible joint re-seal, link-seal, Pressure Wedge, Kor-N-Seal or equal. Conform to ASTM C923.
- D. Concrete: 4000 psi 28 day, 4-inch maximum slump.
- E. Concrete Brick: ASTM C55, Grade N-1 (repair of brick manholes ONLY)
- F. Grade Rings: ASTM C478 with mastic rope seal or mortar for adhesion.

- G. Mortar (For grade ring adjustments only): ASTM C270: 1-part Portland cement, 1-part lime and 3 parts sand by volume.
- H. Manhole Steps:
 - 1. Plastic with $\frac{3}{8}$ -inch steel rod reinforcement conforming to ASTM D4101, Type II.
 - 2. Dimensions: 10-inch deep by 10-inch wide, 5-inch tread depth.
 - 3. Comply with applicable Occupational Safety and Health Administration Standards (OSHA).
- I. Standard Manhole Castings: East Jordan 1040 A cover or – two (2) hole cover with the words “ALLENDAL AREA SANITARY SEWER” & East Jordan 1045 Z1 frame.
- J. Bituminous Waterproofing: ASTM D449.
- K. Cement Waterproofing: Masonry filler.

2.03 FLOWABLE FILL:

- A. Flowable fill shall be low strength, lean mix, flowable mortar meeting the specifications in Article 3.05 SCHEDULES.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Alignment and Grade:
 - 1. Deviations: Notify OWNER's ENGINEER and obtain instructions to proceed where there is a grade discrepancy, or an obstruction not shown on the plans.
 - 2. Laser Beam Control: Provide.
 - 3. Check grade: At set-up point, 25-foot, 50-foot, 100-foot and 200-foot points thereafter to the next set-up point. Pipe invert elevation is to be measured prior to setting manhole cone for as-built drawings.
 - 4. Projector advancement: Reset at each manhole.
- B. Bedding:
 - 1. Method: See Article 3.05 SCHEDULES.
 - 2. Provide bedding area backfill in accordance with MDOT Standard Plan No. R-83B.
 - 3. Provide continuous bearing by supporting entire length of pipe barrel evenly.

3.02 INSTALLATION:

- A. Laying pipe:
 - 1. Direction shall be upstream with spigot or tongue end downstream and bell end upstream.
 - 2. Joints shall be smooth and clean.
 - 3. Place pipe length and bedding as a unit in a frost free, dry trench.
 - 4. Special supports and saddles: See Article 3.05 SCHEDULES.
 - 5. Sewer joints within 10-feet and above watermain offset, shall be encased in concrete (ref 02220-2.01. A.3)

6. Minimum grade for 8-inch pipe: 0.45%.

Pipe Size	Minimum Required Slope	Pipe Size	Minimum Required Slope
8"	0.45%	21"	0.12%
10"	0.32%	24"	0.10%
12"	0.26%	27"	0.08%
15"	0.20%	30"	0.06%
18"	0.16%		

- B. Jointing:
 1. Provide solvents, adhesives and lubricants as furnished by Manufacturer.
 2. Gasket position: Confirm that the gasket is in place and that the joint is properly made.
- C. Manholes:
 1. General: See Article 3.05 SCHEDULES:
 2. Base bedding: Provide 4-inch pea stone with full and even bearing in impervious soils or wet conditions. Otherwise provide on undisturbed, frost-free, dry subgrade.
 3. Fill joint space completely and trowel between sections of precast units.
 4. Provide casting grade setting as follows:
 - a. Existing pavement: Finished grade.
 - b. Gravel grade: 6 inches below in road R.O.W (only).
 - c. Unpaved areas: Finished grade.
 5. Provide waterproofing on ASTM C478 units and cast-in-place manholes using one of the following methods:
 - a. Bituminous: Apply 1 gallon per 100 sq.ft. to outside free of holidays and open pin holes
 - b. Cement: Apply masonry filler to outside by brushing on two (2) coats, each minimum of 2 lbs. per sq. yd.
 6. Flow channels:
 - a. Construct with concrete up to spring line of pipe unless otherwise directed by Township and slope towards center of manhole.
 - b. Grout flow channel using hydraulic cement. Provide smooth, constant grade across structure.
 - c. Minimum elevation difference between pipe inverts: 0.1 feet.
 7. Casting adjustment: concrete ring between leveling and top course of bituminous.
 8. Drop connections, should be required for all installations without a flow channel, required for drop of 2 feet or more. The alternative drop connection should be used for drops greater than 0.1 feet and less than 2 feet: See ARTICLE 3.05 SCHEDULES.
 9. Place manhole at the end of an existing sewer stub if necessary to accommodate change in grade and / or alignment.
 10. Provide access to all manholes for sewer maintenance vehicles as directed by TOWNSHIP and TOWNSHIP ENGINEER.
 11. Manholes with precast flow channels will not be allowed unless the flow channels meet all requirements of these specifications.
- D. Abandoning and filling existing sanitary sewer:
 1. Plug both ends of the sewer pipe to be abandoned and fill the existing pipe completely with flowable fill. Fill to be utilized if existing sanitary sewer is above the water table.

E. Connections:

1. Expose existing sanitary sewer and structures to which the new work is to be connected to confirm condition, location and elevation.
2. Connect to existing sanitary manhole by coring an opening adequate to insert pipe and flexible water tight rubber boot and secure circumference of pipe with non-shrink cement mortar.
 - a. Relay and repoint loose blocks and bricks on existing block and brick structures. Re-channel flow lines and benches with concrete.
3. Construct manhole over existing sanitary sewer by installing precast manhole doghouse over existing pipe onto precast concrete manhole base. Do not cut open the existing pipe until written approval has been obtained from the TOWNSHIP.
4. Future Sanitary Sewer: Provide the following:
 - a. Plug: Pipe 6-inch through 21-inch with standard disc.
 - b. Bulkhead: Pipe 24-inch and larger with brick and mortar and ½-inch plaster coat outside.
 - (1) 24 inch - 36 inch: 4-inch thick.
 - (2) 42 inch - 60 inch: 8-inch thick.
5. No inside drop connections shall be permitted.

F. Service Lines:

1. Sanitary sewer must be situated along lot's road frontage for service to be provided. All laterals must be located in 10' utility easement (if available) or within the road right of way. Easements will not be allowed to obtain service to a residence.
2. Align at right angles to street or easement line. Locate 15 feet from left property line (facing lot) unless otherwise directed by TOWNSHIP.
3. Grade: Provide at uniform rate from connection or main riser to the property or easement line, minimum 1/4 inch per foot (2%) for residential and commercial uses.
4. Provide minimum depth at street right-of-way line, property line or easement line as follows:
 - a. House with basement: 12 feet below first floor elevation or 3 feet below basement elevation, whichever is deeper.
 - b. Commercial and industrial buildings, schools, churches: As determined by OWNER's ENGINEER.
 - c. The above depths govern, except that the minimum depth at the right-of-way line or property line shall be 6 feet below street or easement centerline grade unless otherwise permitted.
 - d. The above depths are based on homes located at minimum setback from street right-of-way line and with typical 8-foot high ceiling in basement. Depths required may increase based on setback and ceiling heights.
5. Connection fitting:
 - a. Locate as shown on Plans or as directed by OWNER's ENGINEER in field.
 - b. 45° or 60° Wyes: Provide on all pipe except concrete pipe.
 - c. Tees: Allowed only on reinforced concrete pipe.
 - d. No laterals shall be connected to manholes.
6. Main riser will be allowed where cover exceeds 13 feet at mainline.
7. Plugging: Provide standard caps securely blocked.
8. Markers: Place a wood marker (2" x 2" minimum) at end of lateral with sufficient length to extend from invert of lateral to ground surface. Install a steel re-rod 24-inches in length immediately next to the wood marker with the top of the re-rod 2" below grade. Cover 2' x 2' wood marker and steel rerod with 4' long 4-1/2" ID minimum pipe buried 1' foot.
9. Witnesses: Report the following to the Owner's Engineer for preparation of record drawings:

- a. Wyes and Tee: Measurements to nearest downstream manhole.
 - b. Markers: Two (2) measurements to permanent surface features.
 - c. Laterals: Provide lengths and invert elevations.
- 10. Property line Riser: Required on all laterals. See Article 3.05 SCHEDULES.
- 11. Before making a building connection to the sanitary sewer system, the excavation shall be inspected by the Public Utilities Department.
- G. Abandoning existing sanitary lateral: Required on properties with existing sanitary laterals that will not be used. Abandonment of an existing lateral will require a mainline point repair as follows:
 - 1. Sanitary sewer main point repair:
 - a. Abandonment of existing sanitary lateral requires a point repair at the sanitary mainline by way of cured-in-place pipe (CIPP) lining.
 - b. Materials: Source One Environmental PipePatch cured-in-place-pipe lining, or equivalent, is required for sanitary sewer mainline point repairs. Prior to execution of the point repair, contractor must submit manufacturer specifications and certifications of the materials being used for the TOWNSHIP to review.
 - c. Minimum of 48" lining required for CIPP point repair centered at the wye.
 - d. Preparation: Prior to performing the point repair, the sanitary mainline must be cleaned by way of hydraulically propelled high velocity jet spray.
 - e. Finish: The cured liner must provide a smooth transition from the host pipe to the repair. Following completion of the repair, the pipeline must be televised.
 - f. The private end of the sanitary lateral must be cut and capped at the R.O.W or easement.
 - g. Inspections: All sanitary lateral abandonments must be witnessed by the TOWNSHIP. The TOWNSHIP inspector must have 48-hour notice prior to execution of the sanitary lateral abandonment.
- H. By-pass Pumping: Contractor to provide by-pass pumping of wastewater flow as required during construction or replacement of sanitary sewer.
- I. Pipe insulation: Where noted on plans, place 2-inch thick Styrofoam insulation board 4 feet wide over pipe at top of bedding.
- J. No excavation within 10-feet of sanitary sewer or other manner which could cause undermining of service after back fill which could impact its function as determined by Township DPU and /or Township Engineer.

3.03 TESTING AND INSPECTION:

- A. General:
 - 1. **Observation:** By TOWNSHIP or TOWNSHIP's ENGINEER.
 - 2. Testing: Perform upon completion and before connecting to active system.
 - 3. Leakage tests: Provide promptly following installation of sewer pipe including services and keep within maximum 1200 feet behind pipe laying operation.
 - 4. Notification: Clean, pretest and arrange for final inspection and test.
 - 5. Notification: The Township Inspector or Township Engineer shall be provided 48-hour notice and three (3) work days to complete major inspections (See Paragraph 1.04.D).
 - 6. Provide necessary equipment, manpower and assistance.
 - 7. Video televising: Provide prior to paving.
- B. Line and Grade: Allowable drift between structures from proposed alignment will be as follows:
 - 1. Line:

- a. Through 36-inch: 0.20 foot.
 - b. Over 36-inch: 0.40 foot.
 - 2. Grade:
 - a. Allowable sag between pipe joints: 5% of pipe diameter with maximum of 1-inch.
 - 3. Sags in excess of tolerance shall be repaired prior to acceptance by TOWNSHIP. Repaired sections shall be re-televised.
- C. Plastic pipe deformation (required only if video televising indicates a problem):
 - 1. Pipe deflection will be limited to five percent (5%) of diameter.
 - 2. Correction: Repair defects and retest until acceptable.
- D. Video Televising (see Section 02731 – Cleaning and Televising Sanitary Sewers):
 - 1. CONTRACTOR to complete video televising of completed sewers. The sewer main, laterals and manholes shall be cleaned and completely free of debris prior to televising. Flush sewer with flow of water from upstream end immediately prior to televising. Minimum of five (5) gallons of water to be used.
 - 2. Schedule: Televiser after final backfill has been in place a minimum of thirty (30) days, and after shutdown of dewatering operation.
 - 3. CONTRACTOR to provide 1 original (USB Drive) of video of sewers to the Township.
 - 4. The first review will be performed at no charge. Should the inspection fail to meet Township requirements, a subsequent review of corrected items will be performed at no charge. Any subsequent reviews of the televising will be charged to the developer.
 - 5. Repairs causing disturbance to the pipe bedding or backfill will require retesting and an additional mandatory 30-day waiting period for televising.
- E. Leakage Testing:
 - 1. CONTRACTOR to perform exfiltration (air) test.
 - 2. Exfiltration air test will have a holding time not less than that listed in table. Refer to Article 3.05 - Schedules
 - 3. Correction: Repair defects and repeat test until acceptable.
 - a. Method of repairing defects shall be approved by TOWNSHIP or TOWNSHIP's ENGINEER.
- F. Exfiltration (air): Perform in accordance with NCPI Publication, *"Low Pressure Air Test for Sanitary sewers"*, and in accordance with ASTM F 1417, *"Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air"*.
 - 1. Condition: Clean, dry pipe
 - 2. Procedure:
 - a. All pressure readings are above the average groundwater head.

3.04 ADJUST AND CLEAN:

- A. General: Keep pipe and structures clean as work progresses.

3.05 SCHEDULES:

- A. Exfiltration Air Test Table.
- B. Water / Sewer Leakage & Pressure Testing Report Form.
- C. Specification FF-1 for Flowable Fill.

- D. Standard Details:
 - 1. Special supports for underground utilities / pipe saddles.
 - 2. Methods of bedding pipe.
 - 3. Standard sanitary manhole.
 - 4. Watertight manhole cover.
 - 5. Plastic pipe manhole junction.
 - 6. Sanitary sewer cleanout.
 - 7. Standard riser details.
 - 8. Underground utilities detail.
- E. Manhole Final Inspection Punch List.

END OF SECTION

EXFILTRATION AIR TEST

TIME REQUIRED FOR LOSS OF PRESSURE FROM 3.5 PSIG TO 3.0 PSIG FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015 (CU. FT./MIN./SQ.FT. OF INTERNAL SURFACE AREA)

Pipe Diameter (in.)	Mini-mum time (min; sec.)	Length for Min. Time (ft.)	Time for Longer length (sec.)	Specification Time for Length (L) Shown (min:sec)											
				100ft	150ft	200ft	250ft	300ft	350ft	400ft	450ft	500ft	550ft	600ft	
6	2:50	398	.427L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12	3:34	3:55	4:16	
8	3:47	298	.760	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42	6:20	6:58	7:36	
10	4:43	239	1.187L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54	9:54	10:53	11:52	
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:48	11:24	12:50	14:15	15:40	17:06	
15	7:05	159	2.671L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02	22:16	24:29	26:43	
18	8:30	133	3.846L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51	32:03	35:16	38:28	
21	9:55	114	5.235L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16	43:37	47:59	52:21	
24	11:20	99	6.837L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17	56:59	62:41	68:23	
27	12:45	88	8.653L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54	72:07	79:20	86:33	
30	14:10	80	10.683L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07	89:02	97:56	106:51	
33	15:35	72	12.926L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57	107:44	118:31	129:17	
36	17:00	66	15.384L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23	128:13	141:02	153:51	
39	18:25	61	18.054L	30:57	45:09	60:11	75:14	90:16	105:19	120:22	135:24	150:32	165:31	180:34	
42	19:50	57	20.939L	34:54	52:21	69:48	87:15	104:42	122:09	139:36	157:03	174:31	191:58	209:25	

Note: When 2 sizes of pipe are involved, the time shall be computed by the ratio of lengths involved.

Example: 400 feet of 10-inch pipe and 200 feet of 6-inch pipe

$$\text{Time} = \frac{\text{Length (1)} \times \text{Time (1)} + \text{Length (2)} \times \text{Time (2)}}{\text{Length (1)} + \text{Length (2)}} = \frac{400 \times 7:54 + 200 \times 2:50}{400 + 200}$$

$$= \frac{400 \times 474 + 200 \times 170}{400 + 200} = 373 \text{ seconds} = 6:13 \text{ (min:sec)}$$

SPECIFICATION FF-1 SPECIFICATION FOR FLOWABLE FILL

DESCRIPTION

Flowable Fill (FF) shall consist of a mixture of (a) Portland cement, fly ash, and water; (b) Portland cement, granular material, fly ash, and water; or (c) fly ash, granular material and water. All Materials will be as specified in the Standard Specifications or as stated. All flowable fill after setting is intended to be removable by conventional mechanical excavation methods.

MATERIALS

		<u>Specific Gravities***</u>
Portland Cement	MDOT Section 901	3.15
Fly ash	ASTM C 618(1)*	2.40
Granular material Class II **	MDOT Section 902	2.60
Water	MDOT Section 911	1.00

* Except there is no limit on the loss on ignition.

** Except that 100% shall pass 19mm sieve.

*** Specific gravity values used for mix proportions given. If material used differs from these values appropriate adjustments should be made.

OPTIONAL FLOWABLE FILL (FF) MIXTURES

FF Mix Number One*

Cement Stabilized Fly Ash Mixture (Class F Fly Ash)

Portland Cement		100 lb/ft ³
Fly ash	(Class F)	2,000 lb/ft ³
Water	Sufficient water to produce the desired flowability	(approx. 3 gal/ ft ³)

FF Mix Number Two*

Controlled Density Fill Mixture (Class F Fly Ash)

Portland Cement		50 lb/ft ³
Fly ash	(Class F)	500 lb/ft ³
Granular material		2,850 lb/ft ³
Water	Sufficient water to produce the desired flowability	(approx. 1 gal/ft ³)

FF Mix Number Three*

Controlled Density Fill Mixture (Class C Fly Ash)

(due to the variability of type 'C' fly ash there is no suggested mix)

*NOTE: The ready-mixed concrete producer supplying the flowable fill shall have a 28-day test on the mix option to be used for the trench backfill showing that the compressive strength is less than 1034 kPa for the fly ash from the same source that will be used for the trench backfill.

TRANSPORTING AND CONSTRUCTION METHODS

The temperature of the flowable fill mix as manufactured and delivered shall be at least 50° F.

Mixtures shall be transported to the point of placement in a revolving drum mixer or agitator.

During placement operations around manholes and in utility trenches, care shall be used to avoid dislocating any pipes due to fluid pressure from the flowable fill by even placing of the material. Any pipes within the backfill area should be considered for securing to avoid buoyant effect of flowable fill.

When Flowable Fill (FF) is used in pavement cuts the fill shall be placed to the top of pavement. After setting, the flowable fill is to be removed to the bottom of a concrete pavement patch or to the top of bituminous base course.

WATER/SEWER LEAKAGE & PRESSURE TESTING REPORT

PROJECT: _____
 PROJECT NO.: _____
 LOCATION: _____

DATE: _____
 INSPECTOR: _____
 REPORT NO.: _____

LOCATION	TEST NO.	PIPE SIZE (IN.)	LENGTH OF PIPE (LFT.)	PRESSURE AT START OF TEST (PSI)	PRESSURE AT COMPLETION OF TEST (PSI)	ALLOWABLE LOSS (GAL/HR)	ACTUAL LOSS (GAL/HR)	TIME REQUIRED FOR TEST	ACTUAL TIME OF TEST	APPROVED	REJECTED	REMARKS

WATERMAINS:

- PRESSURE TEST: DURATION = 1 HR.
140 TO 150 PSI @ LOWEST POINT
- LEAKAGE TEST: DURATION OF TEST = 2 HRS.
ALLOWABLE LOSS:

$$L = \frac{SD \times \text{square root } (P)}{148,000}$$

148,000

L = LEAKAGE (GALLONS PER HOUR)

S = LENGTH OF PIPE (FEET)

D = NORMAL PIPE DIAMETER (INCHES)

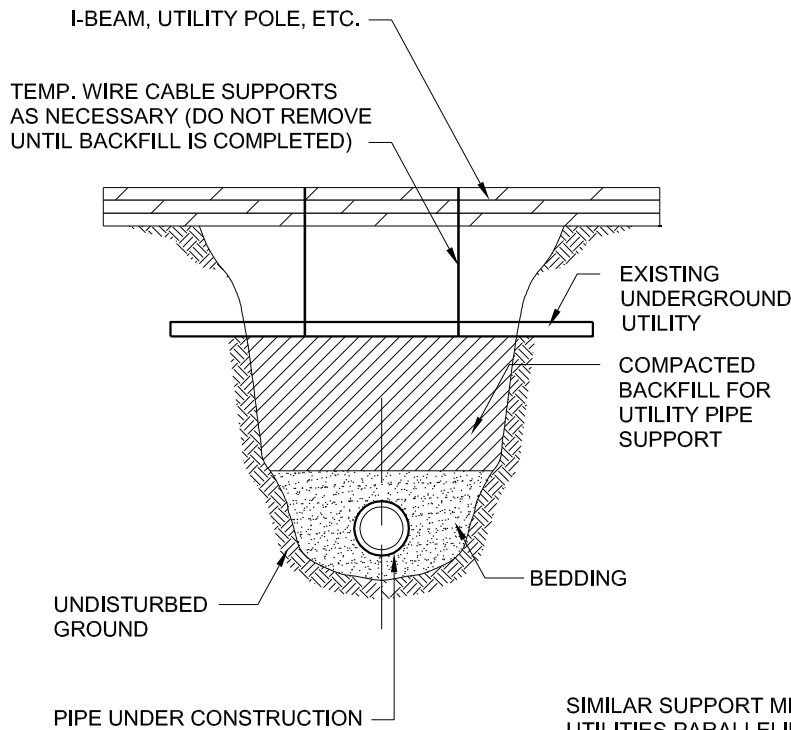
P = AVERAGE TEST PRESSURE (PSI GAUGE)

- VALVES: ALLOWABLE LEAKAGE = LESS THAN 10 PSI IN 5 MINUTES W/PUMP OFF

(120 psi air, 150 psi water)
 LEAKTST.XLS

SEWERS:

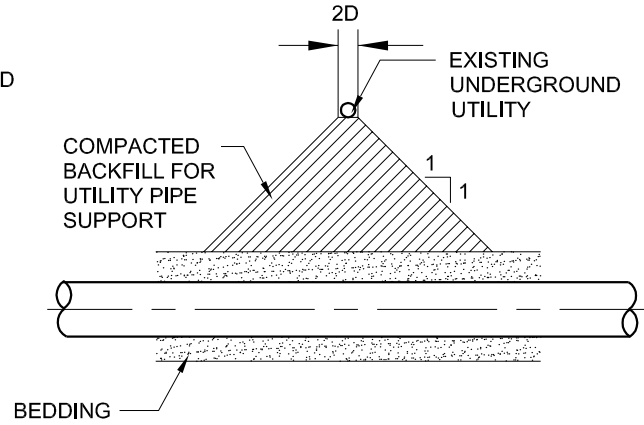
- EXFILTRATION AIR TEST: DURATION = (SEE CHART ON BACK)
 3.5 PSI AFTER STABILIZATION OF PRESSURE
 PRESSURE LOSS FROM 3.5 TO 2.5 PSI MUST NOT EXCEED TIME LIMITS
 TIME FOR 2 OR MORE SIZES IN SAME RUN SHALL BE COMPUTED AND
 ADDED TOGETHER



SECTION

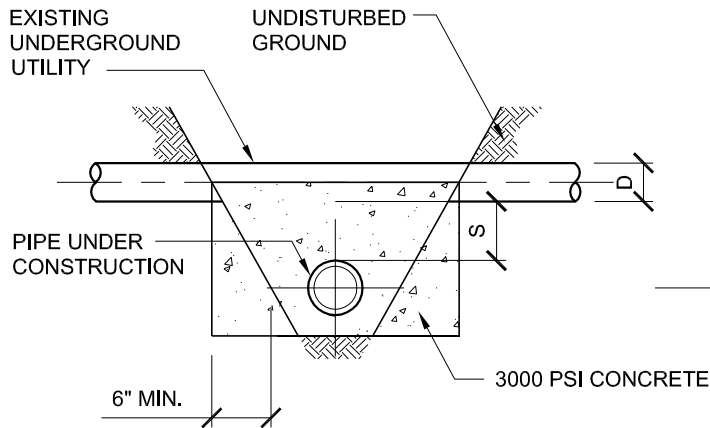
SIMILAR SUPPORT METHODS APPLY TO UTILITIES PARALLELING AND ABOVE THE PIPE UNDER CONSTRUCTION

NOTE: MAINTAIN EXISTING COATING ON UTILITY

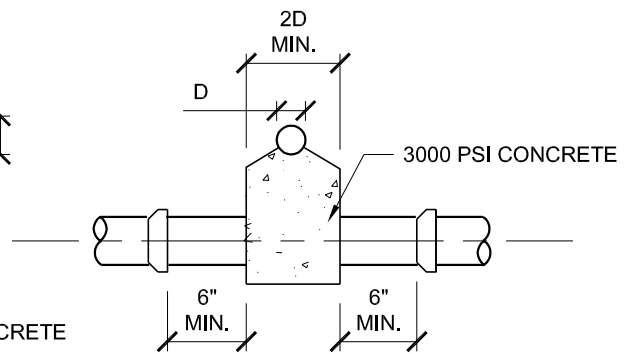


ELEVATION

SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES



SECTION

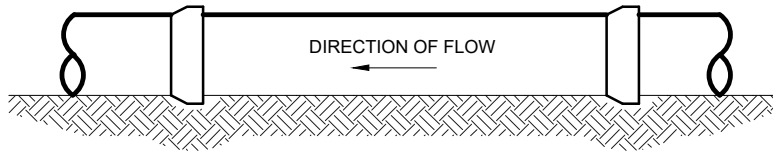


ELEVATION

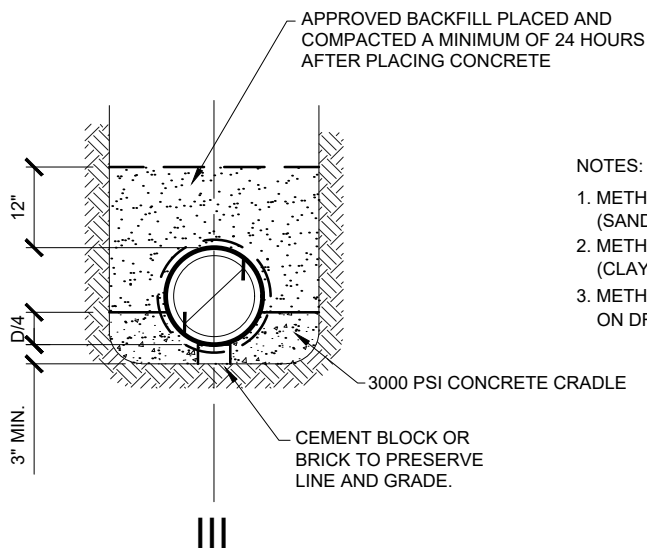
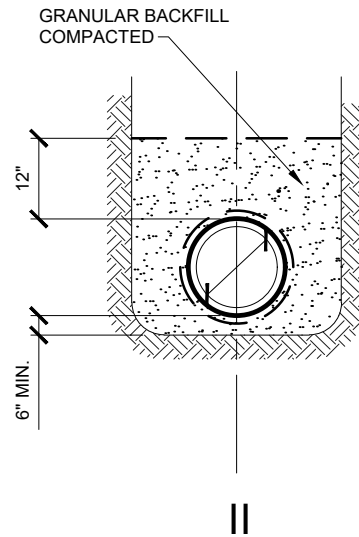
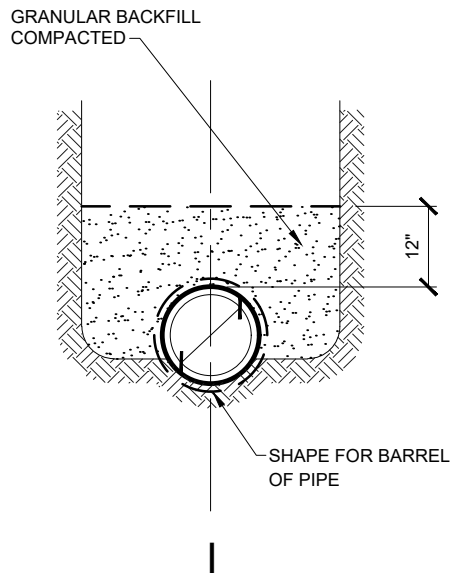
NOTES:

1. PIPE SADDLE REQUIRED WHEN SEPARATION (S) IS 12 INCHES OR LESS UNLESS OTHERWISE DIRECTED OR SHOWN ON PLANS
2. PIPE SADDLE IS NOT REQUIRED FOR PLASTIC, STEEL, LEAD OR COPPER PIPE 2" OR SMALLER.

PIPE SADDLES



EXCAVATION FOR BELLS



NOTES:

1. METHOD I: IN AREAS OF UNCONSOLIDATED SOILS (SAND, GRAVEL, ETC.)
2. METHOD II: IN AREAS OF CONSOLIDATED SOILS (CLAY, HARDPAN, ROCK, ETC.)
3. METHOD III: IN AREAS INDICATED ON DRAWINGS

METHODS OF BEDDING PIPE

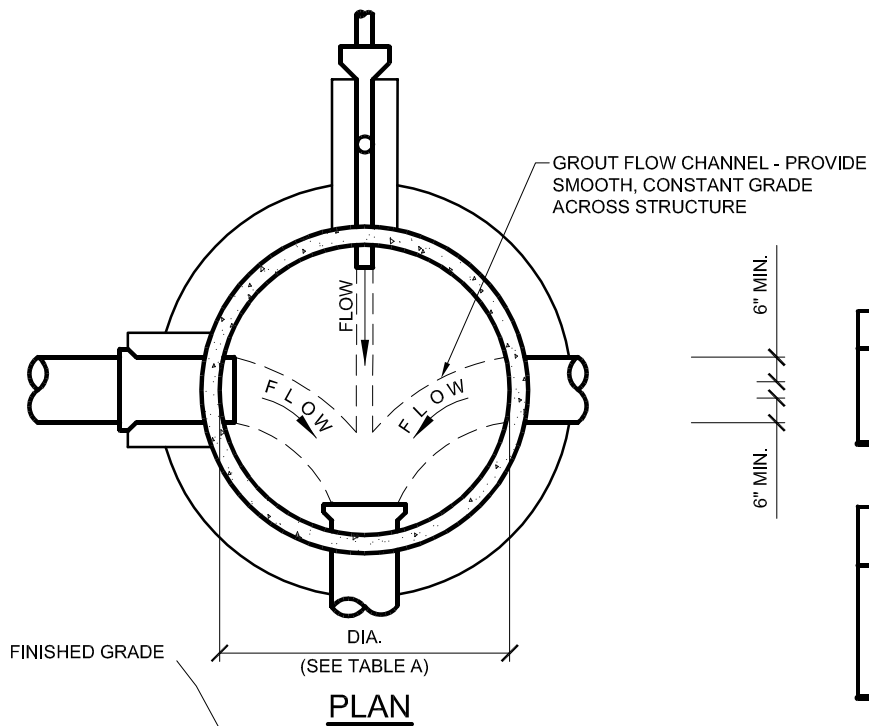
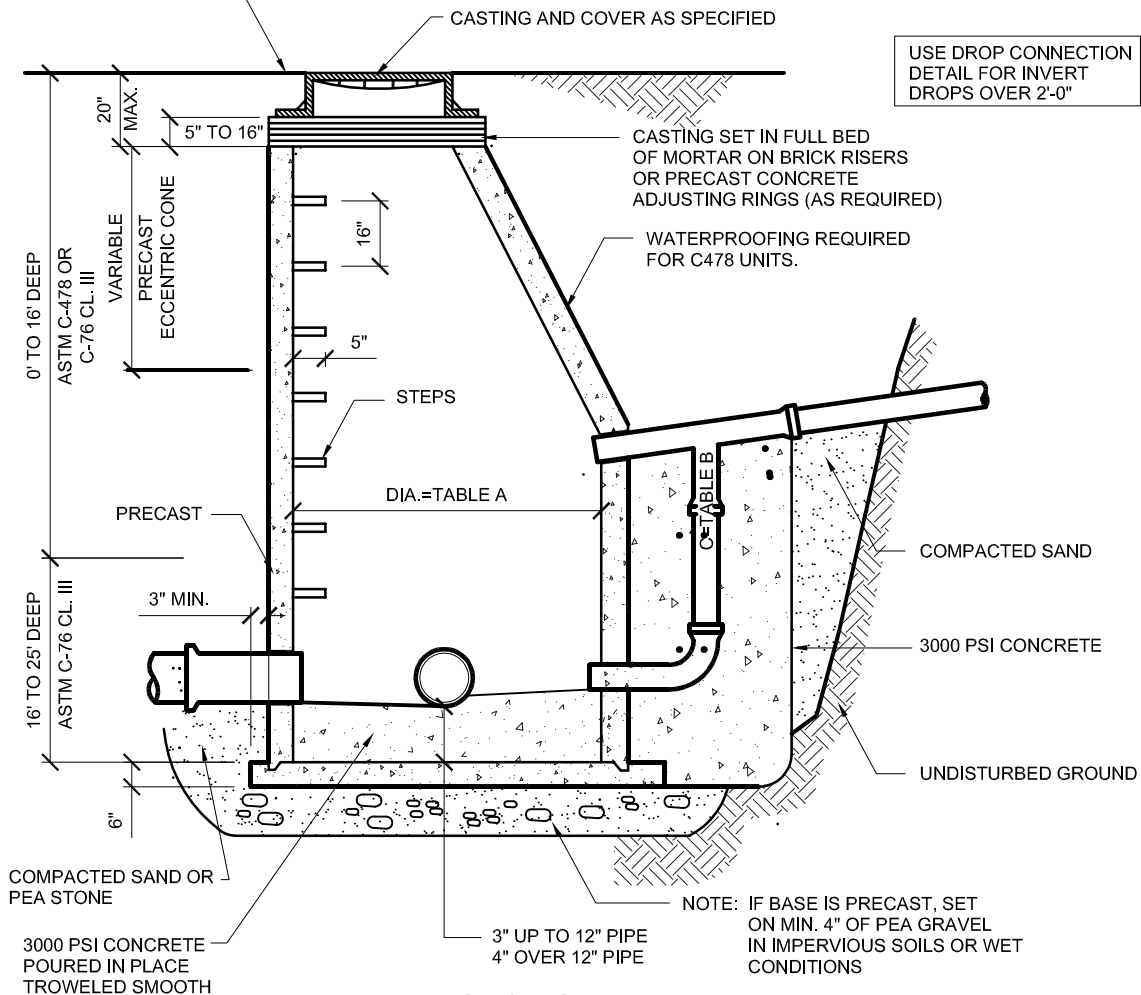


TABLE A

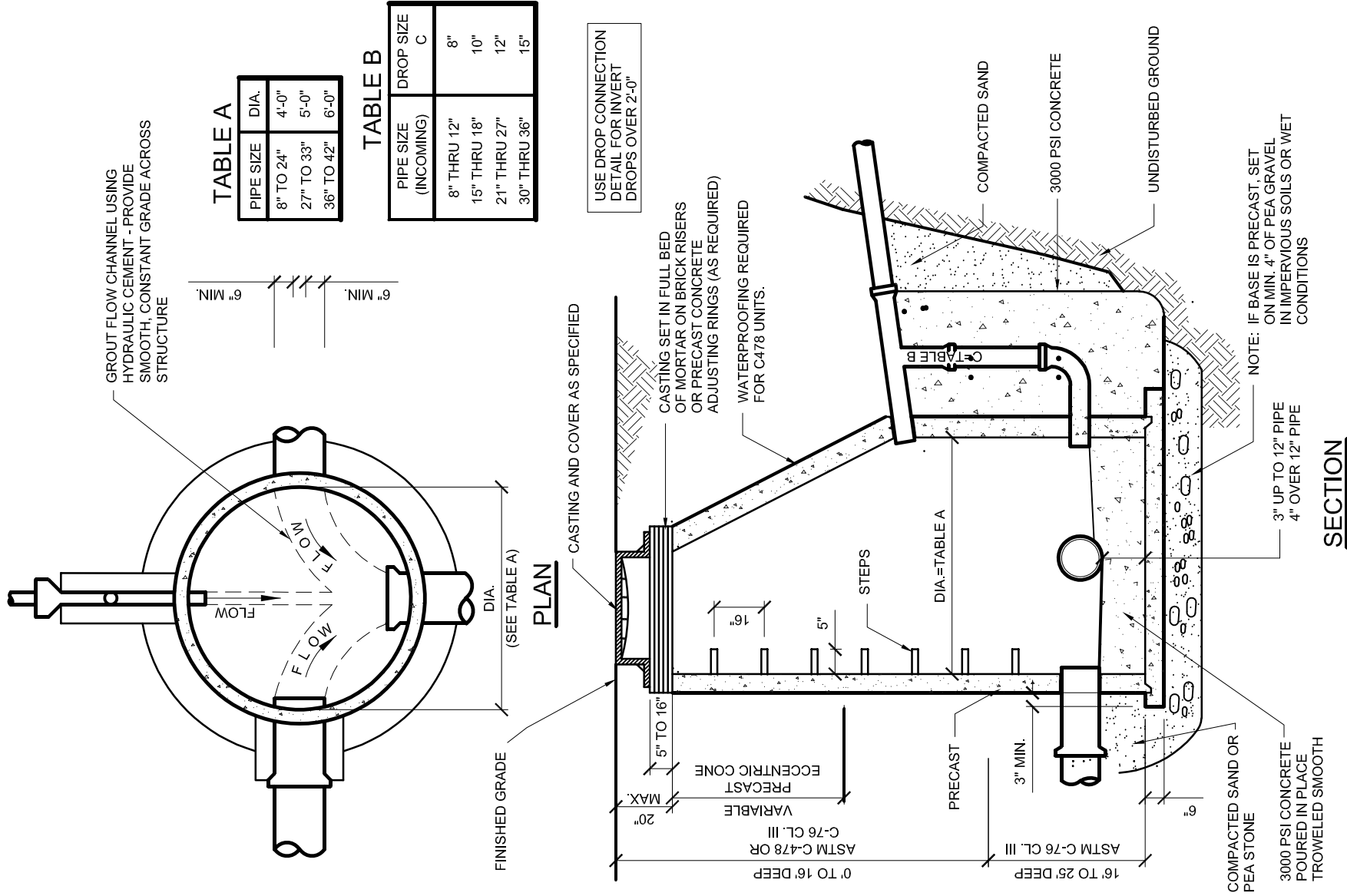
PIPE SIZE	DIA.
8" TO 24"	4'-0"
27" TO 33"	5'-0"
36" TO 42"	6'-0"

TABLE B

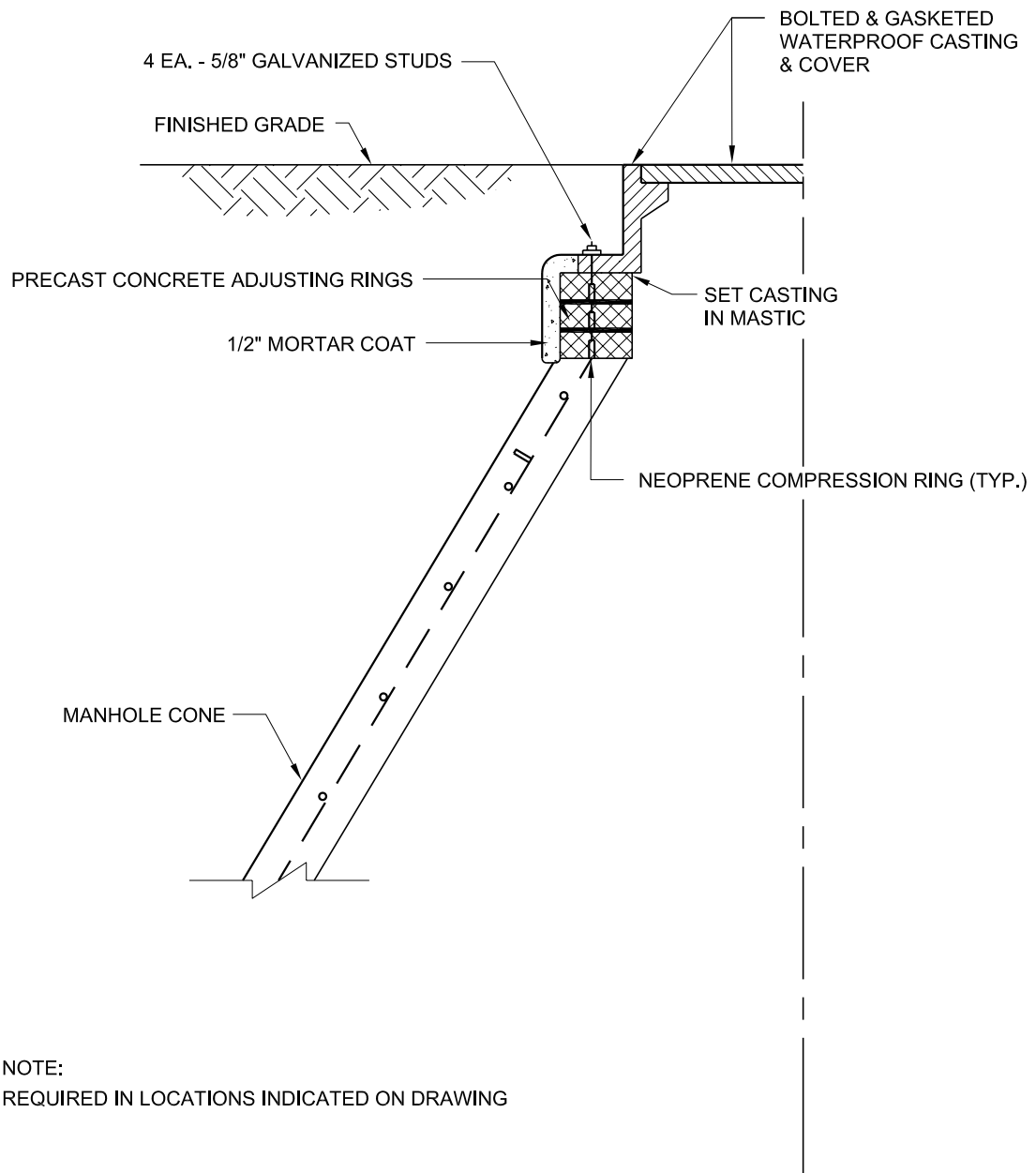
PIPE SIZE (INCOMING)	DROP SIZE C
8" THRU 12"	8"
15" THRU 18"	10"
21" THRU 27"	12"
30" THRU 36"	15"



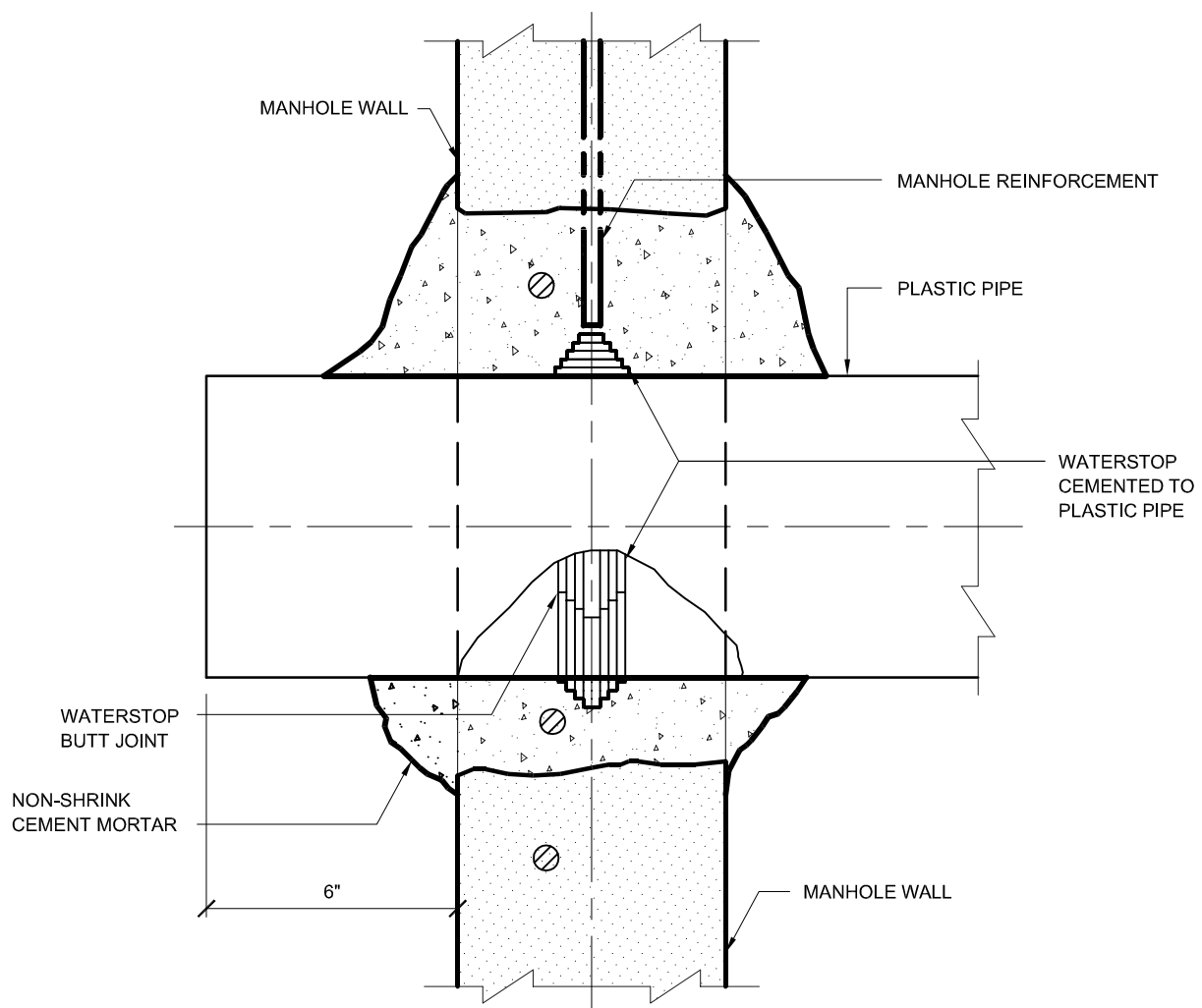
STANDARD SANITARY MANHOLE



STANDARD SANITARY MANHOLE



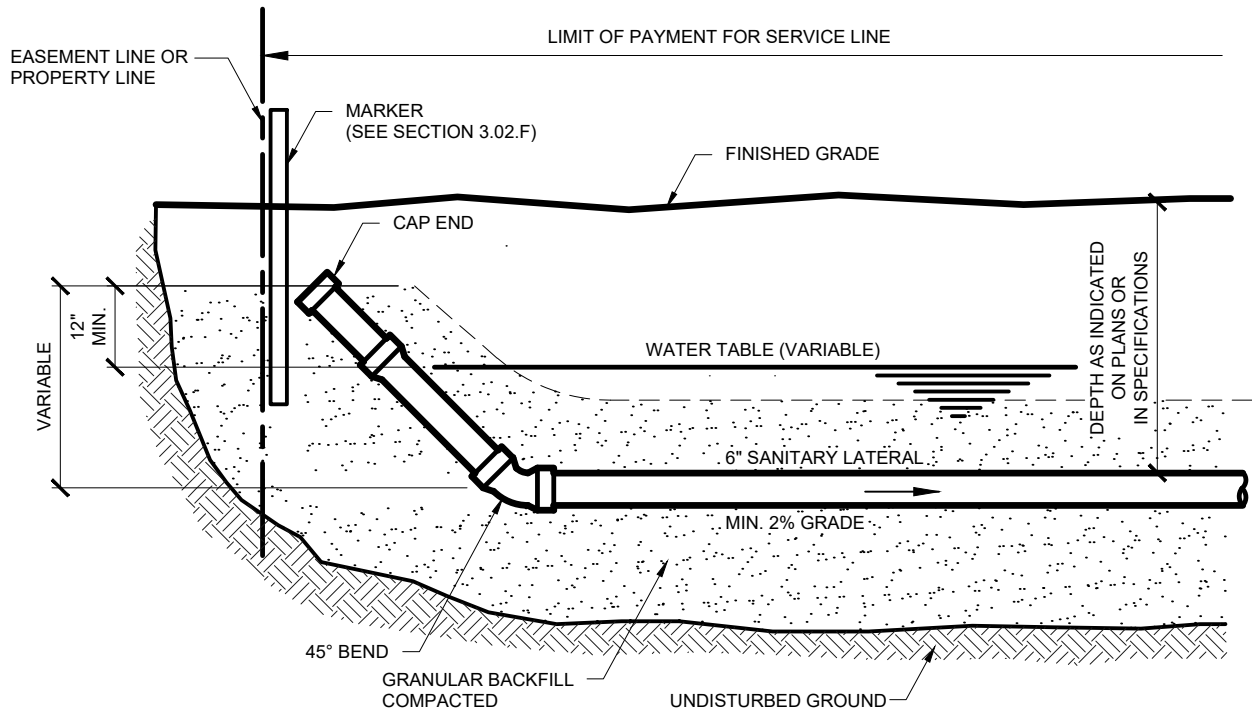
WATER TIGHT MANHOLE COVER



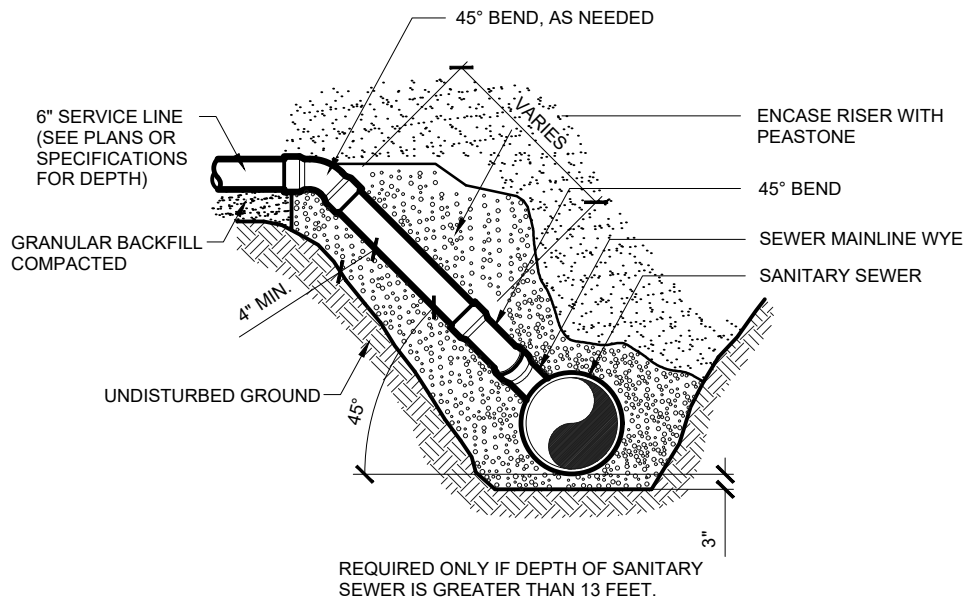
NOTE:

TO BE USED ONLY FOR CONNECTION TO EXISTING
MANHOLE WHERE FLEXIBLE RUBBER BOOT CANNOT
BE INSTALLED OR AS ALLOWED BY ENGINEER

PLASTIC PIPE MANHOLE JUNCTION

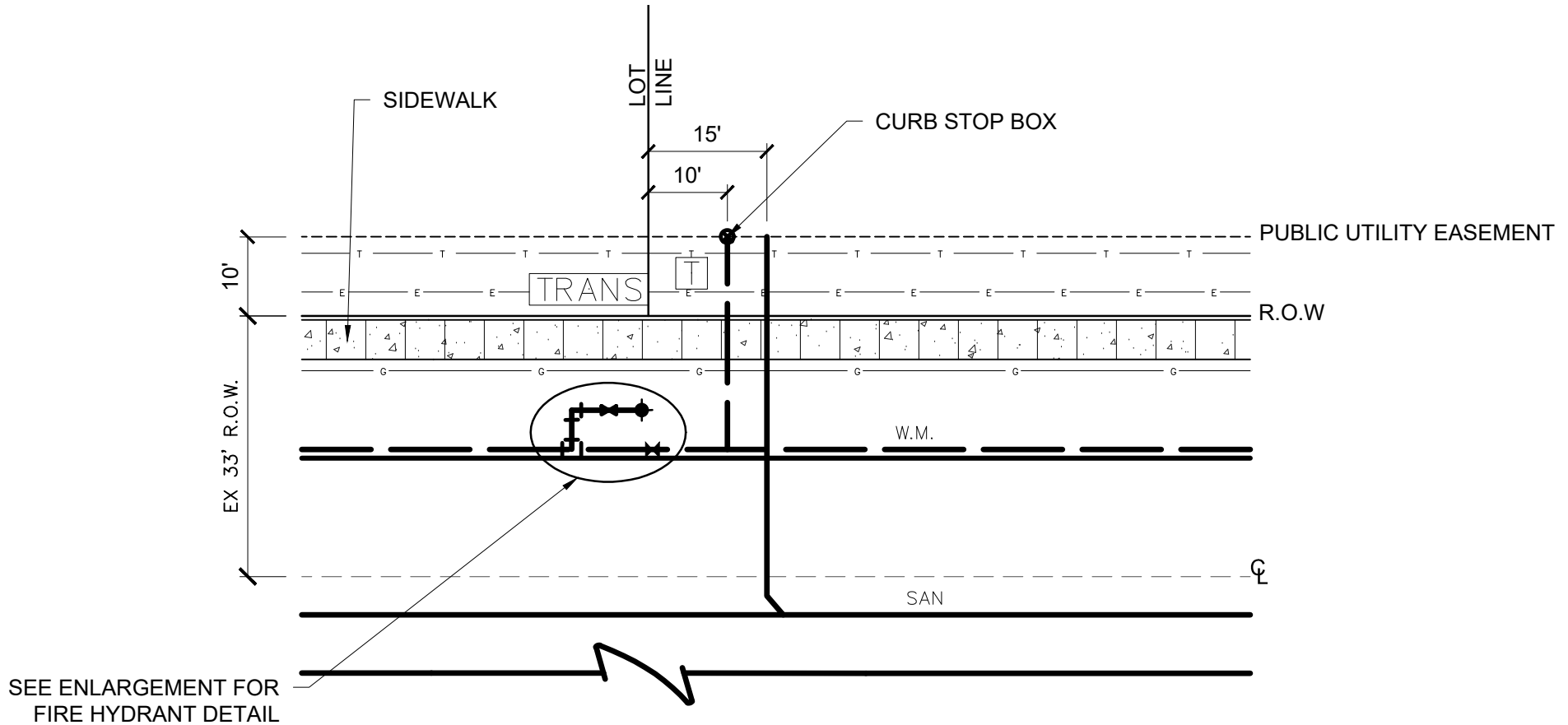


PROPERTY LINE RISER



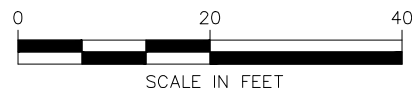
MAINLINE RISER

STANDARD RISER DETAILS



UNDERGROUND UTILITIES

DRAWING TO SCALE



LEGEND

— E — E — Electrical
— T — T — Telephone
— G — G — Gas

T Telephone Pedestal

TRANS Transformer



MANHOLE FINAL INSPECTION PUNCH LIST

- ☐ Verify specification for correct casting.
- ☐ Record depth of all inverts to top of casting.
- ☐ Verify chimney adjustment rings are completely cemented in place and plaster coated.
- ☐ Verify casting is centered in the opening and completely cemented in place with no voids between casting and top of chimney (check maximum dimensions – see manhole detail).
- ☐ Cement lift holes and all penetrations.
- ☐ Verify pipe penetrations are properly sealed.
- ☐ Flow lines are completed and smooth with no high or low spots.
- ☐ Flow line is poured up to spring line or ½ the diameter of pipe.
- ☐ Benches sloped to flow line at 1" per foot minimum.
- ☐ All voids in walls and bottom are cemented.
- ☐ Manhole steps and bottom are clean of concrete, bituminous, dirt, debris, etc.
- ☐ Verify slope is correct from proposed upstream to down-stream inverts. Must have a minimum of 0.1 feet of elevation drop across inverts.
- ☐ Drainage structure constructed of blocks or bricks plaster coated inside of entire structure.
- ☐ Verify catch basin sumps are clean.
- ☐ Casting has been properly adjusted prior to final top course (check tilt to match pavement cross slope).
- ☐ Final inspection completed before final top course of asphalt is laid.

RECOMMENDED SAFETY CHECK LIST (may not be all-inclusive)

1. Use vehicle to protect yourself from traffic.
2. Use construction cones on street with traffic (4 minimum)
3. Always wear reflectorized safety vest.
4. Follow Confined Space Permitting & Entry Procedures if entering a manhole.

SECTION 02731

CLEANING AND TELEVISIONING SANITARY SEWERS

PART 1 – GENERAL

1.01 SUMMARY:

- A. This Section includes work required for the cleaning and televising (video inspection) of sanitary sewers.
- B. Castings must be set to the established gravel grade.
- C. Notification: The Township Inspector or Township Engineer shall be provided notice and allowed three (3) work days to complete major inspections.

1.02 RELATED SECTIONS:

- A. Section 02730 – Sanitary Sewers.

1.03 SUBMITTALS:

- A. Submit the following to Allendale Charter Township Department of Public Works after completion of the sewer cleaning and televising:
 - 1. One copy of a bound written report of the video inspection including the following information:
 - a. Specific details as to the internal condition of the sewer and manholes televised noting location and condition of any broken or crushed pipe, obstructions, defective joints, misalignment in line and grade, infiltration, service laterals, manhole flow channels, etc. per N.A.S.S.C.O. requirements for MACP/PACP grading.
 - b. Length of sewer section, size, pipe material, manhole identification numbers and/or plan stationing, street name, etc.
 - 2. Original of the inspection video to Allendale DPU on a USB drive in protective case and labeled. A MDB file must be included.
 - 3. A read-only program shall be provided for Allendale DPU use.

1.04 JOB CONDITIONS:

- A. Maintain existing sanitary sewer system operational, if applicable.

PART 2 – PRODUCTS

2.01 EQUIPMENT:

- A. Sewer Cleaning Equipment:
 - 1. Shall be capable of removing all dirt, grease, rocks and other deleterious materials without causing damage to the sewer pipe
 - 2. Must be high velocity water-jetting, vacuum
 - 3. Necessary pulleys and supports shall be installed in manholes so as not to restrict the cleaning operation or damage existing manholes.
 - 4. Shall be capable of cleaning sewer lengths of up to 800 feet with vehicular access to one manhole only.

- B. Video Camera:
1. Camera operator to be PACP certified.
 2. Shall be specifically designed and constructed for the required video inspection and shall be capable of operating under 100% humidity conditions.
 3. Shall have "pan / tilt and rotate" capabilities for viewing into lateral connections and manholes.
 4. Shall be capable of producing quality color picture.
 5. Shall record video continuously for each sewer section from manhole to manhole. The recording speed and electronics shall be equal to that which can be played back on standardized equipment in the electronics industry.

PART 3 – EXECUTION

3.01 PREPARATION:

- A. Sewer and Manhole Cleaning:
1. Clean sewer mains, laterals and manholes until they are completely free of debris prior to televising (video inspection).
 2. High velocity water-jetting of all debris to downstream manholes.
 3. Remove all sludge, dirt, sand, rocks, grease and other solid or semisolid material resulting from the cleaning operation at downstream manholes. Passing material from manhole section to manhole section will not be permitted.
 4. Properly dispose of removed material.
 5. If sewer televising indicates that the sewers, laterals and manholes have not been **completely** cleaned free of debris, the sewers, laterals and manholes shall be re-cleaned and re-televised at no additional cost to the Township.

3.02 PERFORMANCE:

- A. Televising (video inspection):
1. Flush sewer with flow of water from upstream end immediately prior to televising. Minimum five (5) gallons of water to be used.
 2. Move camera through sewer in either direction at a moderate and uniform rate (30 to 40 feet per minute) per N.A.S.C.O specifications for P.A.C.P inspection, stopping when necessary to allow examination and documentation of the sewer's condition and all points of infiltration, cracked or crushed pipe, defective joints, misalignment of line and grade, service laterals, and other points of interest noted during the inspection.
 3. Use the "pan / tilt / rotate" features to inspect all service laterals, defective joints and manholes.
 4. If the camera encounters a vertical dip in the sewer line, the amount of vertical dip shall be estimated in inches.
 5. Note distances from a manhole to the various points of interest. The accuracy of the distance measurements shall be verified and certified to within 0.1 feet.

3.03 ACCEPTANCE:

- A. Deliver completed product as outlined in paragraph 1.03 SUBMITTALS for review by the Township and Township Engineer.
- B. If repairs are necessary to correct deficiencies found during the video inspection, the section repaired shall be re-televised for acceptance. This review will be performed at no charge. Any subsequent reviews will be charged to the developer.
- C. Repairs causing disturbance to pipe bedding or backfill will require an additional mandatory 30-day waiting period prior to televising. As such, the contractor will be required to test and inspect the repaired sewer in accordance with SP02730 SANITARY SEWERS - 3.03 TESTING AND INSPECTION.

END OF SECTION

SECTION 02732

SANITARY FORCE MAINS

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes work required for sanitary force mains, structures and appurtenant work.

1.02 REFERENCES:

- A. ASTM - American Society Testing Materials, latest edition.
- B. ANSI - American National Standards Institute, latest edition.

1.03 SUBMITTALS:

- A. Submit the following for review by TOWNSHIP or TOWNSHIP's ENGINEER:
 - 1. Product data on Isolation Valves and Air Release Valves.
 - 2. Proposed equipment and method for Pressure and Leakage testing
 - 3. Details for connection to sanitary sewer system.
 - 4. Submittals must be approved by ACT DPU prior to construction.
- B. Report witness measurements on fittings.
 - 1. Provide measurements from two permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.
- C. Provide certification on pipe and fittings indicating conformance to specifications prior to installation.
- D. Submittal of drawings of record plans to:
 - 1. Provide the Township Hall two (2) printed sets and one (1) electronic file
 - 2. Provide the Township Engineer (1) one electronic file with as-constructed dimensions and witnesses.
 - 3. Provide Township Utilities Superintendent (1) one electronic file

1.04 JOB CONDITIONS:

- A. Clean up promptly following pipe installation and within maximum of 600 feet behind pipe laying operation. Cleanup includes backfill and rough grading.
- B. Installation not allowed when air temperature is 25 degrees or colder (F), or when determined too cold by Township field inspector.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Cement Lining: ANSI A21.4 Standard thickness for ductile iron pipe and fittings.

2.02 PIPE:

- A. Ductile Iron: ANSI A21.50 and ANSI A21.51; Class 52.

2.03 JOINTS:

- A. Ductile Iron Pipe and Fittings:
 - 1. Mechanical: ANSI A21.11.
 - 2. Push-on: ANSI A21.11.
 - 3. Electrical Continuity: Provide bronze wedges (3 per joint), or thermite welded sockets and cables.

2.04 FITTINGS:

- A. Ductile Iron: ANSI A21.10, ANSI 21.53, Class 54, 250 psi working pressure through 12-inch and 150 psi greater than 12-inch.

2.05 VALVES (Open Right):

- A. Gate: AWWA C515, double disc, non-rising stem, fully bronze mounted and roller and gear operator over 16 inches.
- B. Plug: ANSI B16.1, Clow Corporation F-5410, or equal.
- C. Air release: APCO 400 or Val-Matic 48 BWA.
- D. Boxes: Three (3) section cast iron with lid marked SEWER.
 - 1. Upper section: Screw on adjoining center section and full diameter throughout. Place geotextile fabric around threaded joint of risers, if used.
 - 2. Center section: Minimum 5-inch inside diameter.
 - 3. Base section: Fit over valve bonnet and shaped round for valves through 10-inch and oval for 12-inch and over. Place geotextile fabric around valve bonnet.

2.06 AIR RELEASE VALVE AND CLEANOUT CHAMBERS:

- A. Chambers shall be precast or cast-in-place concrete.
- B. Precast Units: ASTM C478 and ASTM C76, Class III.
 - 1. Joints: Cement mortar, preformed bituminous rope or "O"-ring gaskets.
 - 2. Pipe Opening: Pipe diameter plus 6-inch, maximum.
- C. Concrete: 4000 psi 28 day, 4-inch maximum slump.
- D. Concrete Brick: ASTM C55, Grade N-1 (For repair of existing brick structures only).
- E. Grade Rings: ASTM C478.
- F. Mortar: ASTM C270, 1-part Portland cement, 1-part lime and 3-parts sand by volume.
- G. Chamber Steps:
 - 1. Plastic with $\frac{3}{8}$ -inch steel reinforcement.
 - 2. Dimensions: 10-inch deep by 10-inch wide, 5-inch tread depth.
- H. Chamber Casting: East Jordan 1040 A cover – two (2) hole cover with the words "ALLENDALDE AREA SANITARY SEWER" and East Jordan 1045 Z1 frame.

- I. Piping: Coal tar epoxy coating required.

2.07 MISCELLANEOUS:

- A. Tie Rods and Clamps: Clow Corporation or Traverse City Iron Works.
- B. Polyethylene Encasement:
 - 1. Material: ASTM D1248 Polyethylene, Type I, Class C, 8 mils thick.
 - 2. Closing tape: 2-inch wide Poly Ken #900 or Scotchwrap #50.
- C. Mechanical Joint Restraint: Megalug by EBBA Iron Sales, Inc.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Alignment and Grade:
 - 1. Deviations: Notify OWNER's ENGINEER and obtain instructions to proceed where there is a grade discrepancy, or an obstruction not shown on the plans.
 - a. Verify location and depth of existing utilities in advance of construction and provide adjustments in alignment and grade of force main.
 - b. Depth of pipe: Minimum cover over pipe below finished grade shall be 5 feet.
 - 2. High points in pipe line: Locate at air release valves.
 - 3. Install pipe to elevations and grades when indicated on drawings.
 - 4. Measure pipe inverts prior to setting cones, for as-built drawings.
- B. Bedding:
 - 1. Method: See Article 3.04 SCHEDULES.
 - 2. Provide bedding area backfill in accordance with MDOT Standard Plan No. R-83B.
 - 3. Provide continuous bearing by supporting entire length of pipe barrel evenly.
- C. Cleaning Pipe and Fittings:
 - 1. General: Provide interior free of foreign material and joint surfaces free of lumps and blisters.
- D. Termination:
 - 1. Forcemains shall terminate at the bottom of a manhole 0.1 foot above outlet invert.
 - 2. The alignment of forcemain discharge must be within 30 degrees of straight through (i.e. 12 o'clock to 6 o'clock position).
 - 3. Manhole flow channels shall be constructed to crown of downstream outlet.

3.02 INSTALLATION:

- A. Laying pipe:
 - 1. Place pipe length and bedding as a unit in a frost free, dry trench.
 - 2. Special supports and saddles: See Article 3.04 SCHEDULES.
 - 3. Joint deflection shall be as recommended by pipe manufacturer.
- B. Cutting Pipe:
 - 1. Ductile iron: Power saw.

- C. Jointing:
 - 1. Mechanical:
 - a. Lubricate with manufacturer specified material.
 - b. Tighten bolts evenly to manufacturer specifications.
 - 2. Push-on:
 - a. Lubricate as recommended by manufacturer.
 - b. Shape beveling as recommended by manufacturer.
- D. Setting Valves and Fittings:
 - 1. General: See Article 3.04 SCHEDULES.
 - 2. Valves: Plumb.
 - 3. Valve boxes:
 - a. Base section: Center and plumb over operating nut and 2 inches above bonnet joint.
 - b. Upper section: Set cover flush with finished grade.
 - c. Witnesses: Provide two (2) measurements to permanent surface features.
- E. Cleanout and Air Release Valve Chambers:
 - 1. General: See Article 3.04 SCHEDULES:
 - 2. Base Bedding: Provide 4-inch pea stone with full and even bearing in impervious soils or wet conditions. Otherwise provide on undisturbed, frost-free, dry subgrade.
 - 3. Precast: Fill joint space completely and trowel.
 - 4. Provide casting setting as follows:
 - a. Existing pavement: Finished grade.
 - b. Gravel road: 6 inches below.
 - c. Unpaved areas: Finished grade.
- F. Pipe Joint Restraint:
 - 1. Provide mechanical joint restraint for the minimum lengths shown in joint restraint detail (i.e. Schedule 3.06.A.4)
 - * The length of restrained pipe required shown in the joint restraint detail is based on trench backfill being compacted to 95% of the maximum density according to the Modified Proctor Method. The joint restraint detail does not consider polyethylene wrapped pipe. If the pipe is wrapped with polyethylene, a greater length of restrained pipe will be required. Unless otherwise specified, a multiplier of 1.5 shall be used to determine the required length when the pipe is wrapped with polyethylene.
 - ** If straight run of pipe on small side of reducer exceeds this value, then no restrained joints are necessary.
 - a. Tees: Pipe restraint length shown in the joint restraint detail shall be provided in the branch direction. Also, the minimum length of pipe restraint in the straight through (run) direction shall be 10 feet on both sides of the tee.
 - b. Bends: Pipe restraint length shown in the joint restraint detail shall be provided on both sides of the bend.
 - c. Dead End: Pipe restraint length shown in the joint restraint detail shall be provided back from the dead-end plug.
 - d. See 3.06 SCHEDULES for a detail illustrating the joint restraint requirements.
 - e. All joints shall be restrained for pipe within casings.
 - f. All joints between bends on water main offsets shall be restrained.

G. Reaction Backing (allowed only where restrained joints cannot be used and when approved by ENGINEER):

1. Placement:
 - a. Place concrete manhole block next to pipe and concrete reaction backing behind. Megalugs and fitting bolts shall not be covered with concrete.
2. Bearing area: Provide the following square feet of concrete against trench wall in sand:

Pipe Size	Tees Plugs	Hydrants 90° Els	Wyes 45° Els	22½° Els	11¼° Els
4"	2	1	1	1	1
6"	3	3	2	1	1
8"	4	6	3	2	1
12"	9	11	6	3	2
16"	13	20	10	6	3

3. Other Soil Conditions:
 - (a) Cement sand or hardpan - Multiply above by 0.5
 - (b) Gravel - Multiply above by 0.7
 - (c) Hard dry clay - Multiply above by 0.7
 - (d) Soft clay - Multiply above by 2.0
 - (e) Muck - secure all fittings with Megalug retainer glands or tie rod clamps and concrete reaction backing the same as listed for sand conditions. Install as required by SECTION 02220 – EXCAVATING, BACKFILLING AND COMPACTING.

H. Polyethylene Encasement:

1. In corrosive soils: Install over ductile iron pipe and tape seams in accordance with AWWA C-105.

3.03 TESTING AND INSPECTION:

A. General:

1. Observation: By TOWNSHIP or TOWNSHIP's ENGINEER.
2. Completion: Before connection to lift station.
3. Notification: Pretest and arrange for inspection and test.
4. Equipment and assistance: Provide.
5. Required water: By TOWNSHIP where available from municipal system.

B. Electrical Continuity: Test ductile iron pipe for continuity and repair breaks.

C. Pressure:

1. Conditions: Air or air-water methods of applying pressure prohibited.
2. Range: 100 to 110 psi at lowest elevation.
3. Duration: 1 hour and until completion of inspection.
4. Procedure: Fill system slowly, expel air through air release valve connection at high points and apply pressure. Install air release valve after test.
5. Inspection: Examine line and appurtenances for leaks and movement.
6. Corrections: Repair defects, visible leaks and repeat test until acceptable.

D. Leakage:

1. Condition: Following pressure test.
2. Average pressure: Within pressure test range.
3. Duration: two (2) hours.
4. Filling: As in pressure test.
5. Supplying make-up water: Measurable source.
6. Leakage: Quantity of water supplied to maintain test pressure.
7. Allowable: Less than:

$$L = \frac{ND \times \text{Square root of } P}{3700}, \text{ where}$$

L = leakage (gallons per hour)

N = number of joints

D = nominal pipe diameter (inches)

P = average test pressure (pounds per square inch gauge)

Note: Formula equals 0.8 gallon per hour per mile per inch diameter at 100 psi for 18-foot lengths.

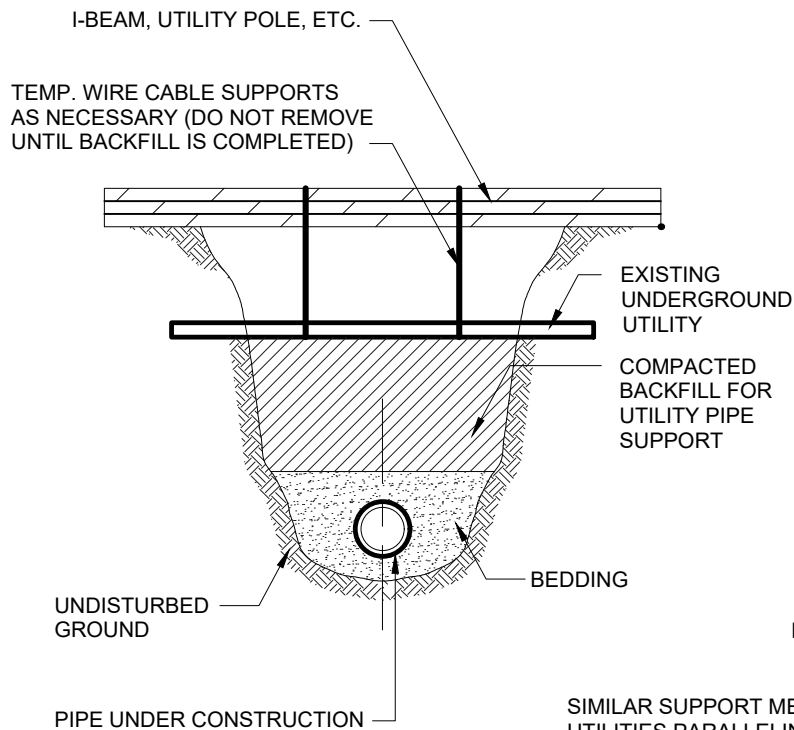
8. Correction: Repair defects and repeat test until acceptable.

3.04 SCHEDULES:

A. Standard Details:

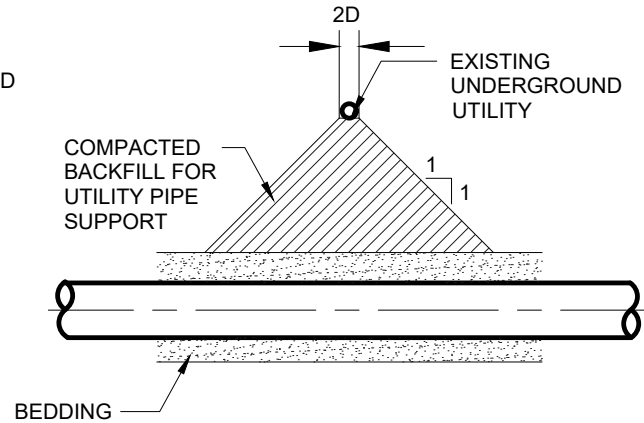
1. Special supports for underground utilities / pipe saddles
2. Methods of bedding pipe
3. Standard air release valve chamber
4. Joint Restraint Requirements
5. Drop connection detail
6. Force main discharge detail

END OF SECTION



SECTION

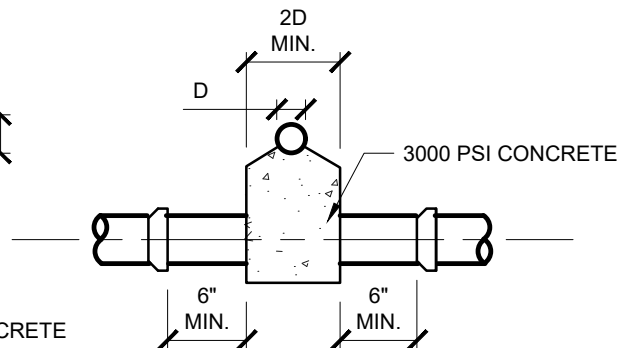
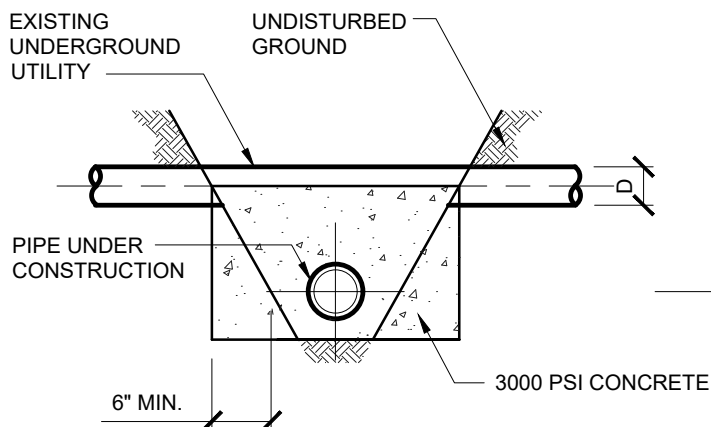
NOTE: MAINTAIN EXISTING
COATING ON UTILITY



ELEVATION

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

SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES



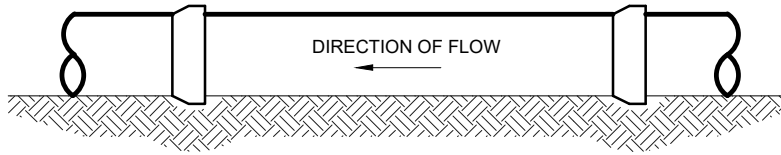
NOTE:

1. PIPE SADDLE IS NOT REQUIRED FOR PLASTIC,
STEEL, LEAD OR COPPER PIPE 2" OR SMALLER.

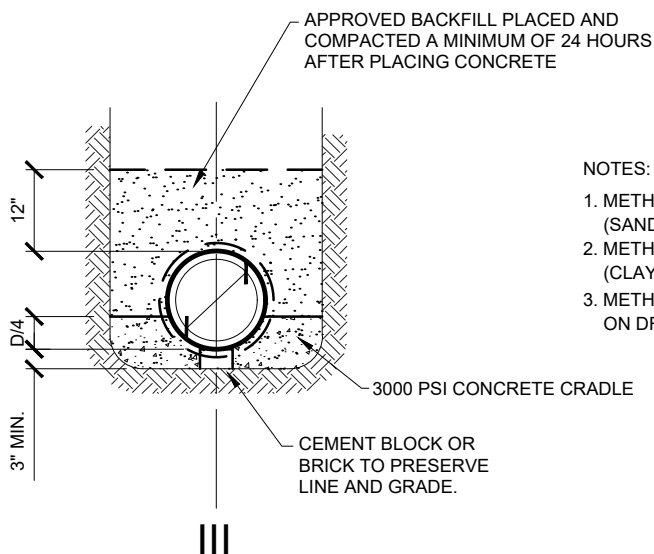
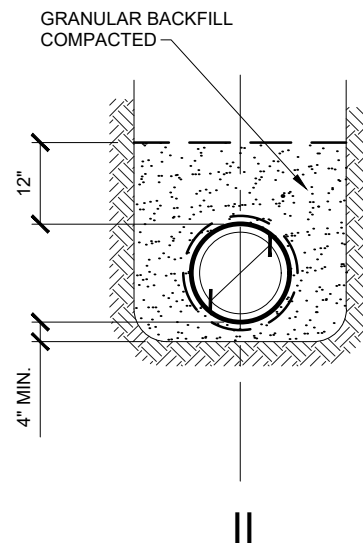
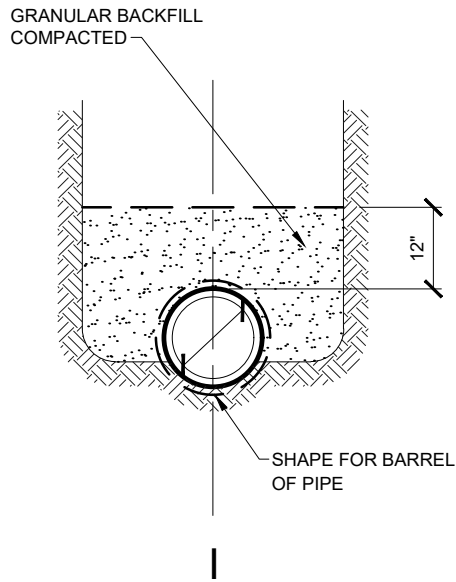
SECTION

ELEVATION

PIPE SADDLES



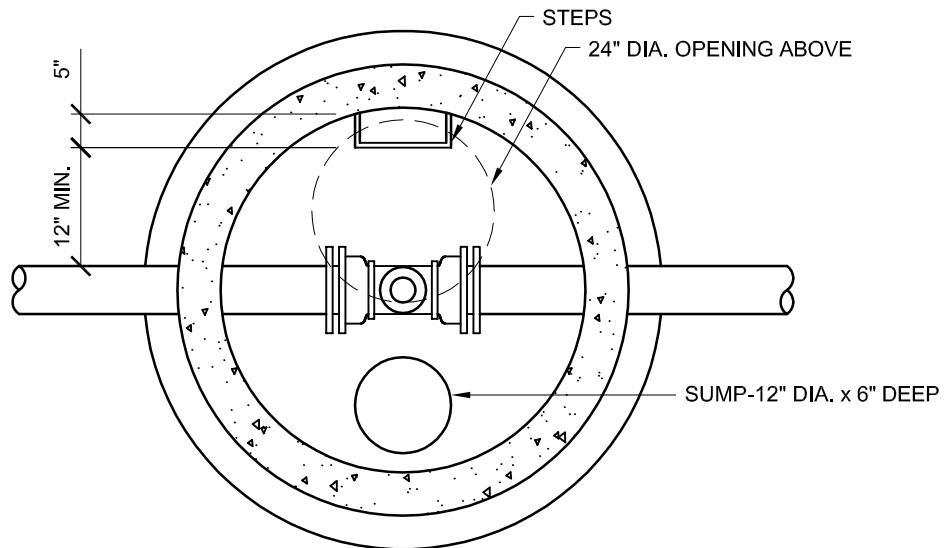
EXCAVATION FOR BELLS



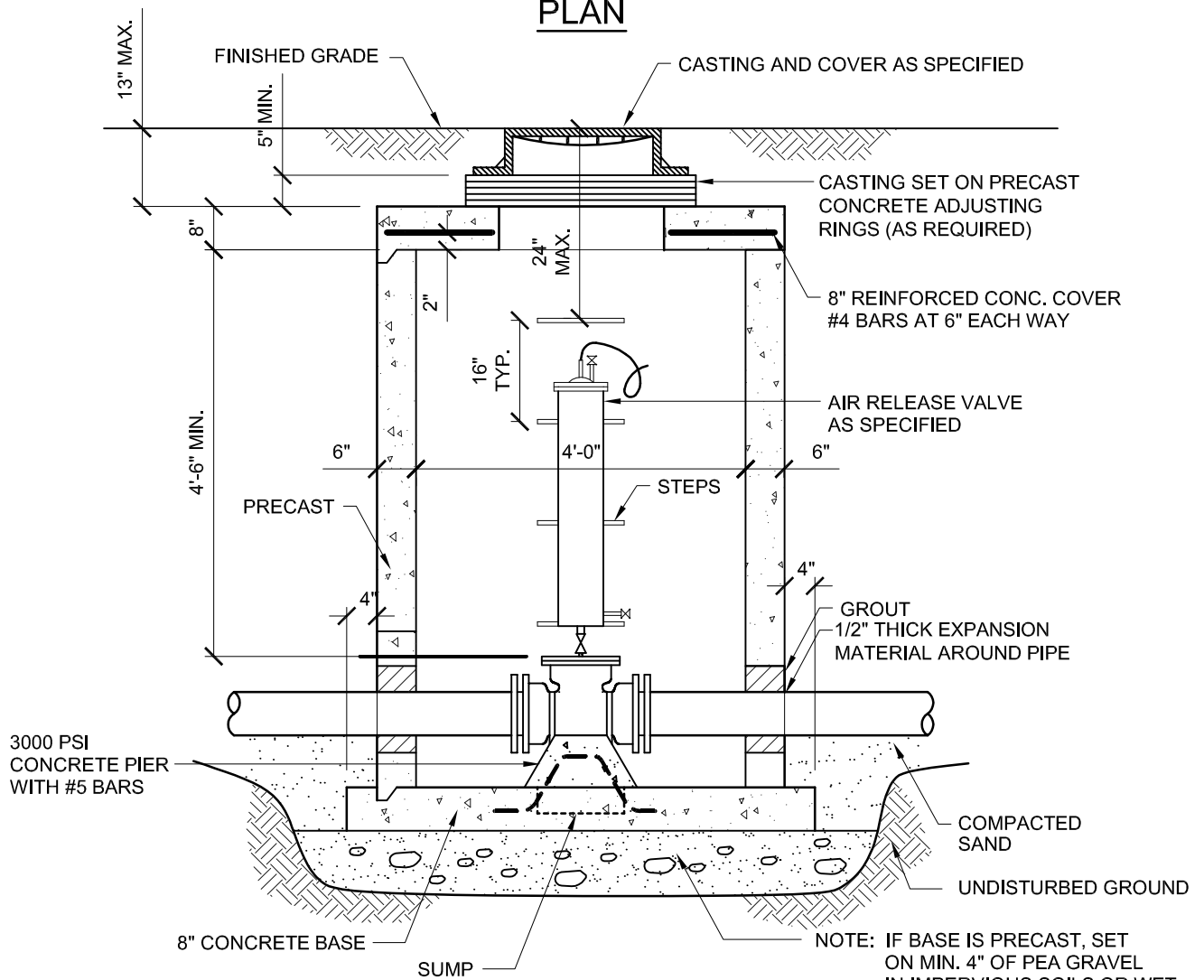
NOTES:

1. METHOD I: IN AREAS OF UNCONSOLIDATED SOILS (SAND, GRAVEL, ETC.)
2. METHOD II: IN AREAS OF CONSOLIDATED SOILS (CLAY, HARDPAN, ROCK, ETC.)
3. METHOD III: IN AREAS INDICATED ON DRAWINGS

METHODS OF BEDDING PIPE

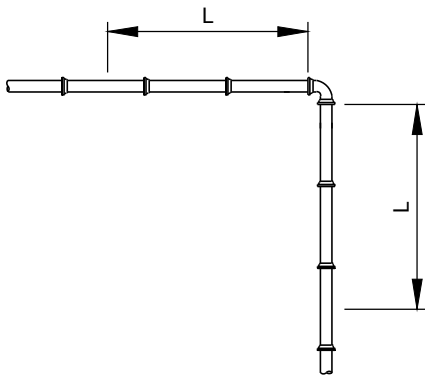


PLAN

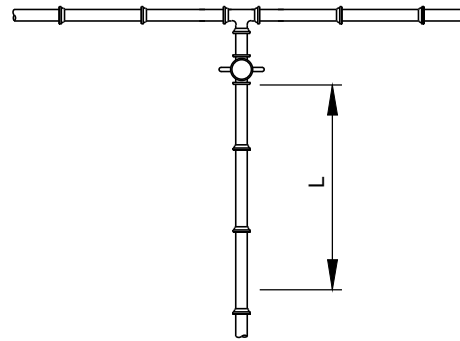


SECTION

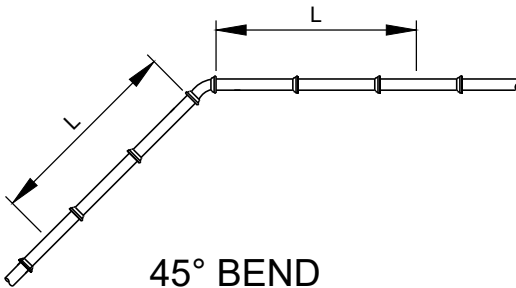
STANDARD AIR RELEASE VALVE CHAMBER



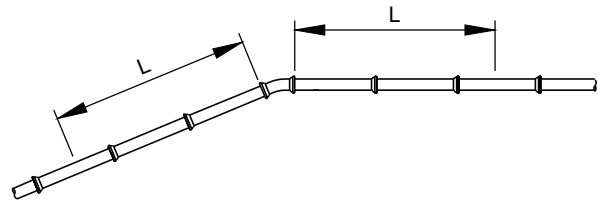
90° BEND



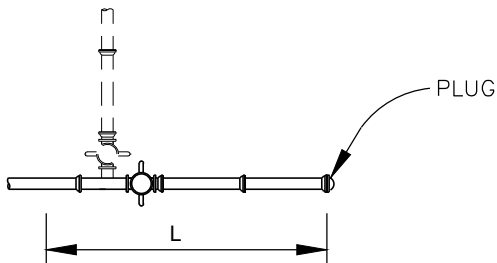
TEE



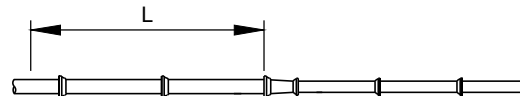
45° BEND



22 1/2° BEND OR LESS



DEAD END



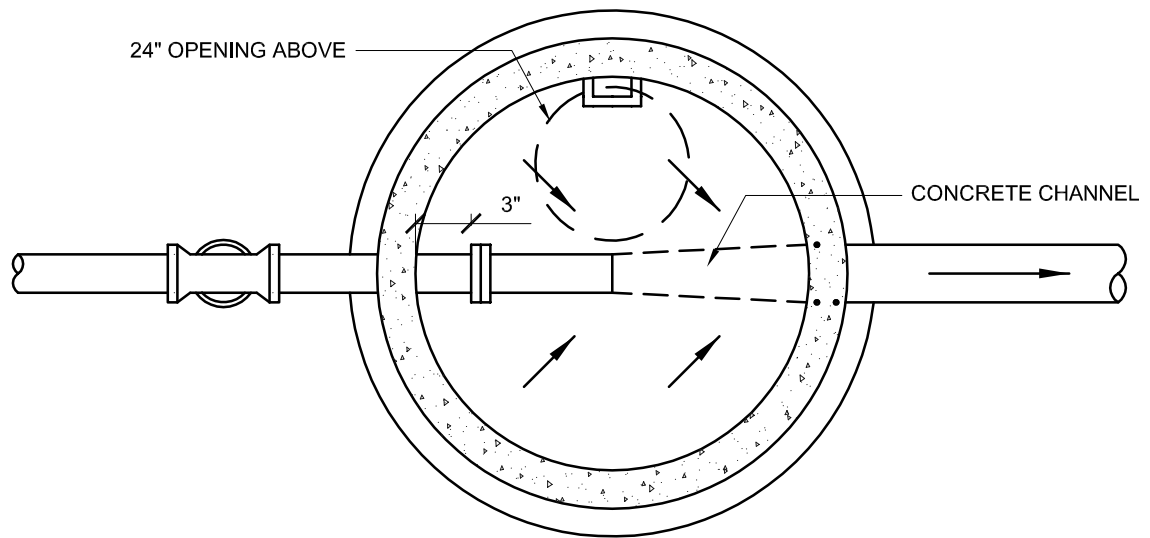
REDUCERS

"L" = MINIMUM LENGTH OF MECHANICAL JOINT
RESTRAINT SHOWN IN TABLE

PIPE RESTRAINT LENGTH (L) REQUIRED, FEET*							
Pipe Dia.	Tees, 90° Bends	45° Bends	22-1/2° Bends	11-1/4° Bends	Dead Ends	Reducers (one size)	**
4"	23	9	5	2	57		
6"	32	13	6	3	82	43	63
8"	41	17	8	4	104	43	55
12"	58	24	12	6	149	80	120
16"	74	31	15	7	192	82	110

* AND ** - SEE PARAGRAPH 3.02H OF SPECIFICATION SECTION 02660
***VERTICAL BENDS REQUIRE 50% OF ADDITIONAL RESTRAINT.

JOINT RESTRAINT REQUIREMENTS



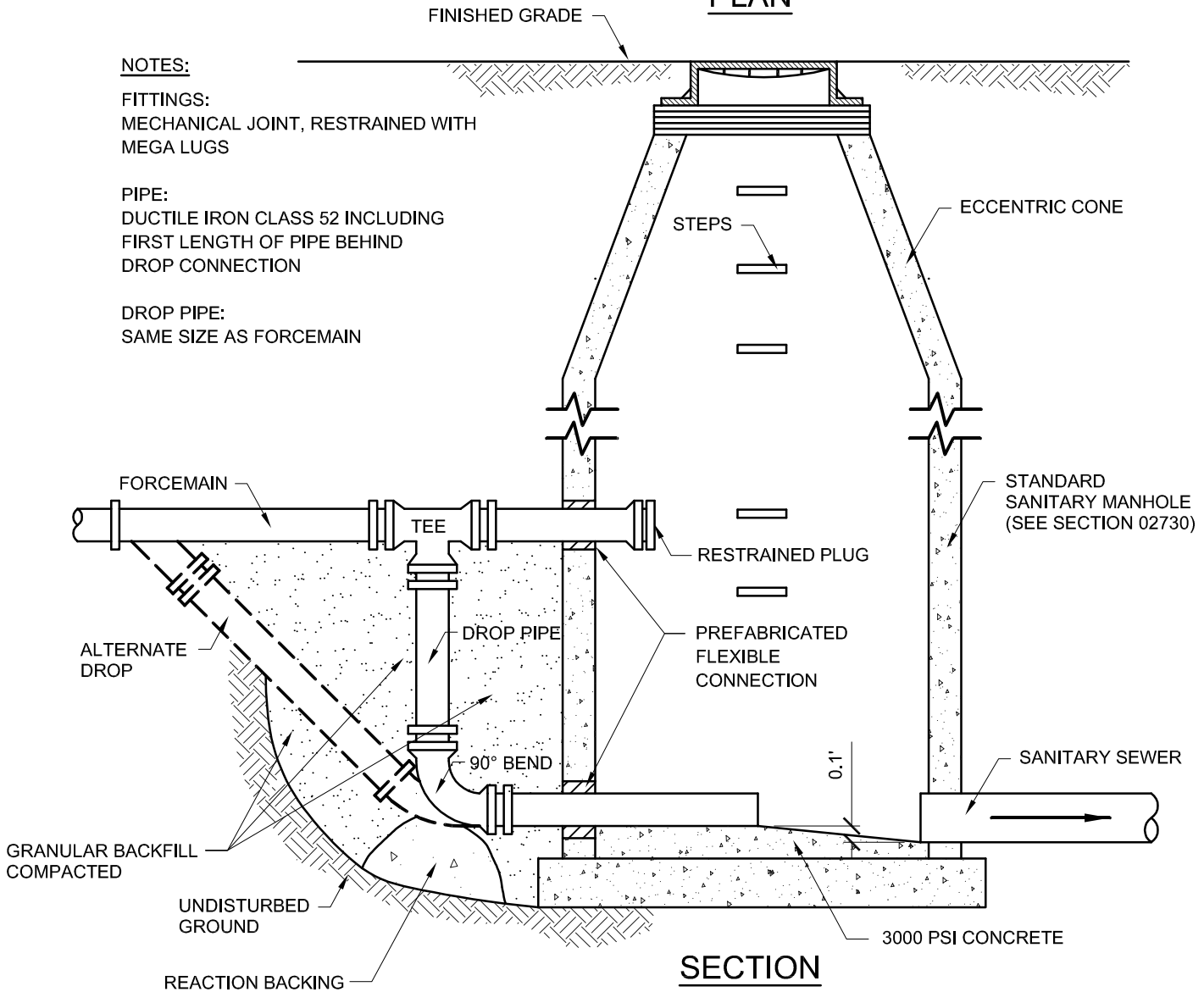
PLAN

NOTES:

FITTINGS:
MECHANICAL JOINT, RESTRAINED WITH
MEGA LUGS

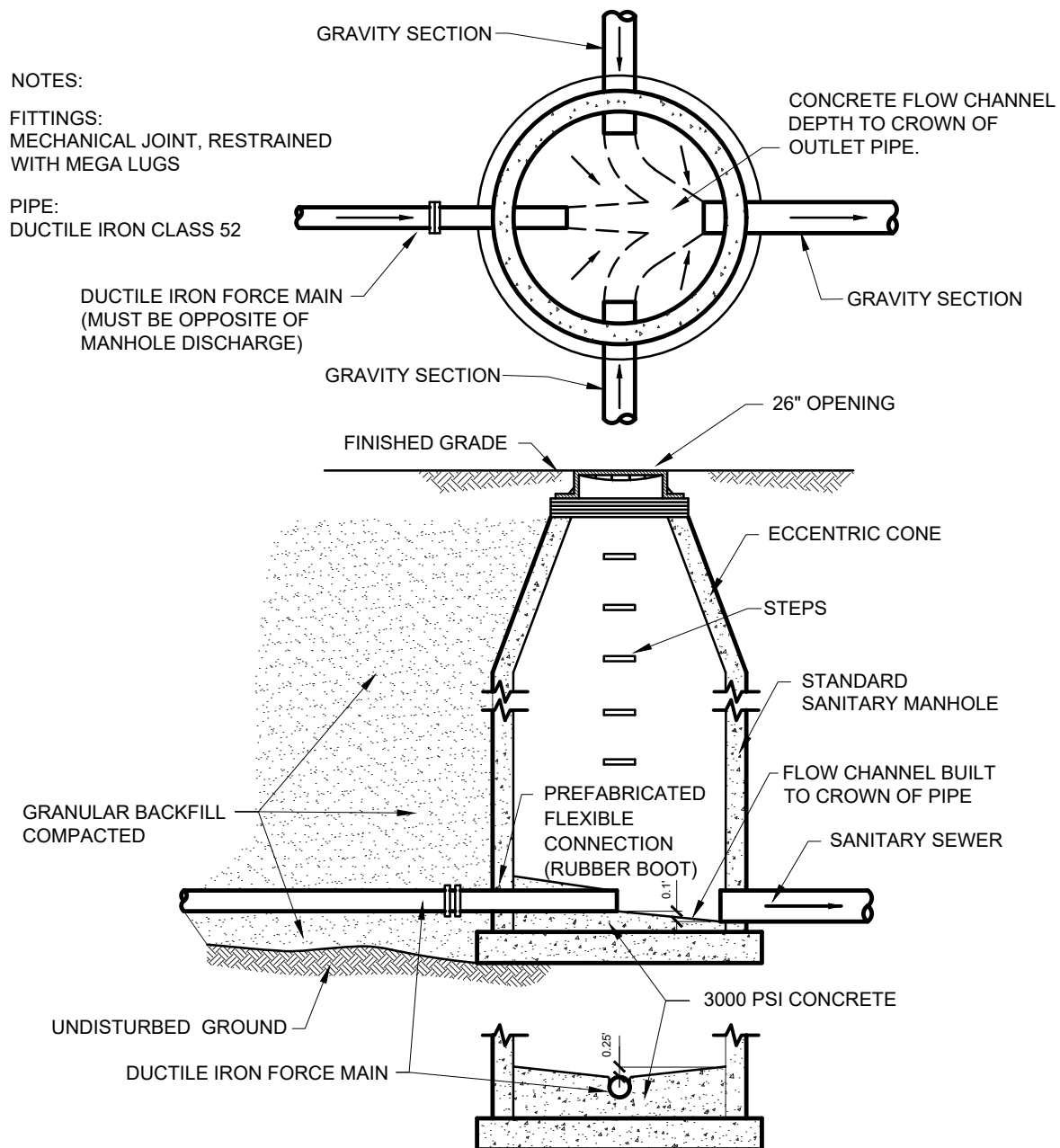
PIPE:
DUCTILE IRON CLASS 52 INCLUDING
FIRST LENGTH OF PIPE BEHIND
DROP CONNECTION

DROP PIPE:
SAME SIZE AS FORCEMAIN



SECTION

DROP CONNECTION DETAIL



FORCE MAIN DISCHARGE DETAIL

SECTION 02733

CURED-IN-PLACE PIPE (CIPP)

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the work necessary to restore existing sanitary sewers by the installation of a cured-in-place pipe (CIPP). The CIPP shall be formed by inverting a resin impregnated flexible tube into the existing sewer line using air or steam pressure and curing with air, steam, UV, or other approved means to produce a hard, impregnable pipe, which is tightly formed to the original pipe. The CONTRACTOR shall provide all materials, labor, equipment and services necessary for bypass pumping of sewage flows, cleaning, pre-inversion television inspection of the sewers to be lined, installation of the liner, reconnection of sewer service connections, and final television inspection.

1.02 REFERENCES:

- A. This specification references standards from the American Society for Testing and Materials, such as: ASTM F2019 (Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)), ASTM F1216 (Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube), ASTM F1743 (Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP)), ASTM D5813 (Cured-in-Place Thermosetting Resin Sewer Pipe), ASTM D790 (Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials), and D2990 (Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics) which are made a part hereof by **such reference and shall be the latest edition and revision thereof**. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

1.03 PRODUCT, MANUFACTURER/INSTALLER QUALIFICATION REQUIREMENTS:

- A. Products and Installers must meet the following criteria to be deemed Acceptable:
 - 1. For a Product to be considered, a minimum of 50 successful wastewater collection system projects of a similar size and scope of work shall be performed in the U.S. and documented to the satisfaction of the Owner to assure viability.
 - 2. For an Installer to be considered, the Installer must satisfy all insurance, financial, and bonding requirements of the Owner, and must have had at least 15 years active experience in the installation. In addition, the Installer must have successfully installed at least 100,000 feet of a cured-in-place product in wastewater collection systems. Acceptable documentation of these minimum installations must be submitted to the Owner. Installer's project managers must have a minimum of two years of CIPP installation experience and must be on-site during the installation of the CIPP products.
 - 3. Sewer rehabilitation products submitted for approval must provide third party test results supporting the structural performance (short-term and long-term) of the product and such data shall be satisfactory to the Owner. No product will be approved without independent third-party testing verification.
 - 4. Both the rehabilitation manufacturing and installation processes shall operate under a quality management system which is third-party certified to ISO 9000 or other recognized organization standards. Proof of certification shall be required for approval.

1.04 SUBMITTALS:

A. Pre-Construction:

1. Design Calculations:

- a) Calculations of minimum wall thickness completed by an engineer proficient in the design of CIPP systems.

2. Resin and Liner Product Data:

- a) Material product data
- b) Installation instructions.

3. Certified Wet-Out Report to be submitted by the Contractor for each liner length to be installed for the project.

B. Post Construction: None

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Tube - The sewn Tube shall consist of one or more layers of absorbent non-woven fabric and meet the requirements of ASTM F1216, Section 5.1 or ASTM F1743, Section 5.2.1 or ASTM D 5813, Sections 5 and 6, or ASTM F2019. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe, and stretch to fit irregular pipe sections.

1. The wet-out Tube shall have a relatively uniform thickness that when compressed at installation pressures will equal or exceed the calculated minimum design CIPP wall thickness.
2. The Tube shall be manufactured to a size that when installed will tightly fit the internal circumference and length of the original pipe. Allowance should be made for circumferential stretching during installation.
3. The outside layer of the Tube shall be coated with an impermeable, flexible membrane that will contain the resin and allow the resin impregnation (wet out) procedure to be monitored.
4. The Tube shall contain no intermediate or encapsulated elastomeric layers. No material shall be included in the Tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.
5. The wall color of the interior pipe surface of CIPP after installation shall be a relatively light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.
6. Seams in the Tube shall be stronger than the non-seamed felt material.
7. The Tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings shall include the Manufacturers name or identifying symbol. The tubes must be manufactured in the USA.
8. Contractor may also use UV GRP Cured-In-Place-Pipe (CIPP) per ASTM specifications. Such reference shall be the latest edition and revisions thereof.

B. Resin - The resin system shall be a corrosion resistant polyester or vinyl ester system including all required catalysts, initiators that when cured within the tube create a composite that satisfies the requirements of ASTM F1216, ASTM D5813 and ASTM F1743, the physical properties herein, and those which are to be utilized in the submitted and approved design of the CIPP for this project. The resin shall produce a CIPP that will comply with the structural and chemical resistance requirements of this specification.

2.02 STRUCTURAL REQUIREMENTS:

- A. The CIPP shall be designed as per ASTM F1216, Appendix X.1. The CIPP design shall assume no bonding to the original pipe wall.
- B. The Contractor must have performed long-term testing for flexural creep of the CIPP pipe material installed by his Company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a performance test of the materials (Tube and Resin) and general workmanship of the installation and curing as defined within the relevant ASTM standard. A percentage of the instantaneous flexural modulus value (as measured by ASTM D790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Retention values exceeding 50% of the short-term test results shall not be applied unless substantiated by qualified third-party test data to the Owner's satisfaction. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.
- C. The Enhancement Factor 'K' to be used in 'Partially Deteriorated' Design conditions shall be assigned a value of 7.
- D. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If the layers separate during field sample testing, new samples will be required to be obtained from the installed pipe. Any reoccurrence may cause rejection of the work.
- E. The cured pipe material (CIPP) shall conform to the structural properties, as listed below.

MINIMUM CIPP PHYSICAL PROPERTIES

<u>Property</u>	<u>Test Method</u>	<u>Fiber Reinforced CIPP</u>	
		Min. per ASTM F1216	Enhanced Resin
Modulus of Elasticity	ASTM D790	250,000 psi	400,000 psi
Flexural Stress	ASTM D790	4,500 psi	4,500 psi

- F. The required structural CIPP wall thickness shall be based, as a minimum, on the physical properties in Paragraph 5.E above or greater values if substantiated by independent lab testing and in accordance with the design equations in the Appendix X1, Design Considerations of ASTM F1216, and the following design parameters:

Design Safety Factor (typically used value)	=	2.0
Retention Factor for Long-Term Flexural Modulus to be used in Design (<i>As determined by long-term tests described in Paragraph 2.02B and approved by the Owner</i>)	=	50%
Ovality* (calculated from (X1.1 of ASTM F1216)	=	2%
Enhancement Factor, K	=	See Paragraph 2.02.C
Soil Density**	=	120 pcf
Live Load**	=	H20 Highway
Design Condition (partially or fully deteriorated)***	=	***

- * Denotes information, which can be provided here or in inspection videotapes or project construction plans. Multiple lines segments may require a table of values.
 - ** Denotes information required only for fully deteriorated design conditions.
 - ***Based on review of video logs, conditions of pipeline can be fully or partially deteriorated. (See ASTM F1216 Appendix) The Owner will be sole judge as to pipe conditions and parameters utilized in design.
- G. Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.
 - H. Chemical Resistance - The CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical-testing requirements.
 - I. Hydraulic Capacity - Overall, the hydraulic cross-section shall be maintained as large as possible. The CIPP shall have as a minimum of the full flow capacity of the original pipe before rehabilitation. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.
 - J. CIPP Field Samples - When requested by the Owner, the Contractor shall submit test samples to the Allendale Department of Public Utilities (APU) from field installations of the same resin system and tube materials as proposed for the actual installation. The test samples will be handled and delivered by APU to a third-party testing facility. These test results must verify that the CIPP physical properties specified in Paragraph 2.02.E have been achieved in previous field applications. Samples for this project shall be made and tested as described in Paragraph 3.04A.

PART 3 - EXECUTION

3.01 INSTALLATION RESPONSIBILITIES FOR INCIDENTAL ITEMS:

- A. It shall be the responsibility of the Owner to locate and designate all manhole access points open and accessible for the work and provide rights-of-access to these locations. If a street must be closed to traffic because of the orientation of the sewer, the CONTRACTOR shall institute the actions necessary to provide access during this for the mutually agreed time period. The Owner shall provide free access to water hydrants for cleaning, installation and other process related work items requiring water.
- B. Cleaning of Sewer Lines - The CONTRACTOR, when required, shall remove all internal debris out of the sewer line that will interfere with the installation of CIPP. The CONTRACTOR shall dispose of all debris removed from the sewers during the cleaning operation in an approved manner. Any hazardous waste material encountered during this project will be considered as a changed condition.
- C. Bypassing Sewage - The CONTRACTOR, when required, shall provide for the flow of sewage around the section or sections of pipe designated for lining. Plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system shall make the bypass. The pump(s) and bypass line(s) shall be of adequate capacity to accommodate the sewage flow. The Owner and/or ENGINEER may require a detail of the bypass plan to be submitted for approval.

- D. Inspection of Pipelines - Inspection of pipelines shall be performed by NASSCO certified and equipment personnel trained in locating breaks, obstacles and service connections using close circuit television (CCTV) inspection techniques. The pipeline interior shall be carefully inspected to determine the location of any conditions that may prevent proper installation of CIPP. These shall be noted and corrected. A thumb drive and suitable written log for each line section shall be produced for later reference by the Owner and/or ENGINEER.
- E. Line Obstructions - It shall be the responsibility of the CONTRACTOR to clear the line of obstructions such as solids and roots that will prevent the insertion of CIPP. If pre-installation inspection reveals an obstruction such as a protruding service connection, dropped joint, or a collapse that will prevent the installation process, that was not evident on the pre-bid video and it cannot be removed by conventional sewer cleaning equipment, the Contractor shall notify the Owner and/or ENGINEER. If an excavation and point repair is necessary, the CONTRACTOR shall make the repair, schedule and coordinate his work accordingly at no additional cost to the Owner.
- F. Acceptance Video Televising: Section 33 01 30 – Video Televising of Sewers. In accordance with Allendale Charter Township Construction Standards. Pipe Logix to be used unless otherwise approved by the Township.
- G. Public Notification - The Contractor shall make every effort to maintain sewer service usage throughout the duration of the project. In the event that a connection will be out of service, the longest period of no service shall be 8 hours. A public notification program shall be implemented, and shall as a minimum, require the Contractor to be responsible for contacting each home or business connected to the sanitary sewer and informing them of the work to be conducted, and when the sewer will be off-line. The Contractor shall also provide the following:
 - 1. Written notice to be delivered to each home or business the day prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor they can call to discuss the project or any potential problems.
 - 2. Personal contact with any home or business, which cannot be reconnected within the time stated in the written notice.
- H. The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing the CIPP.

3.02 INSTALLATION:

- A. CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6, with the following modifications:
 - 1. Resin Impregnation - The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the potential loss of resin during installation through cracks and irregularities in the original pipe wall, as applicable.
 - 2. Tube Insertion – The wet-out tube shall be positioned in the pipeline using either inversion or a pull-in method as defined within relevant ASTM standards previously stipulated. If pulled into place, a power winch or its equivalent should be utilized and care should be exercised not to damage the tube as a result of pull-in friction. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
 - 3. Temperature gauges shall be placed between the tube and the host pipe's invert position to monitor the temperatures during the cure cycle.

4. Curing shall be accomplished by utilizing UV or steam pressure in accordance with the manufacturer's recommended cure schedule. A cool-down process shall be conducted that complies with the resin manufacturer's specification.
5. **Follow N.A.S.S.C.O requirements for exhaust chimney height and barricaded safety zone area.**

3.03 REINSTATEMENT OF BRANCH CONNECTIONS:

- A. Branch connections to buildings shall be re-opened without excavation, utilizing a remotely controlled cutting device, monitored by a CCTV. The Contractor shall certify a minimum of two complete functional cutters plus key spare components are on the job site before each installation or are in the immediate area of the jobsite and can be quickly obtained. Unless otherwise directed by the Owner or his authorized representative, all laterals will be reinstated. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor will be responsible for all costs and liability associated with such excavation, providing temporary service and restoration work.

3.04 INSPECTION:

- A. CIPP samples shall be prepared for each installation designated by the ENGINEER or approximately 20% of the project's installations. Pipe physical properties will be tested in accordance with ASTM F1216 or ASTM F1743, Section 8, using either sampling method proposed. The flexural properties must meet or exceed the values listed in this specification, Table 1 of ASTM F1216 or the values submitted to the ENGINEER by the CONTRACTOR for this project's CIPP wall design, whichever is greater.
- B. Wall thickness of samples shall be determined as described in paragraph 8.1.6 of ASTM F1743. The minimum wall thickness at any point shall not be less than 87.5 % of the submitted minimum design wall thickness as calculated in Paragraph 2.02F of this specification.
- C. Visual inspection of the CIPP shall be in accordance with ASTM F1743, Section 8.6.

3.05 CLEAN-UP:

- A. Upon acceptance of the installation work and testing, the CONTRACTOR shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

3.06 SCHEDULES:

- A. Summary of CIPP Lining.
- B. Video televising logs / reports / USBs

END OF SECTION

SECTION 02740

HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the work required to install a carrier or casing pipe under an obstacle using the method commonly known as directional drilling to the grades and alignments shown on the Drawings, where approved by the TOWNSHIP and TOWNSHIP ENGINEER.

1.02 REFERENCES:

- A. ASTM - American Society of Testing Materials, *Latest Edition*.
- B. PPI - Plastics Pipe Institute
- C. AWWA - American Water Works Association
- D. ANSI - American National Standards Institute

1.03 JOB CONDITIONS:

- A. MDOT Right-of-Way: Comply with MDOT "Provisions for Jack Construction (1998)" for permitting, installing and inspecting jacked-in-place and directional-drilled pipe within MDOT right-of-way.
- B. Other Jurisdictions: Comply with all permit requirements.
- C. Critical Crossings: Critical crossings, such as surface water crossings, require valve chambers on each side of the crossing so that the section of piping may be isolated. The valve chambers shall include corporation stops on each side of the valve for purposes of future chlorination, sampling, and leak testing.

1.04 GENERAL REQUIREMENTS:

- A. The CONTRACTOR shall be responsible for the method of construction, the stability and accuracy of the drilled and reamed hole and pits constructed, and all costs for damages resulting from any failure thereof. The CONTRACTOR shall be solely responsible for the safety of the pits and related structures and personnel engaged in underground construction throughout the duration of the work.
- B. The CONTRACTOR's methods and schedule shall consider the overall project requirements and anticipated subsurface soils and groundwater conditions. The CONTRACTOR's selection of inadequate, inappropriate or inefficient equipment and methods will not be cause for adjustments to the contract price or contract time.
- C. The general dimensions, arrangement and details for the drilled hole and pits to be constructed shall be as needed to complete the required work.

- D. Methods of excavation, equipment and procedures for the directional drilling operation and pits shall be selected by the CONTRACTOR to provide adequate working space and clearances for the work to be performed.
- E. Pit excavation methods, groundwater control and pit support techniques shall be selected by the CONTRACTOR.

1.05 CONTRACTOR QUALIFICATIONS:

- A. The CONTRACTOR who will complete the work contained in this Section must be experienced in the type of work specified in this Section and must have successfully completed similar projects within the last three years.
- B. Personnel that will perform the work must be trained and experienced in the fabrication and installation of the materials and equipment, as well as being knowledgeable of the design and the reviewed shop drawings.
- C. At the ENGINEER's request, the CONTRACTOR responsible for the completion of the work contained in this Section shall submit a list of jobs successfully completed within the last three years. Information on each job must include the following:
 - 1. Date of Project
 - 2. Location
 - 3. Length of Directional Drill
 - 4. Size and Material of Pipe
 - 5. General CONTRACTOR's name, contact and phone number.
 - 6. OWNER's name, contact and phone number.
 - 7. Other information relevant to the successful completion of the project.

1.06 SAFETY:

- A. The CONTRACTOR shall become familiar with, and shall at all times conform to, all applicable codes, ordinances and laws in relation to the work required.
- B. Directional drilling equipment machine safety requirements shall include a common grounding system to prevent electrical shock in the event of a high voltage underground cable strike. The grounding system shall connect all pieces of interconnecting machinery; the drill, mud mixing system, drill power unit, drill rod trailer, operator's booth, worker grounding mats and any other interconnected equipment to a common ground. The drill shall be equipped with an "electrical strike" audible and visual warning system that shall notify the system operators of an electrical strike.
- C. Operators of the drill shall wear electrical shock protection equipment and operate from common grounding mats as required.

1.07 SUBMITTALS:

- A. Proposed drill profile data including the minimum information listed below:
 - 1. Entrance angle
 - 2. Exit angle
 - 3. Minimum radius of curvature
 - 4. Depth of pipe every 50 feet
 - 5. Pilot hole diameter
 - 6. Back ream hole diameter
 - 7. Wet or dry pullback
 - 8. Estimated maximum pullback force
- B. Polyethylene pipe data including, but not limited to, the following:
 - 1. Manufacturer's brochures and catalog sheets
 - 2. Dimensions
 - a. Inside diameter
 - b. Outside diameter
 - c. Standard dimension ratio
 - d. Yield stress
- C. HDPE to DI connection:
 - 1. Manufacturer
 - 2. Product data sheet
 - 3. Dimension drawing
 - 4. Installation instructions
- D. Drilling Fluid:
 - 1. Bentonite (or alternate):
 - a. Product manufacturer
 - b. Product data sheet
 - c. Mixing instructions
 - 2. Polymer:
 - a. Product manufacturer
 - b. Product data sheet
 - c. Mixing instructions
 - d. Material safety data sheet (MSDS)
- E. Drill Path Documentation upon completion: See Article 3.07.
- F. Contractor corrective action plan as noted in Section 02740.1, Paragraph 5.

1.08 DELIVERY, STORAGE AND HANDLING:

- A. Handle and store materials in a manner that will prevent:
 - 1. Deterioration or damage
 - 2. Contamination with foreign matter
 - 3. Damage by weather or elements
- B. After the pipe is fused together and before it is pulled through the drilled hole, the CONTRACTOR shall be responsible to provide vehicular and emergency access to all properties affected by the fused pipeline. The CONTRACTOR shall be responsible to repair all damage to existing surface and site improvements damaged by the fused pipeline.

1.09 UTILITY PROTECTION:

- A. All underground utilities shown on the drawings are shown according to the best available information. It is the CONTRACTOR's responsibility to verify the location of all existing utilities prior to working in the area.
- B. All utilities are to remain in service and shall be protected by the CONTRACTOR from any damage as a result of his operations.
- C. Where utilities are encountered and not shown on the drawings, the CONTRACTOR shall report them to the OWNER before proceeding with the work.
- D. All utilities damaged by the CONTRACTOR's activities shall be repaired or replaced by the CONTRACTOR without preventable delay. All costs to repair the utility including, but not limited to, materials, labor, inspection, testing and temporary service shall be borne by the CONTRACTOR with no cost to the OWNER.
- E. All utilities in close proximity to the drill pilot bore, back ream or product pipe installation must be exposed in accordance with all codes, ordinances and regulations to ensure, by visual inspection, that the CONTRACTOR's work has not caused any damage to the utility or to the CONTRACTOR's work and adequate clearance between the utility and the CONTRACTOR's work is maintained.

1.10 APPLICABLE REGULATIONS:

- A. All work covered by this Section shall be performed in accordance with all applicable federal, state and local laws, regulations, codes and ordinances which pertain to such work, as well as the supplemental regulations contained in these specifications. If a conflict exists between any laws, regulations, codes or ordinances, the most stringent shall govern.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. PIPE:

- 1. Water main pipe material shall be high density polyethylene (HDPE) constructed of PE 3408 resin with an SDR of 11 or less and conform to AWWA Standard C-906. In addition, all materials must be listed and approved for use with potable water under ANSI/NSF Standards 14 and 61 (Standard 14 meets the requirements of Standard 61). The Exterior wall of all HDPE pipe proposed for potable use must also bear NSF and AWWA C-906 identification. The pipe shall conform to DIPS (Ductile Iron Pipe Size) size and be appropriately striped as water main (blue).
- 2. Sanitary force main pipe material shall be high density polyethylene (HDPE) made from a high density, high molecular weight resin classified as a Type III, Grade P34, Class C, Category 5 by ASTM D1248. Cell Classification by ASTM D3350 shall be 345434C, and rated 3408 by the Plastics Pipe Institute, a Division of the Society of the Plastics Industry, Inc.

3. The pipe shall have the minimum or maximum inside diameter (ID) and standard dimension ratio (SDR) as indicated on the plans. The rated working pressure (psi) shall be as indicated on the plans.
 4. The CONTRACTOR is responsible for calculating loads placed on the pipe during its installation based on the CONTRACTOR's chosen means and methods of construction. It is the CONTRACTOR's responsibility to ensure the pipe will withstand all loadings placed on it during installation. If the pipe with dimensions given above will not withstand the installation loads, it is the CONTRACTOR's responsibility to size the pipe to withstand the installation loads.
 5. Manufacturers:
 - a. Phillips Driscopipe, Inc.
 - b. Chevron Chemical Company (Plexco)
 - c. or Engineer approved equal
- B. DRILLING FLUIDS:
1. The CONTRACTOR must use a high-quality Bentonite drilling fluid or equivalent to ensure hole stabilization, cuttings transport, bit and electronics cooling, and hole lubrication to reduce drag on the drill pipe and the product pipe. Oil-based drilling fluids or fluids containing additives that can contaminate the soil or ground water will not be considered acceptable substitutes. Composition of the drilling fluid must comply with all federal, state and local environmental regulations.
 2. Polymer used as lubrication in the drilling fluid is acceptable, if desired.
 3. Drilling fluids must be mixed with water that is free from significant solids and contamination. Potable water is acceptable. River water is acceptable provided no organic matter or soil particulates are mixed into the drilling fluid. It is the CONTRACTOR's responsibility to apply for and obtain any necessary permits for the procurement of drilling fluid water. It is also the CONTRACTOR's responsibility to pay permit application fees, metering charges or any other costs associated with drilling fluid mixing water.
- C. HDPE TO DUCTILE IRON CONNECTION:
1. The connection from the HDPE pipe to DI shall be manufactured by the pipe manufacturer. It shall be made of HDPE and connect to the DI pipe with a standard rubber gasket and a mechanical joint gland.
 2. Additional restraint shall be provided on each side of the connection point in the form of an HDPE anchor ring encased in concrete or other methods as approved by TOWNSHIP ENGINEER. All proposed connection and restraint details shall be included on the plans.
 3. Connections shall not be made for a period of 24 hours after the pipe has been installed to allow the pipe to approach an equilibrium temperature with its surrounding environment.
 4. The HDPE pipe shall be properly aligned at all connections.
- D. TRACER WIRE:
1. Provide minimum copper 6 gauge.

PART 3 - EXECUTION

3.01 ALIGNMENT AND PROFILE OPTIONS:

- A. Alignment and profile shown on the drawings.

- B. An alternate alignment and profile developed by the CONTRACTOR with the following requirements:
 - 1. Alignment must be within easement(s) and right-of-way.
 - 2. Clearance between utilities is maintained.
 - 3. 15-foot minimum vertical distance between the drill path and the bottom of a river to prevent drilling fluid breakout.
 - 4. Changes from the approved plans shall be applied by the Township DPU or Township Engineer.

3.02 PIPE FUSION:

- A. All pipe shall be joined with the “butt fusion” method in accordance with the pipe manufacturers recommendations. Socket fusion, extrusion welding, hot gas welding and mechanical connections are not acceptable.
- B. Butt fusion joining shall produce a joint of equal or greater tensile strength than the strength of the pipe.

3.03 DRILL ENTRANCE AND EXIT PITS:

- A. The CONTRACTOR is responsible for the design and construction of the drill entrance and exit pits. Supports may be required to maintain safe working conditions. Ensure stability of the pit, minimize loosening, and minimize soil deterioration and disturbance of the surrounding ground.
- B. Entrance and exit pits must be contained in the easement(s) and right-of way.
- C. Drill entrance and exit pits must be maintained at minimum size to allow only the minimum amount of drilling fluid storage prior to transfer to mud recycling or processing system or for removal from the site.
- D. Drilling fluid will not be allowed to freely flow on the site or around the entrance or exit pits. Fluid spilled must be removed as soon as possible and the ground restored to original condition.
- E. Pits must be shored to OSHA standard if workers are required to enter the pits for any reason.

3.04 DRILL ENTRANCE AND EXIT ANGLES:

- A. Entrance and exit angles of the drill can be whatever the CONTRACTOR desires such that the elevation profile maintains adequate ground cover to ensure no drilling fluid breakout occurs and that ground exit occurs within the designated easement(s) or right-of-way. The CONTRACTOR is responsible for ensuring that entrance and exit angles ensure pullback forces do not exceed 5% strain on the polyethylene pipe.

3.05 GUIDANCE SYSTEM:

- A. The guidance system must have the capability of measuring inclination, roll and azimuth. The guidance system must have an independent means to ensure the accuracy of the installation. The CONTRACTOR will demonstrate a viable method to eliminate accumulated error due to the inclinometer (pitch or accelerometer). The guidance system will be capable of generating a plot of the borehole survey for the purpose of an as-built drawing.

The guidance system must meet the following specifications:

Inclination:	Range	-90° to +90°
	Accuracy	0.2°
Azimuth:	Range	0° to 360°
	Accuracy	0.5°
Roll:	Range	0° to 360°
	Accuracy	0.2°

3.06 PILOT HOLE TOLERANCES:

- A. The pilot hole shall be drilled along the agreed-to alignment and profile with the following tolerances:
 - 1. Vertical
 - a. Plus 4 feet (deeper or additional ground cover).
 - b. Minus 1 foot (shallower or reduced ground cover).
 - 2. Horizontal:
 - a. Plus, or minus 2.5 feet
 - 3. Curve radius:
 - a. Curve radius shall not exceed the pipe manufacturer's recommendations.

3.07 DRILL PATH DOCUMENTATION:

- A. The CONTRACTOR is responsible for maintaining drilling logs that provide drill path data every 25 feet along the drill path. Information logged every 25 feet will, at a minimum, include the following:
 - 1. Pilot hole:
 - a. Distance out or station
 - b. Depth below a known ground surface elevation
 - c. Plus, or minus (left or right) of alignment
 - d. Torque
 - e. Drill fluid flow rate
 - f. Time
 - 2. Back ream:
 - a. Distance out or station
 - b. Pull back force
 - c. Torque
 - d. Drill fluid flow rate
 - e. Time

3.08 PIPE GOUGING:

- A. The CONTRACTOR shall take every precaution to prevent gouging of the pipe prior to and during pipeline installation.

- B. It is expected some pipe gouging will occur during pullback. However, the constructed pipeline shall not have any gouges that are deeper than 10% of the pipe wall thickness. Pipe that has gouges greater than 10% of the pipe wall thickness will not be accepted.

3.09 INSTALLING PRODUCT PIPE:

- A. After the pilot hole is completed, install a swivel to the reamer and commence pullback operations. Pre-reaming of the tunnel may be necessary and is at the option of the CONTRACTOR.
- B. Reaming diameter will not exceed 1.4 times the diameter of the product pipe being installed.
- C. Allow sufficient length of product pipe to extend past the termination point to allow connections to adjacent pipe sections or gate valves. Pulled pipes will be allowed 24 hours of stabilization prior to making tie-ins. The length of extra product pipe will be at the CONTRACTOR'S discretion.
- D. Install an AWWA C153-11 Mechanical Joint Adaptor, per the manufacturer's requirements, when connecting the pipe to a valve or hydrant.

3.10 YIELD STRESS:

- A. The yield stress shall be calculated from the HDPE material submitted and the cross-sectional area of the pipe. The result will be the force at which the HDPE pipe will yield.
- B. The pullback force will be monitored throughout the pullback. At no time shall the equipment be operated to produce a pullback force that exceeds 75% of the yield force.

3.11 CLEANUP:

- A. All excavated soil, soil cuttings and drilling fluid shall be the property of the CONTRACTOR. All material shall be disposed of in accordance with all laws, regulations, codes, ordinance and these specifications.
- B. Immediately upon completion of the work in this section, all rubbish and debris shall be removed from the job site. All construction equipment and implements of service shall be removed and the entire area involved shall be left in a neat, clean and acceptable condition.
- C. If a drilling fluid breakout should occur, the area shall be cleaned immediately, and the surface washed and returned to original condition by Contractor.
- D. Every precaution shall be implemented to prevent a drilling fluid breakout in the river. It is the CONTRACTOR's responsibility to conduct construction activities to prevent this occurrence. However, if a drilling fluid breakout occurs in the river, it is the CONTRACTOR's responsibility to clean up any resultant contamination. The CONTRACTOR is also responsible for any damage to property or the environment due to such a breakout.

3.12 HYDROSTATIC TESTING:

- A. Notification: The Township Inspector or Township Engineer shall be provided notice and allowed three (3) work days to perform major inspections for water main.
- B. EQUIPMENT: Contractor must provide.
- C. CONTRACTOR is responsible for conducting the test.
- D. The pipe shall be hydrostatically tested in accordance with ASTM F2164 before being connected to other piping systems. The pipe shall be tested independently of other hydrostatic tests.
- E. Hydrostatic testing will consist of filling the constructed pipeline with water taking care to bleed off trapped air. The CONTRACTOR shall pressurize the pipe to 150 psi for a minimum of 4 hours to give the pipe time to expand. During this initial 4 hours, make-up water shall be added as-needed to maintain the pressure within 5 psi of the specified pressure. At the end of the first 4 hours, the pipe shall be pressurized to the specified pressure and the test commences. The pipeline shall be maintained under the test pressure for a continuous period of between 1 and 4 hours, as determined by the TOWNSHIP ENGINEER, by pumping water into the line. The volume of water so added to maintain pressure within 5 psi of the specified pressure shall be measured and considered to represent the "leakage" from the line during the interval.

The allowable "leakage" for the pipeline shall not exceed the allowances given in the following table.

Nominal Pipe Size (In)	Allowable "Leakage" (Gal/100' of Pipe)		
	1-Hour Test	2-Hour Test	3-Hour Test
3	0.10	0.15	0.25
4	0.13	0.25	0.40
6	0.30	0.60	0.90
8	0.50	1.0	1.5
10	0.75	1.3	2.1
11	1.0	2.0	3.0
12	1.1	2.3	3.4
14	1.4	2.8	4.2
16	1.7	3.3	5.0
18	2.2	4.3	6.5
20	2.8	5.5	8.0
22	3.5	7.0	10.5
24	4.5	8.9	13.3
28	5.5	11.1	16.8
32	7.0	14.3	21.5
36	9.0	18.0	27.0
40	11.0	22.0	33.0
48	15.0	27.0	43.0

It is understood that the pipe will continue to expand after the initial 4 hours under pressure and throughout the 1 to 4-hour test period. The allowable "leakage" presented in the table above accounts for this expansion and no additional allowable "leakage" will be considered. The testing length is not to exceed 2000 linear feet.

- F. Under no circumstances shall the total time under the specified test pressure exceed 8 hours. If the test is not completed due to leakage, equipment failure, etc., the test shall be terminated, and the pipeline shall be de-pressurized and permitted to "relax" for a minimum of 8 hours prior to the next testing sequences.
- G. If there are no visual leaks or significant pressure drops during the final test period, and the measured "leakage" is less than allowable, the pipeline passes the hydrostatic test.
- H. In the event that the "leakage", as determined by the ENGINEER, exceeds the specified allowable, the CONTRACTOR shall be responsible to repair or replace the pipeline until the pipeline passes the hydrostatic test, as determined by the ENGINEER.

3.13 TRACER WIRE:

- A. Tracer wire shall be installed with the directionally drilled pipe.

3.14 SCHEDULES:

- A. Horizontal Directional Drilling Plan for Preventing and Controlling the Loss of Drilling Mud (3 sheets).
- B. Joint Adapter Detail (1 sheet).
- C. HDPE to DIP Connection Detail (1 sheet).

END OF SECTION

SECTION 02740.1

HORIZONTAL DIRECTIONAL DRILL PLAN FOR PREVENTING LOSS OF DRILLING MUD

1.0 INTRODUCTION

- A. This directional drill contingency plan provides specific procedures and steps to prevent and/or to contain inadvertent releases of drilling mud (also referred to as frac-outs) for waterbodies that are crossed using horizontal directional drilling (HDD) techniques.

2.0 HORIZONTAL DIRECTIONAL DRILLING PROCESS

- A. Installation of a pipeline by HDD is generally accomplished in three stages. The first stage consists of directionally drilling a small-diameter pilot hole along a pre-determined path. The second stage enlarges this pilot hole to a diameter that will accommodate the pipeline. Numerous "reaming" passes will be necessary with each pass enlarging the diameter of the pilot hole incrementally. The third stage involves pulling the pipeline through the enlarged hole.

During the drilling of the pilot hole, directional control is achieved by using a non-rotating drill string with an asymmetrical leading edge. The asymmetry of the leading edge creates a steering bias, which allows the operator to control the direction of the drill bit. The actual path of the pilot hole is monitored during drilling by taking periodic readings of the inclination and azimuth. These readings are used to calculate the horizontal and vertical coordinates along the pilot holes relative to the initial entry point on the surface.

Once the pilot hole is complete, it is enlarged using reaming tools that are often custom-made for a particular diameter of pipe or type of soil. The reamers are typically attached to the drill string at the exit point and are rotated and drawn to the drilling rig, thus enlarging the pilot hole with each pass. Pipe installation is accomplished by attaching a prefabricated pull section behind a reaming assembly at the exit point and pulling the entire assembly back to the drilling rig.

- B. Ideally, horizontal directional drilling involves no disturbance to the bed or banks of a stream or wetland. However, it is possible that geologic irregularities could be encountered during drilling, and drilling could fail. This plan describes the potential for failure of horizontal directional drilling, the contingency methods that would be implemented in the event of inadvertent release of drilling fluids to water or land, and drill hole abandonment procedures.

The feasibility of the horizontal directional drill method primarily depends on the local geologic setting, as well as site topography and other surface features. For example, horizontal directional drilling may not be feasible in areas of glacial till or outwash interspersed with boulders and cobbles, highly fractured bedrock, or non-cohesive coarse sands and gravels. These formations increase the likelihood that drilling could fail due to refusal of the drill bit, continuous loss of drilling fluid through fractures or weak areas in the ground, or collapse of the bore hole in non-cohesive, unstable substrate.

Fortunately, surface characteristics at the proposed Project drill sites are generally favorable for HDD.

Also, subsurface geotechnical investigations indicate that conditions are favorable for horizontal directional drilling.

3.0 MONITORING PROCEDURES

- A. The Project Engineer and construction personnel will continuously monitor operations during drilling activities.
 - 1. Visual inspection along the drill path, including monitoring the water body for evidence of a release.
 - 2. Continuous examination of drilling fluid pressures and returns flows.

4.0 NOTIFICATION PROCEDURES

- A. If in the course of an inspection an inadvertent release is discovered, steps will be taken by construction personnel to contain the release as described in Section 5.0, Corrective Action and Cleanup.
- B. If monitoring indicates an in-stream release, the Project Engineer will immediately notify the appropriate Federal and State agencies as soon as possible by telephone and/or facsimile of an in-stream release event, detailing the nature of the release and corrective actions being taken. The notified agencies will determine whether additional measures need to be implemented.
- C. If a release occurs that may migrate downstream and affect water quality, downstream water users will be contacted.

5.0 CORRECTIVE ACTION AND CLEANUP

- A. By monitoring drilling operations continuously, it is intended to correct problems before they occur. In addition, containment equipment including earth-moving equipment, portable pumps, hand tools, sand, hay bales, silt fence, lumber, and a suction dredge will be readily available at the drill site. If a release does occur, the following measures will be implemented to stop or minimize the release and to clean it up.
 - 1. The drilling contractor will decide what modifications to make to the drilling technique or composition of drilling fluid (e.g., thickening of fluid by increasing bentonite content) to reduce or stop minor losses of drilling fluid.
 - 2. If a minor bore path void is encountered during drilling, making a slight change in the direction of the bore path may avoid loss of circulation.
 - 3. If the bore head becomes lodged resulting in loss of drilling pressure, the borehole may be sized by moving the bore head back and forth to dislodge the stuck materials.
 - 4. If necessary, drilling operations will be reduced to assess the extent of the release and to implement other possible corrective actions.
 - 5. If public health and safety are threatened, drilling fluid circulation pumps will be turned off. This measure will be taken as a last resort because it increases the potential for drill hole collapse resulting from loss of down-hole pressure.
 - 6. If a land release is detected, the drilling crew will take immediate corrective action to contain the release and to prevent migration off site.
 - 7. The contractor will construct pits and berms around the borehole entry point to contain inadvertent releases onto the ground.
 - 8. Any drilling mud released into the pits will be pumped by contractor personnel into a mud-processing unit for recycling of drilling fluid and separation of cuttings.
 - 9. Additional berms will be constructed around the bore pit as directed by the Project Engineer to prevent release materials from flowing into the water body.

10. If the amount of an on-land release does not allow practical collection, the affected area will be diluted with fresh water and allowed to dry. Steps will be taken (such as berm, silt fence, and/or hay bale installation) to prevent silt-laden water from flowing into the water body.
11. If hand tools cannot contain a small on-land release, small collection sumps (less than 5 cubic yards) may be constructed to pump the released material into the mud processing system.
12. Contractor HDD crews will immediately implement non-mechanized measures to contain the spread of drilling fluids, including the installation of hay bales or silt fence.
13. Sump pumps or vacuum trucks will be used to remove and dispose of any drilling fluids.

6.0 ABANDONMENT

- A. If corrective actions do not prevent or control releases from occurring into the water body, the HDD Contractor may opt to re-drill the hole along a different alignment or suspend the Project altogether. In either case, the following procedures will be implemented to abandon the drill hole.
 1. The method for sealing the abandoned drill hole is to pump thickened drilling fluid into the hole as the drill assembly is extracted, and using cement grout to make a cap.
 2. Closer to the surface of the hole(s) (within approximately 10 feet of the surface), a soil cap will be installed by filling with soil extracted during construction of the pit and berms.
 3. The bore hole entry location will be graded by the contractor to its original grade and condition after the drill hole has been abandoned.

SECTION 02800

SURFACE PROTECTION AND RESTORATION

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes the work required for protection and restoration of surface features such as site improvements and all trees, shrubs, lawns and other landscape features.
- B. Definition of Site Improvements: Fences, retaining walls, parking appurtenances, playing fields and equipment, sheds, mail boxes, lawn sprinkling systems, landscaping, yard lights and yard accessories.

1.02 REFERENCES:

- A. MDOT - Michigan Department of Transportation, *"Standard Specifications for Construction", Current Edition.*

1.03 JOB REQUIREMENTS:

- A. Lawn Areas Disturbed by Construction Operation shall be as follows:
 - 1. Restoration: Fine grade to 4 inches below finish elevations. Remove all stones and debris greater than 1-inch diameter. Place 4 inches of new topsoil, and heavy duty hydroseed and mulch.
 - 2. Install mulch blanket as directed.
- B. Scheduling:
 - 1. Restoration of lawns and other surface features: Promptly following curb and gutter, site improvements and paving.
 - 2. Restoration of site improvements: Promptly following utility installation.
 - 3. Clean up: Promptly following restoration.
- C. Seasonal Limitations: MDOT 816.03.

PART 2 - PRODUCTS

2.01 MATERIALS:

- A. Trees, shrubs and Plants: MDOT 917.
- B. Topsoil: MDOT 917.
- C. Chemical Fertilizer: MDOT 917. Phosphorus not allowed.
- D. Grass Seed: MDOT 917.12.
 - 1. Lawns: Mixture THM.
 - 2. Other areas: Mixture THV.
- E. Sod: MDOT 917.13.
- F. Mulch Blanket: Excelsior or straw mulch blanket, MDOT 917.15, anchored in place only with wood stakes.

- G. Site Improvements: Provide materials equal to or better than those that existed prior to start of construction whether shown or not shown on the drawings.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Inspection: Approval required.

3.02 TREES AND SHRUBS:

- A. Protection: All items not indicated for removal.
- B. Damaged branches: Trim and seal within fifteen (15) days.
- C. Replacement: MDOT 815. Place mulching around tree with diameter one foot greater than ball diameter.
- D. Maintain a clear space of ten feet (10') around all existing and proposed fire hydrants.

3.03 TOPSOIL:

- A. Place new topsoil in preparation of seeding or sodding. Remove all stones and debris larger than 1-inch diameter.
- B. Construction methods: MDOT 816.03.

3.04 SEEDING:

- A. Construction methods: MDOT 816.03 except with the following rates:
 - 1. Topsoil: 4 inches of new topsoil.
 - 2. Heavy duty hydroseed.
 - 3. Heavy duty hydromulch.

3.05 SODDING:

- A. Construction Methods: MDOT 816.03 with 4-inch topsoil.

3.06 SITE IMPROVEMENTS:

- A. Protection: All items not indicated for removal.
- B. Restoration: Approval required.

3.07 SURFACE RESTORATION:

- A. Seed: Backfill with site soil, place new topsoil, fine grade, remove stones larger than 1 inch, clay lumps, wood, debris and other extraneous materials, provide hydraulic seeding.
- B. Sod: Grade backfill to smooth subgrade, place and fine grade new topsoil, place Class A sod, fertilizer, water and roll into new topsoil.

SECTION 13425

PEDESTRIAN BRIDGE

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included:

1. This Section includes the design, furnishing, erection, testing and placing in service of a pedestrian bridge intended to carry pedestrian and bicycle traffic.

1.02 REFERENCES:

A. General:

1. Bridge shall be designed, fabricated and constructed in accordance with the AASHTO Guide Specifications for Pedestrian Bridges and the AASHTO Guide Specifications for Highway Bridges where applicable.

B. The work of this Section shall comply with the following references:

1. AASHTO HB-17– Standard Specification for Highway Bridges, Latest Edition
2. AASHTO GSDPB – LRFD Guide Specifications for Design of Pedestrian Bridges, Latest Edition
3. AASHTO GSDFPB – Guide Specifications for Design of FRP Pedestrian Bridges, Latest Edition
4. Michigan Building Code, Latest Edition
5. AWS D1.1 – Structural Welding Code, Latest Edition
6. AWS D1.5 – Bridge Welding Code, Latest Edition
7. ACI 318 – Building Code and Commentary, Latest Edition
8. AISC – Manual of Steel Construction, Latest Edition
9. AITC TCM–Timber Construction Manual, Latest Edition
10. NDS – National Design Standard for Wood Construction, Latest Edition
11. ASCE 7 – Minimum Design Loads for Buildings and other Structures, Latest Edition
12. PCI - Pre-stressed Concrete Institute:
 - a) MNL-116 - Manual for Quality Control for Plants and Production of Precast Pre-stressed Concrete Products.
 - b) MNL-127 - Recommended Practice for Erection of Precast Concrete.
13. ASTM Standard Specifications:
 - a) A 185 - Steel Welded Wire Fabric. Plain, for Concrete Reinforcement.
 - b) A 615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - c) C 33 - Concrete Aggregates.
 - d) C 150 - Portland Cement.
 - e) A123 - Standard Specifications for Zinc (hot dip galvanizing) coatings on iron and steel products.

1.03 SUBMITTALS:

A. Signed and sealed design calculations, specifications, plans and detail drawings.

1. Prepared by a Professional Engineer registered in Michigan.
2. Submit for:
 - a. Foundation
 - b. Bridge Structure
 - c. Bridge Railings
3. Obtain ENGINEER's review prior to proceeding with fabrication and construction.

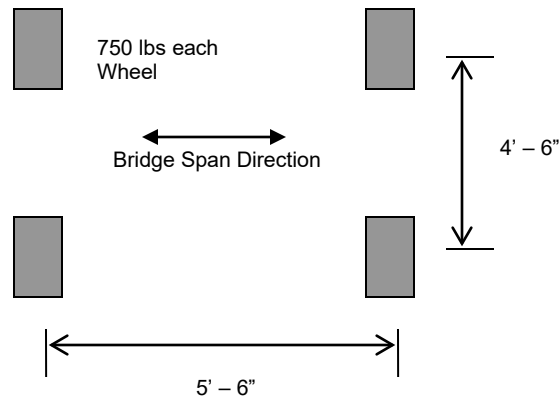
- B. Welder's qualifications and certification.
- C. Structural steel certified steel mill test reports and certification.
- D. Concrete reinforcing steel certified mill steel test report.
- E. Concrete mix design.
- F. Concrete reinforcing steel schedule and layout drawing.
- G. Precast Concrete test reports
- H. Prestressing strand certifications.
- I. Soils report for foundation design.

1.04 GUARANTEE:

- A. Bridge Contractor shall guarantee the structure against any defects in materials or workmanship for a period of one year from the date of completion. If any defect is discovered and reported to the Contractor during the guarantee period, the Contractor shall make the necessary repairs without charge to the owner.

1.06 DESIGN REQUIREMENTS:

- A. Design Loads:
 - 1. Dead load: Structure load including decking
 - 2. Live load: 85 pounds per square foot uniformly distributed. Reductions in live load will be allowed for contributory area exceeding 400 square feet in accordance with the AASHTO Specification. In no case shall the live load be less than 65 pounds per square foot.
 - 3. Snow load: Calculated per ASCE 7 acting in combination with the live load
 - 4. Wind load: Calculated per AASHTO Specification
 - 5. Concentrated load: The bridge structure shall be designed for each of the following point load conditions:
 - 6. A concentrated load of 1000 pounds placed on any area 2 feet x 2 feet square.
 - 7. A 3000 pound 4-wheel vehicle as shown in the following diagram placed on the structure to provide the most critical loading.



8. Construction loads: All other associated loads experienced during construction such as equipment, workers, steel rigging and erecting methods.

B. Hydraulic Capacity:

1. For bridges over water the clear opening of the structure shall be designed to pass the 100 yr storm with a minimum of one foot of freeboard to the low beam elevation.
2. The span of the structure shall be set to clear the channel and to minimize scour of the abutments and footings. Where scour counter measures are required, such as sheet piling or rip rap shall be utilized.

C. Abutments:

1. The bridge abutments shall be constructed using cast in place steel reinforced concrete.

D. Foundation:

1. Design the foundation based on the results of a soil investigation report and foundation recommendations provided by geotechnical engineer registered in the State of Michigan.

E. Railings:

1. Railings shall be designed to resist a 50 lb/ft linear load applied to any member in from any direction and a nonconcurrent 200 lb point load applied in any direction to the top of the rail.
2. Railing posts shall be spaced at a maximum of 5'-0" on center.

F. Structure Dimensions:

1. The Minimum clear width for the structure as measured from face of curb to face of curb shall be 8 feet.
2. The bridge shall be cambered for dead load of the bridge and 1% of the span length. The camber shall not exceed the maximum grades specified for ADA compliance.

G. Deflection:

1. The vertical deflection of the main span due to the pedestrian load shall not exceed 1/500 of the span length.
2. The horizontal deflection of the main span shall not exceed 1/500 of the span under an 85-mph wind load.

1.07 PERMITS:

- A. The CONTRACTOR shall obtain all permits required for the structure including but not limited to the MDEQ Inland Lakes and Streams Army Corps of Engineers Joint Permit, SESC permit and applicable County Road Commission and Drain Commission permits.

PART 2 - PRODUCTS

2.01 BRIDGE:

A. Foundation:

1. Foundation shall consist of reinforced concrete spread footings or piles as recommended in the soil's investigation report.
2. Foundation concrete shall have a minimum 3500 psi compressive strength.

B. Abutments:

1. Abutments shall be constructed of reinforced cast in place concrete with minimum 3500 psi compressive strength.

C. Bearings:

1. The proposed bridge shall include bearing devices designed for the rotational movements of the bridge due to dead and live loads as well as the anticipated thermal expansion and contraction movements of the structure.
2. Anchor rods shall be provided at the bearing points of the bridge to resist the design reactions at the bearing points.

2.02 ATTACHMENTS:

A. Safety Railings:

1. Vertical safety rails or pickets shall be placed on the structure to a minimum height above the deck surface of 54 inches. The pickets shall be placed as to prevent a 4-inch diameter sphere from passing through the railing.
2. Railings shall extend off of the structure where required for approach slopes in excess of 1 on 3 or where required for fall protection from vertical drops.

B. Handrail:

1. The bridge shall have a handrail on each side of the structure meeting ADA requirements.

C. Rubrail:

1. The bridge design shall include a 6-inch-high rubrail located along each side of the structure at deck level. The rubrail shall be designed and located to protect the structure and handrails during snowplowing operations.
2. The design of the rubrail and placement shall not impede stormwater runoff from the structure.

D. Paint:

1. Steel structures shall be constructed with unpainted weathering steel with a minimum corrosion index of 6.0, determined in accordance with ASTM G101.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Coordinate Site access and staging area with ENGINEER prior to mobilization.

3.02 ERECTION:

- A. Erect in accordance with bridge manufacturer's Shop Drawings and these Specifications.
B. Remove all lifting lugs and other devices used for the purpose of bridge erection.

END OF SECTION

Sewer/Water Utility - Trace Wire Specification

Materials

General

All trace wire and trace wire products shall be domestically manufactured in the U.S.A.

All trace wire shall have HDPE insulation intended for direct bury, color coated per APWA standard for the specific utility being marked.

Trace wire

- **Open Trench** - Trace wire shall be #12 AWG Copper Clad Steel, High Strength with minimum 450 lb. break load, with minimum 30 mil HDPE insulation thickness.
- **Directional Drilling/Boring** - Trace wire shall be #12 AWG Copper Clad Steel, Extra High Strength with minimum 1,150 lb. break load, with minimum 30 mil HDPE insulation thickness.
- **Trace wire – Pipe Bursting/Slip Lining** - Trace wire shall be 7 x 7 Stranded Copper Clad Steel, Extreme Strength with 4,700 lb. break load, with minimum 50 ml HDPE insulation thickness.

Connectors

- All mainline trace wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At Crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative.
- **Direct bury wire connectors** – shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground trace wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion, and shall be installed in a manner so as to prevent any uninsulated wire exposure.
- Non locking friction fit, twist on or taped connectors are prohibited.

Termination/Access

- All trace wire termination points must utilize an approved trace wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose.
- All grade level/in-ground access boxes shall be appropriately identified with “sewer” or “water” cast into the cap and be color coded.
- A minimum of 2 ft. of excess/slack wire is required in all trace wire access boxes after meeting final elevation.
- All trace wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the trace wire connection and the terminal for the grounding anode wire connection.
- Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

Sewer/Water Utility - Trace Wire Specification

- **Service Laterals on public property** - Trace wire must terminate at an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway.
- **Service Laterals on private property** - Trace wire must terminate at an approved above-ground trace wire access box, affixed to the building exterior directly above where the utility enters the building, at an elevation not greater than 5 vertical feet above finished grade, or terminate at an approved grade level/in-ground trace wire access box, located within 2 linear feet of the building being served by the utility.
- **Hydrants** – Trace wire must terminate at an approved above-ground trace wire access box, properly affixed to the hydrant grade flange. (affixing with tape or plastic ties shall not be acceptable)
- **Long-runs, in excess of 500 linear feet without service laterals or hydrants** - Trace wire access must be provided utilizing an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway. The grade level/in-ground trace wire access box shall be delineated using a minimum 48" polyethylene marker post, color coded per APWA standard for the specific utility being marked.

Grounding

- Trace wire must be properly grounded at all dead ends/stubs
- Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20ft of #14 red HDPE insulated copper clad steel wire connected to anode (minimum 0.5 lb.) specifically manufactured for this purpose, and buried at the same elevation as the utility.
- When grounding the trace wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance.
- When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the trace wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to trace wire with a mainline to lateral lug connector.
- Where the anode wire will be connected to a trace wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

Installation

General

- Trace wire installation shall be performed in such a manner that allows proper access for connection of line tracing equipment, proper locating of wire without loss or deterioration of low frequency (512Hz) signal for distances in excess of 1,000 linear feet, and without distortion of signal caused by multiple wires being installed in close proximity to one another.
- Trace wire systems must be installed as a single continuous wire, except where using approved connectors. No looping or coiling of wire is allowed.

Sewer/Water Utility - Trace Wire Specification

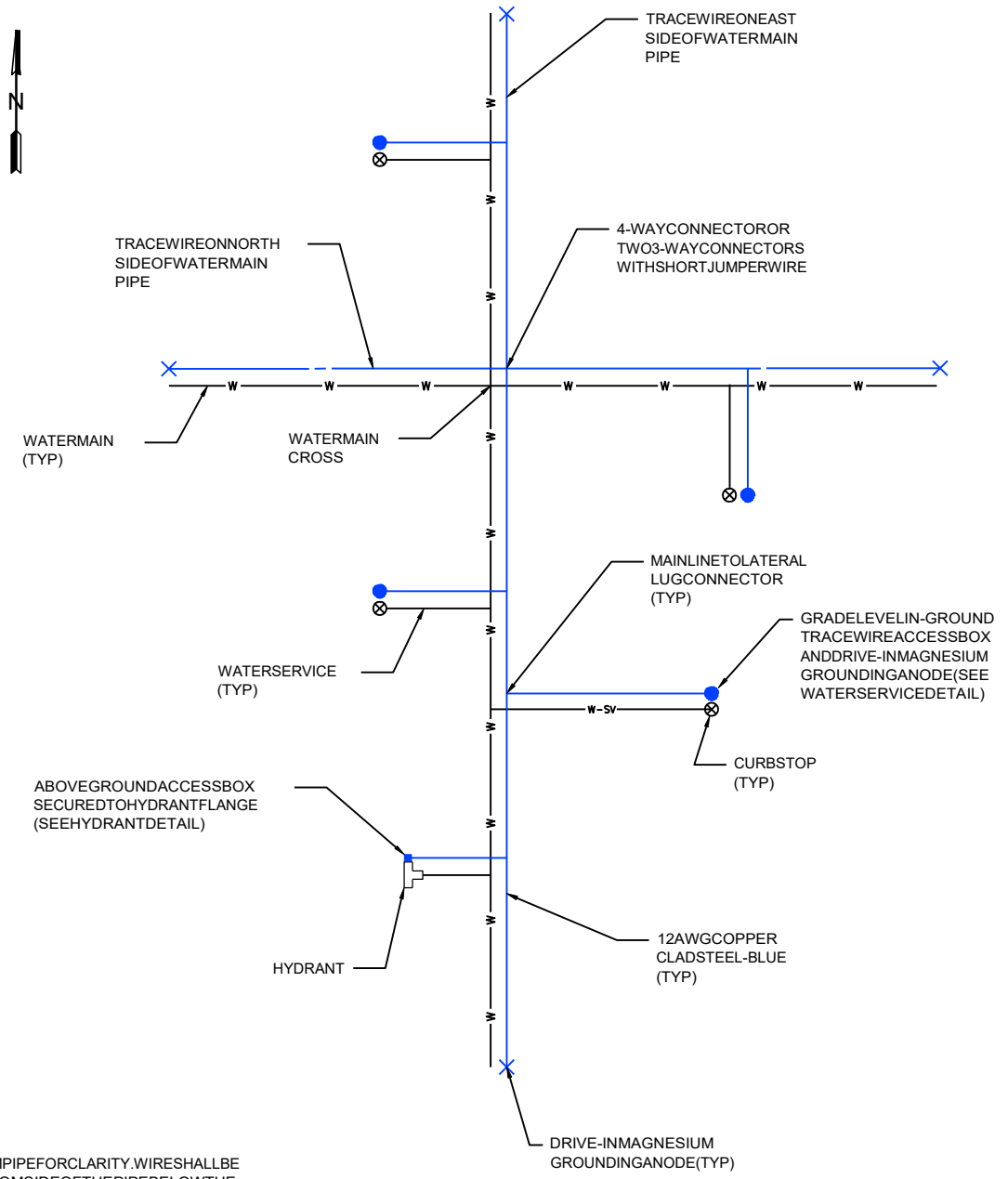
- Any damage occurring during installation of the trace wire must be immediately repaired by removing the damaged wire, and installing a new section of wire with approved connectors. Taping and/or spray coating shall not be allowed.
- Trace wire shall be installed at the bottom half of the pipe and secured (taped/tied) at 5' intervals.
- Trace wire must be properly grounded as specified.
- Trace wire on all service laterals/stubs must terminate at an approved trace wire access box located directly above the utility, at the edge of the road right-of-way, but out of the roadway. (See Trace wire Termination/Access)
- At all mainline dead-ends, trace wire shall go to ground using an approved connection to a drive-in magnesium grounding anode rod, buried at the same depth as the trace wire. (See Grounding)
- Mainline trace wire shall not be connected to existing conductive pipes. Treat as a mainline dead-end, ground using an approved waterproof connection to a grounding anode buried at the same depth as the trace wire.
- All service lateral trace wires shall be a single wire, connected to the mainline trace wire using a mainline to lateral lug connector, installed without cutting/splicing the mainline trace wire.
- In occurrences where an existing trace wire is encountered on an existing utility that is being extended or tied into, the new trace wire and existing trace wire shall be connected using approved splice connectors, and shall be properly grounded at the splice location as specified.

Sanitary Sewer System

- A mainline trace wire must be installed, with all service lateral trace wires properly connected to the mainline trace wire, to ensure full tracing/locating capabilities from a single connection point.
- Lay mainline trace wire continuously, by-passing around the outside of manholes/structures on the North or East side.
- Trace wire on all sanitary service laterals must terminate at an approved trace wire access box color coded green and located directly above the service lateral at the edge of road right of way.

Water System

- A mainline trace wire must be installed, with all service lateral trace wires properly connected to the mainline trace wire, to ensure full tracing/locating capabilities from a single connection point.
- Lay mainline trace wire continuously, by-passing around the outside of valves and fittings on the North or East side.
- Trace wire on all water service laterals must terminate at an approved trace wire access box color coded blue and located directly above the service lateral at the edge of road right of way.
- Above-ground tracer wire access boxes will be installed on all fire hydrants.
- All conductive and non-conductive service lines shall include tracer wire.



NOTES:

1. WIRES SHOWN AWAY FROM PIPE FOR CLARITY. WIRES SHALL BE INSTALLED ON THE BOTTOM SIDE OF THE PIPE BELOW THE SPRING LINE. THE WIRES SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS.

TRACEWIRE PLAN (WATER)

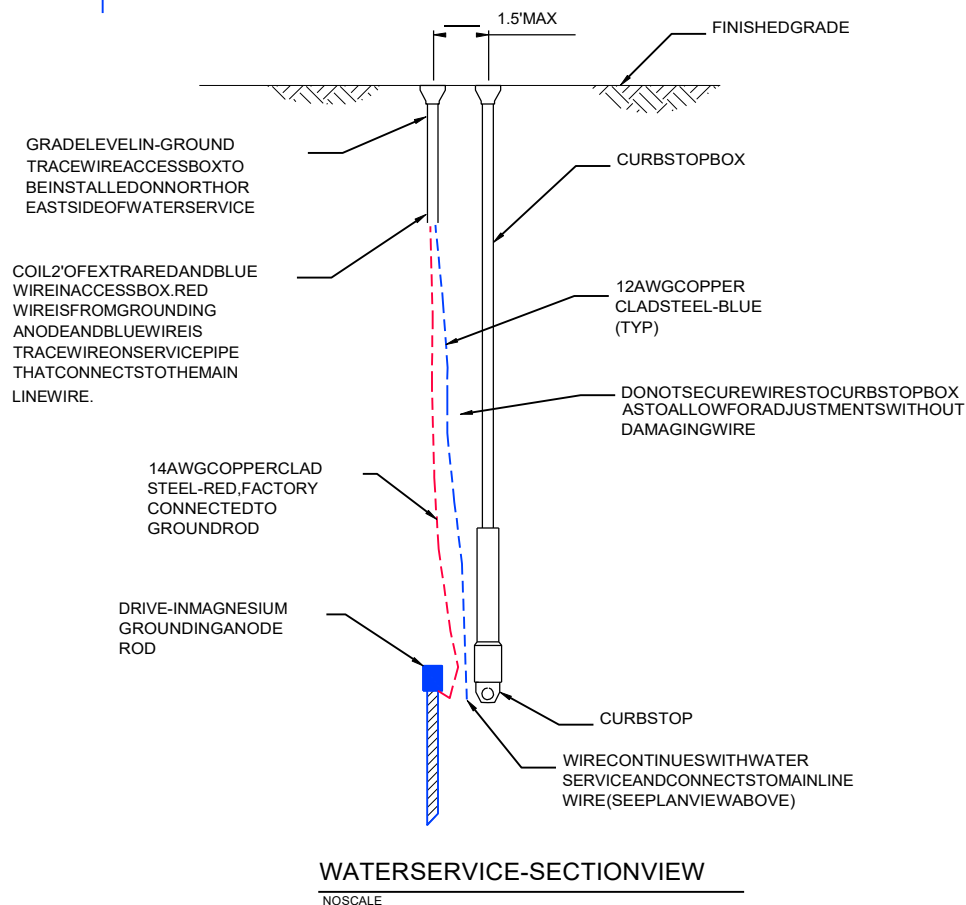
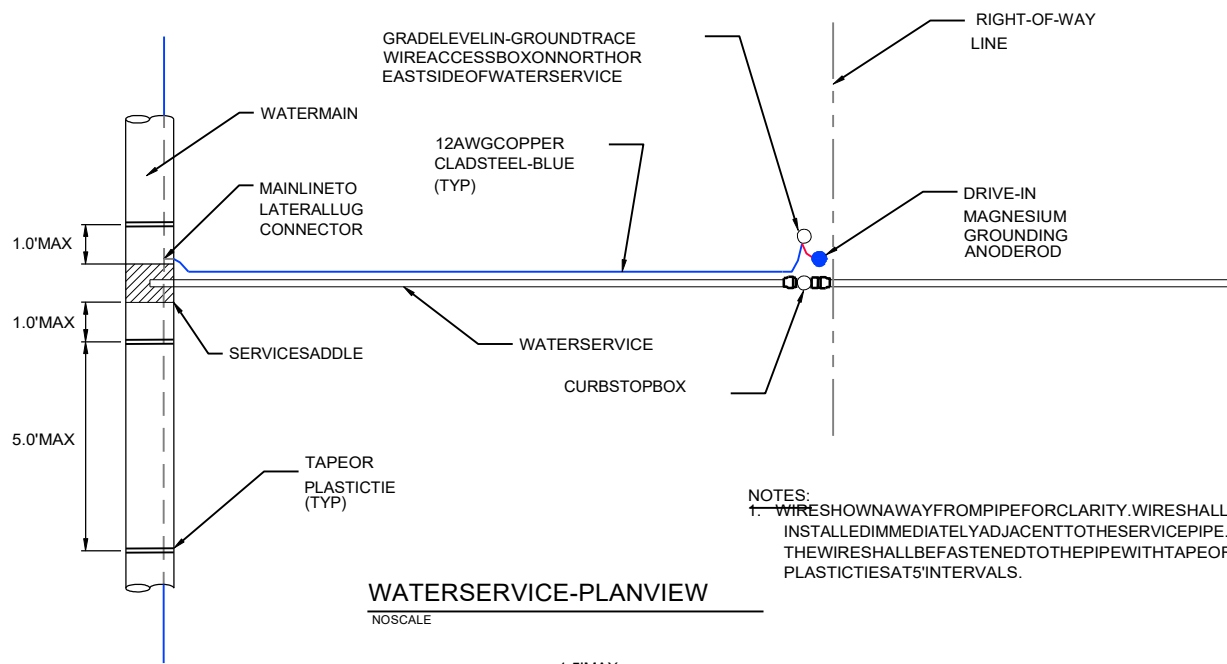
NOSCALE

MICHIGAN RURAL WATER ASSOCIATION
STANDARD DETAIL



TRACEWIRE
SAMPLE WATER PLAN

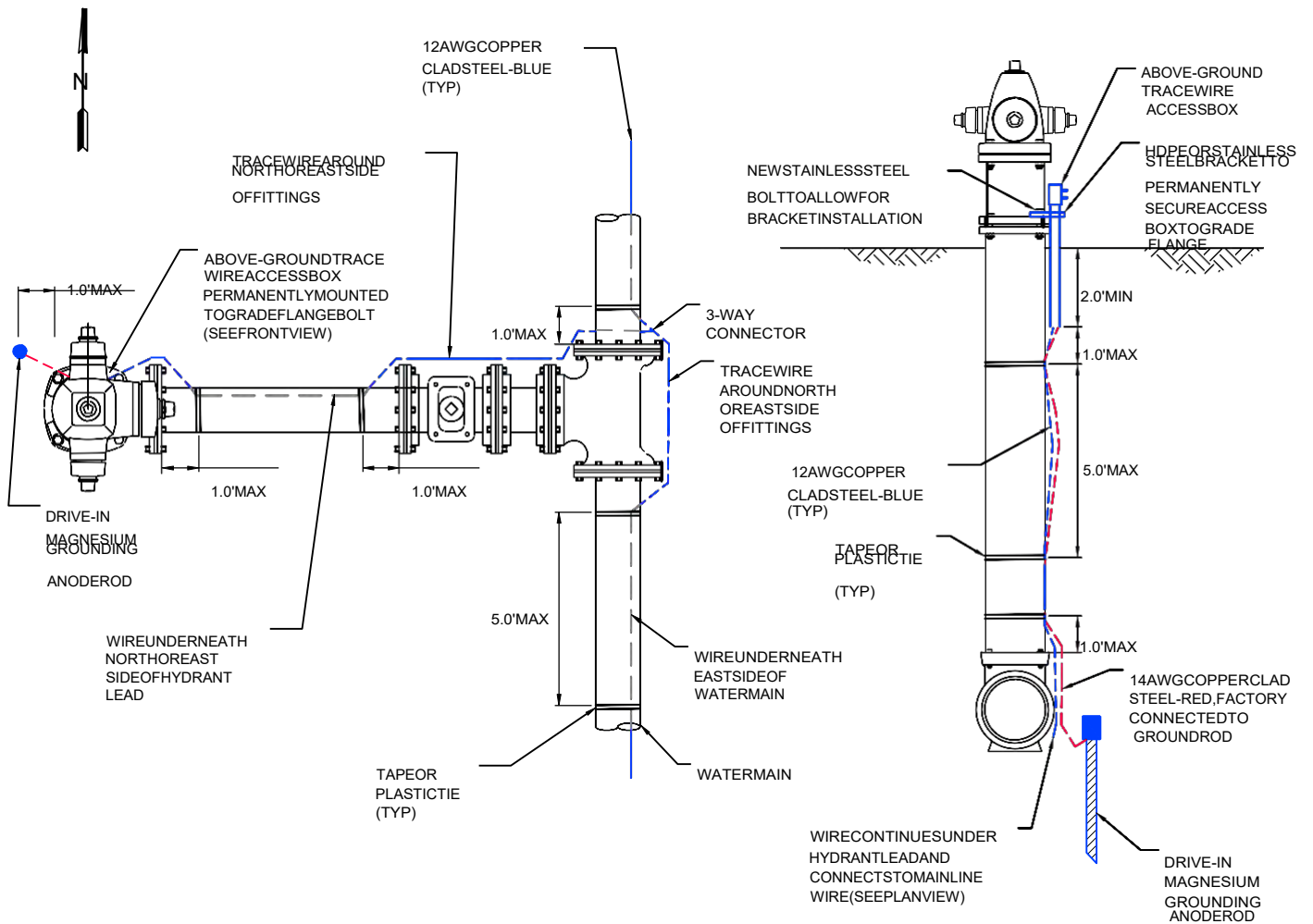
May 28, 2014



MICHIGAN RURAL WATER ASSOCIATION
STANDARD DETAIL

TRACE WIRE
WATER SERVICE DETAIL

May 28, 2014



HYDRANT-PLAN VIEW

NOSCALE

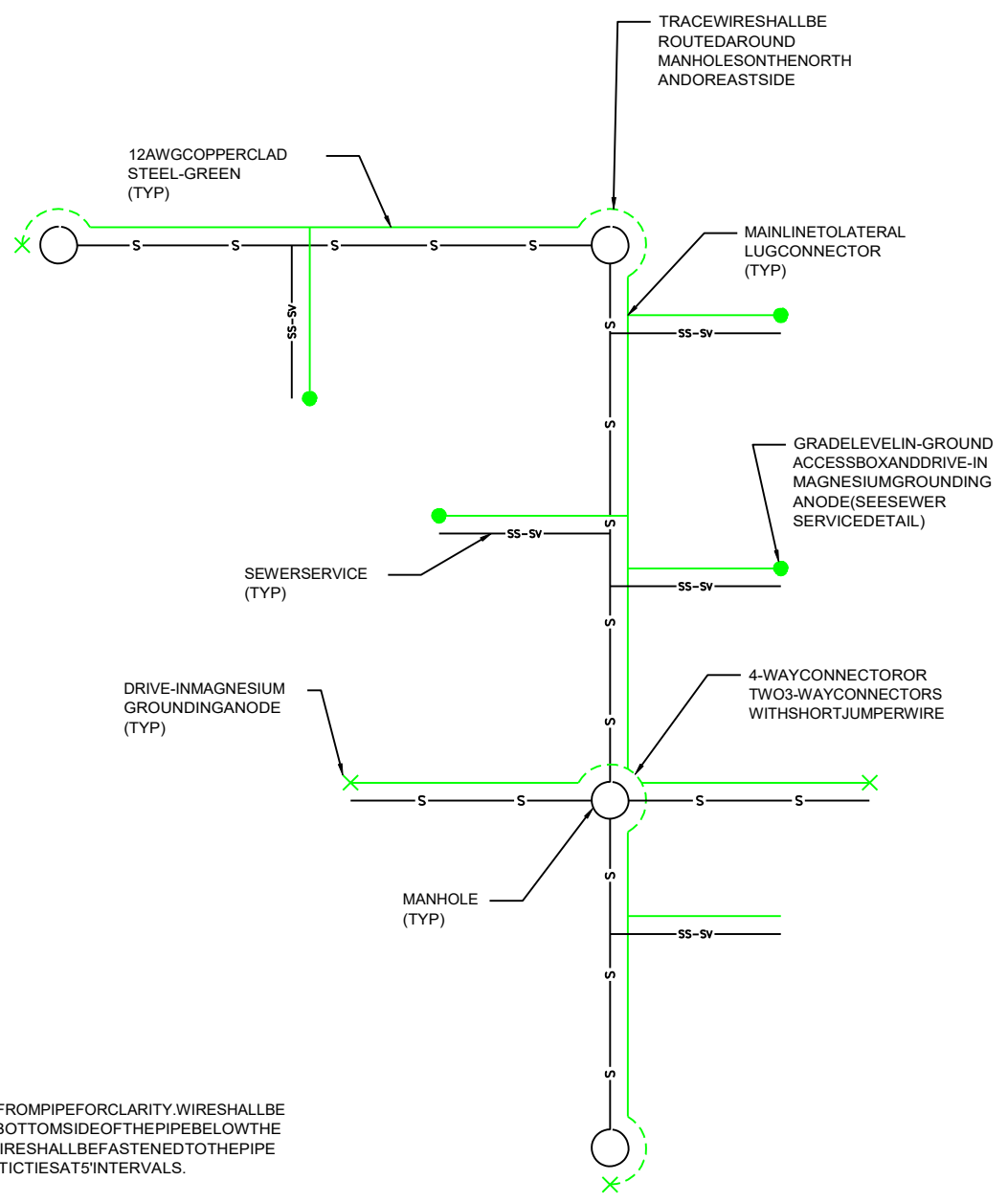
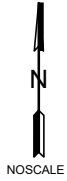
HYDRANT-SECTION VIEW

NOSCALE



MICHIGAN
RURAL WATER ASSOCIATION
STANDARD DETAIL

TRACE WIRE
HYDRANT DETAIL



NOTES:
1. WIRE SHOWN AWAY FROM PIPE FOR CLARITY. WIRE SHALL BE INSTALLED ON THE BOTTOM SIDE OF THE PIPE BELOW THE SPRING LINE. THE WIRE SHALL BE FASTENED TO THE PIPE WITH TAPE OR PLASTIC TIES AT 5' INTERVALS.

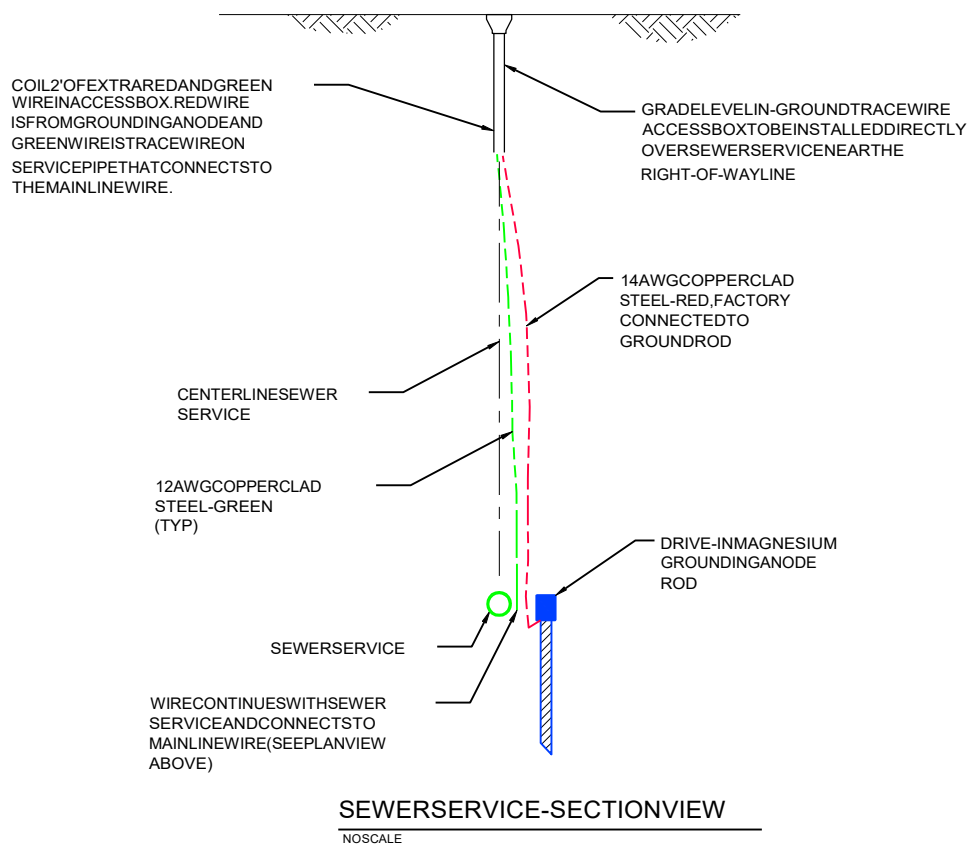
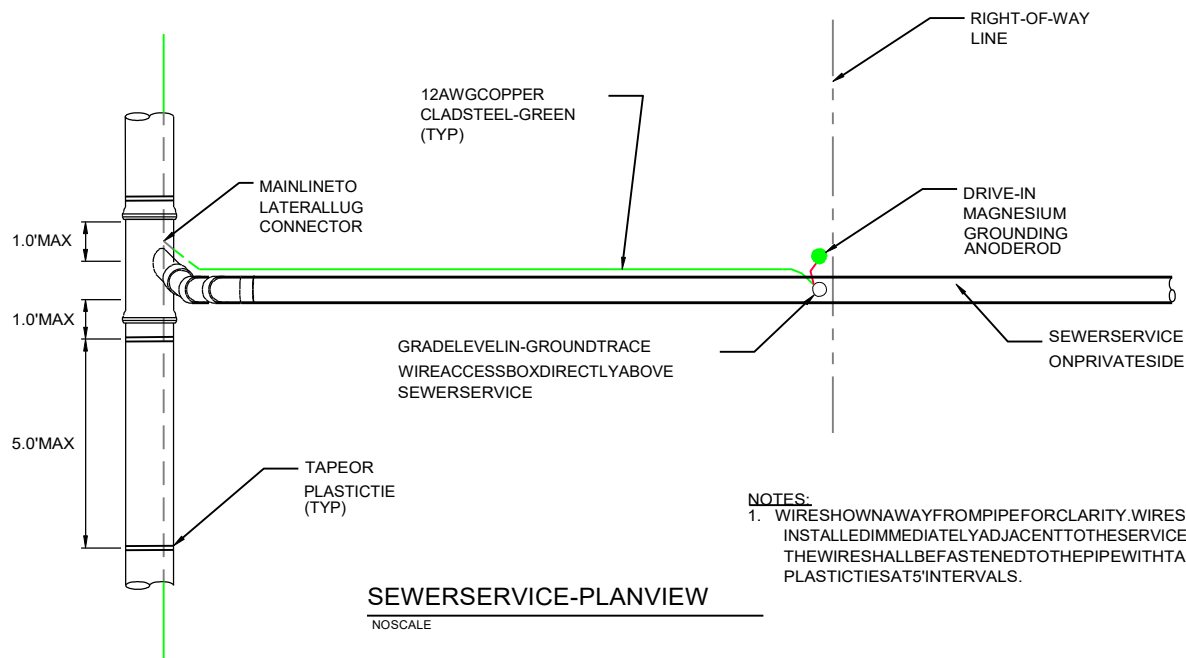
TRACE WIRE PLAN (SEWER)
NOSCALE



MICHIGAN RURAL WATER ASSOCIATION
STANDARD DETAIL

TRACE WIRE
SAMPLE SEWER PLAN

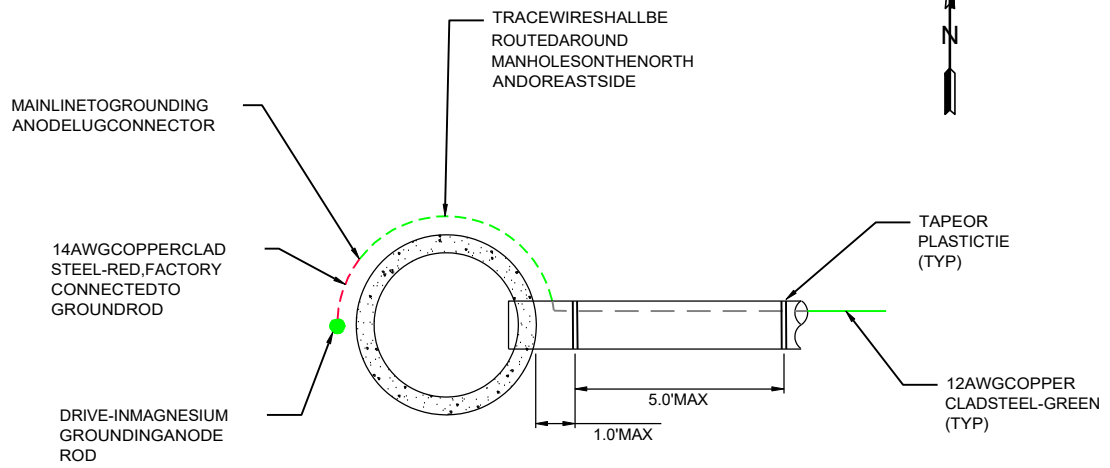
May 28, 2014



MICHIGAN RURAL WATER ASSOCIATION
STANDARD DETAIL

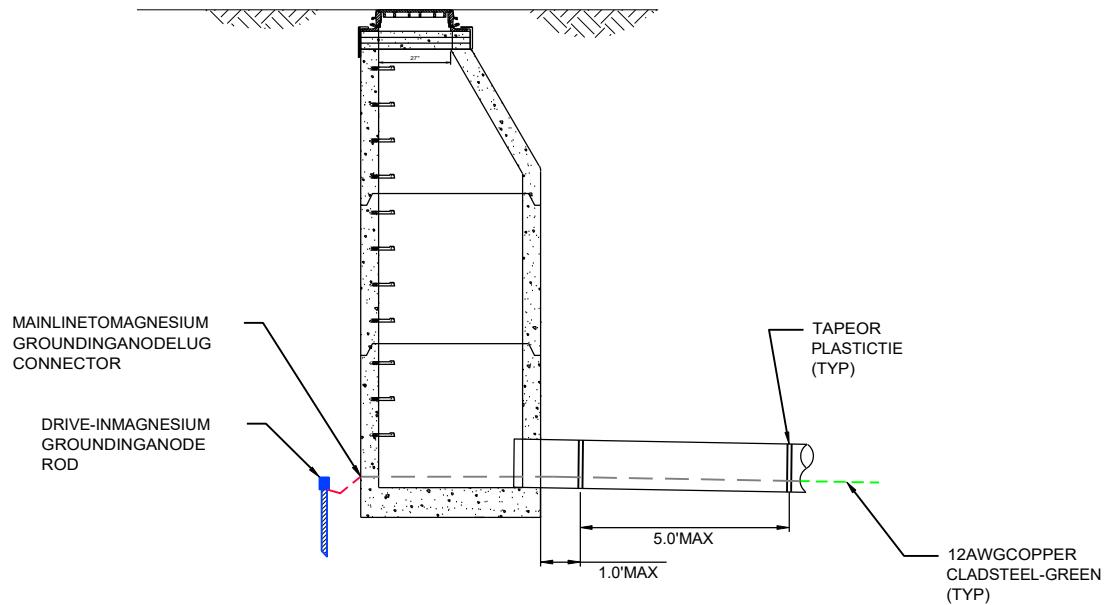
TRACEWIRE
SEWERSERVICEDETAIL

May 28, 2014



SEWERMANHOLE-PLANVIEW

NOSCALE



SEWERMANHOLE-SECTIONVIEW

NOSCALE

MICHIGAN RURAL WATER ASSOCIATION
STANDARD DETAIL



TRACEWIRE
SEWERMANHOLE DETAIL

May 28, 2014

APPENDIX A

APPENDIX “A”

WATER MAIN AND SANITARY SEWER PLANS AND SPECIFICATIONS OVERVIEW

1. The Plans and Specifications shall be submitted with a cover letter which shall contain a brief description of the proposed extension or connection, including the name, location and the lengths and sizes of the water mains and sewer lines per street to be constructed. The plans must indicate the project name, location of the project and location sketch. Refer to Section 01000, Paragraph 1.03 for complete description of the plan review process.
2. The plans must be sealed by a State of Michigan licensed professional engineer.
3. The proposed Plans must be reviewed and approved by the Township and Township Engineer.
4. Easements for water and/or sewer lines must be detailed on the Plans. Platted easements must be so noted and one (1) executed easement document must be submitted for each easement.
5. A general note must be included on the Plans stating the construction shall be done in accordance with the “Allendale Charter Township Standard Construction Requirements”.
6. The Plans must define all areas of construction adjacent to lakes, streams, water courses, or other erosion sensitive locations and reference acceptable control techniques, which must be used to control soil erosion and sedimentation.
7. If the project is within 500 feet of a lake or stream, or if the construction activity is within a 100 year floodplain and /or wetlands (Wetlands as defined by 30301(d) of Part 303 of Act 451 of Michigan, PA 1994) copies of all necessary permits or evidence of submittal, or a request for determination from the Michigan Department of Environmental Quality – Land and Water Management Division regarding those activities must be submitted.
8. For water mains constructed within public easement, the curb stops, or shut-off valve must be located on the easement line or right-of-way.
9. For water main and sanitary sewer projects, the permit applications for water systems as required by Act 399 and wastewater systems as required by Authority of Part 41, Act 451 of Michigan, PA 1994 as amended shall be completed and submitted.

APPENDIX B

APPENDIX “B”

DEVELOPMENT FEE

This fee is intended to cover the cost of plan review, construction observation/inspection and administration by the Township and Township Engineer on development projects in the Township.

The fee amount will be considered an estimated amount and is estimated for each development project by application of the following rates:

<u>Item</u>	<u>Rate</u>
Water main	\$5.00 per lineal foot
Sanitary Sewer	\$7.00 per lineal foot
Force main	\$4.50 per lineal foot
Storm Sewer / Storm Water Management	\$900 lump sum
Sidewalk, Shared Use Path, Pedestrian Bridge	\$4.00 per lineal foot
Pump Station(s)	\$22,000 lump sum per station

The entire estimated Development Fee shall be paid by the Developer to the Township prior to submittal of plans to MDEQ for permits.

The above noted fees are intended to cover all Township expenses related to site plan reviews, construction plan reviews, meeting, construction observation/inspection, and Township administration. Any plans submitted multiple times for review will have an additional charge for each plan review after the second review. Beginning with the third submittal, a review fee of \$400.00 will be added on to the development fee.

The Development Fee amount paid by the Developer to the Township will be placed into an Escrow Account. Draws from the Escrow Account will be made by the Township for the actual costs incurred in plan review, design engineering, construction observation/inspection and administration by the Township and Township Engineer.

Should expected costs exceed fees placed in the escrow account, the Township may request additional funds be deposited into the account in an amount necessary to cover current and/or projected future costs.

Monies remaining in the Escrow Account upon completion of the project and acceptance by the Township will be returned to the Developer within 30 days after final acceptance of the project by the Township.

APPENDIX C

APPENDIX "C"

UTILITY LINE EASEMENT

Contract No. _____
Plan Sheet _____
Tax Description No. _____
Tax Map _____

THIS INDENTURE, made and entered into this ____ day of _____, 20__, by and between _____, whose address is _____, hereinafter referred to as "Grantor," and **ALLENDALE CHARTER TOWNSHIP, a body corporate, as authorized by the Constitution of the State of Michigan, acting by and through its TOWNSHIP BOARD**, whose address is 6676 Lake Michigan Dr., P.O. Box 539 Allendale, Michigan 49401, hereinafter referred to as "Township";

WITNESSETH:

For and in consideration of the sum of _____ (\$_____) Dollar(s), paid to Grantor, the receipt of which is hereby acknowledged, Grantor does hereby grant unto Township, its successors and assigns, a non-exclusive perpetual and permanent easement and right of way, under, through and across a certain piece or parcel of land situated in the _____ **OF _____, in the COUNTY OF OTTAWA and STATE OF MICHIGAN**, the piece or parcel of land being owned by Grantor in fee simple and described as follows:

FEE DESCRIPTION:

EASEMENT DESCRIPTION:

This Easement is exempt from ad valorem transfer tax by reason of MCL 207.526, Section 6(a) and MCL 207.505, Section 5(a).

The easement and right of way granted herein shall be for the purpose of the construction and installation of utility lines, including sewer line or lines, water line or lines, storm sewer lines, drains and drain tiles, and their appurtenant valves, hydrants and accessories, under, through and across the above-described Easement Description for the purpose of constructing, operation, maintaining, repairing, replacing, reinstalling, inspecting and keeping in working order the utility lines, sewer lines, water lines and storm sewer lines, and their appurtenant valves, hydrants and accessories, which are running under, through and across the above-described Easement Description, all hereinafter collectively referred to as "Utility Lines."

The easement and right of way granted herein shall include the right to enter upon sufficient land of Grantor adjacent to the Easement Description ("Adjacent Land") as is required for the construction, installation, maintenance, repair, replacement, reinstallation, operation and inspection of said Utility Lines, together with the right to install intersecting Utility Lines therein. In exercising its rights to enter Adjacent Land, Township shall conduct its activities in a manner that will minimize its presence on land outside of the easement and right of way. Each time it enters the Adjacent Land, Township shall, at its sole expense, restore it to the condition it was in immediately prior to entry.

TERM: Said easement and right of way under, through and across the above-described Easement Description, for the use and benefit of Township, its successors and assigns, shall be perpetual.

AUTHORITY: Grantor warrants that they have the right and authority to grant this easement as above-described and own the lands covered by the Easement Description.

RESTORATION: The easement and right of way shall include, but not be limited to, Township's right to enter upon the Easement Description at such times as may be reasonably necessary to construct, maintain, repair, replace, reinstall and inspect its Utility Lines across, through and under the above-described Easement Description, together with the right to excavate a trench or ditch for the location of said Utility Lines. Township shall have the further right to remove trees, brush, undergrowth and other obstructions situated upon the above-described Easement Description interfering with the location, construction, maintenance or repair of said Utility Lines. As a consideration for the Township to have the right to construct and install said Utility Lines, Township shall be obligated, at its sole expense (i) to fill and grade to ground level the trench or ditch occupied by said Utility Lines and (ii) to restore the drives, parking areas, shrubs or grass to their former condition, insofar as is reasonably possible. Township does further covenant and agree that in the event it shall become necessary, at any time, to enter upon the above-described Easement Description for the purpose of maintenance, repair, replacement, construction or reinstallation of said Utility Lines, Township shall, at its sole expense, return said piece or parcel of land to a similar condition as before such maintenance or repair upon the completion of the same, insofar as is reasonably possible.

The removal or demolition of any existing buildings, structures or fences which shall be required for the reasonable exercise of the foregoing powers, shall be removed or demolished at the expense of the Township.

INDEMNIFICATION: Township agrees to fully defend, indemnify, save and keep harmless the Grantor from any and all claims for damage to real and personal property and injuries and death suffered by persons in any manner caused by or growing out of or in any way connected with the construction, installation, repair, maintenance or presence of said Utility Lines, under and across the piece or parcel of land of Grantor or the presence of Township or its employees, guests, invitees, contractors and agents upon the Easement Description or Adjacent Land. Grantor agrees that they will not construct a building, structure or other permanent improvement on said Easement Description without first obtaining the written consent of the Township, which consent will not be unreasonably withheld, delayed or conditioned; and this conveyance includes a release of any and all claims to damage arising from or incidental to the exercise of any of the foregoing powers, except as above provided.

The pronouns and relative words herein are written in the masculine and singular only. If more than one joins in, or be either of the feminine sex or a business entity, such words shall be read as if written in plural, feminine or neuter, respectively.

The Grantor has caused these presents to be signed the day and year first above written.

Sign here: _____
Type here: _____

Sign here: _____
Type here: _____

Address: _____

SS.

SS.

Prepared by:

Type here: _____

My Commission Expires:_____

CONSENT AND ACKNOWLEDGMENT OF EASEMENT

Parcel _____ (_____)

KNOW ALL MEN BY THESE PRESENTS, that _____
_____, of _____, as the
Mortgagee under a certain Mortgage dated _____, 20__, and recorded
on _____, 20__, in Liber _____ of Ottawa County records on Page
_____, hereby consents to the grant of easement made by
_____, Mortgagor in the Mortgage herein described,
to _____,
dated _____, 20__, and recorded on _____, 20__, in
Liber _____ of Ottawa County records on Page _____, and acknowledges that such Mortgage
will be subject to this Easement.

Dated this _____ day of _____, 20__.

Signed in the Presence of:

Sign here: _____
Type here: _____

By:
Sign here: _____
Type here: _____
Its: _____

Sign here: _____
Type here: _____

By:
Sign here: _____
Type here: _____
Its: _____

STATE OF _____)
) ss.
 COUNTY OF _____)

On this _____ day of _____, 20____, before me, a Notary Public, in and for
said _____ County, appeared _____ and
_____, to me personally known, who,
being by me duly sworn, did say that they are respectively the _____
_____ and the _____ of
_____, the banking corporation
named in and which executed the within instrument, and that instrument was signed on behalf of
said banking corporation by authority of its Board of Directors, and said
_____ and _____
acknowledged said instrument to be the free act and deed of said banking corporation.

Prepared by:

Sign here: _____
Type here: _____

Notary Public
_____ County, _____

My Commission Expires:_____

STATEMENT OF JUST COMPENSATION

TO: _____

THIS STATEMENT OF JUST COMPENSATION is based on the fair market value of the interest in real property, hereinafter described, obtained by the

_____, for the _____

_____ **Project.** This Statement is not less than the appraised value of the interest in said property acquired, and this Statement disregards any decrease or increase of the fair market value of the property caused by the Project. It has been determined that there is no damage to any remaining real property. There are no buildings, structures or other improvements, including fixtures, removable building equipment and trade fixtures which are considered to be part of the real property interest for which the offer of just compensation is made, as follows:

REAL PROPERTY:

INTEREST OBTAINED:

DESCRIPTION OF PROPERTY:

INTERESTED PERSONS:

APPORTIONMENT OF JUST COMPENSATION:

APPRAISED FAIR MARKET VALUE:

By: _____

Its: _____

THE UNDERSIGNED acknowledges receipt of the foregoing Statement of Just Compensation and understands their rights and hereby waives their rights under Public Law 91-646, and agrees to grant the interest requested on the terms proposed, even if a donation of such interest.

This waiver includes a waiver of any appraisal of our property, including accompanying an appraiser inspecting our property. This waiver and the execution of the Easement and/or instruments of conveyance of our interest in such property is made without undue influence or coercive action of any nature by anyone involved in this Project. We understand that we could request an appraisal of our property and have the right to receive Just Compensation for the conveyance of the interest being requested by the party receiving the Easement or conveyance.

Dated this ____ day of _____, 200_.

BICYCLE PATH AND WALKWAY EASEMENT

Parcel No. _____
_____ Project

THIS INDENTURE made and entered into this ____ day of _____, 200_, by and between _____, of _____, hereinafter "Grantor," and the _____, of _____, hereinafter "Township;"

WITNESSETH:

For the sum of One and no/100 (\$1.00) Dollar and other valuable consideration paid to the Grantor by the Township, the receipt of which is hereby acknowledged by Grantor, the Grantor does hereby grant, bargain, convey and assign unto the Township, its successors and assigns, a non-exclusive, perpetual and permanent easement and right-of-way over and across that certain piece or parcel of land situated in the _____ **OF** _____, **COUNTY OF** _____ **and STATE OF MICHIGAN**, the piece or parcel of land being owned by the Grantor in fee simple and described as follows:

FEE DESCRIPTION:

IN A PUBLIC BICYCLE PATH AND WALKWAY EASEMENT SPECIFICALLY DESCRIBED AS FOLLOWS:

EASEMENT DESCRIPTION:

This Easement is exempt from transfer tax by reason of MCL 207.526, Section 6(a); and MCL 207.505, Section 5(a).

The easement granted herein shall be for the purpose of installing, constructing, operating, maintaining, repairing, replacing, reinstalling, inspecting and keeping in working order the Bicycle Path and Walkway (including sidewalks at the election of the Township) which may run over and across the above-described easement and right-of-way, all hereinafter collectively referred to as the "Bicycle Path and Walkway Easement."

The easement granted herein shall include the right to enter upon sufficient land owned by the Grantor which is adjacent to the Bicycle Path and Walkway as is required for the construction, installation, maintenance, repair, replacement, reinstallation, operation and

inspection of said Bicycle Path and Walkway, together with the right to install signs on the adjacent land as to the use by the public.

TO HAVE AND TO HOLD said Bicycle Path and Walkway Easement and right-of-way over and across the above-described piece or parcel of land unto the Township, its successors and assigns, for the use and benefit of the Township, its successors and assigns, **FOREVER**.

The Grantor warrants that they have the right and authority to grant this easement as above-described and own the lands covered by the easement and right- of-way.

The easement and right-of-way shall include, but not be limited to, the right to enter upon the easement at any reasonable time for the purpose of such construction, maintenance, repair, replacement, reinstallation and inspection of its Bicycle Path and Walkway, together with the right to excavate a foundation for the location of such Bicycle Path and Walkway. The easement and right-of-way shall further include right to remove trees, brush, undergrowth and other obstructions situated upon the above-described piece or parcel of land which may interfere with the location, construction, maintenance or repair of such Bicycle Path or Walkway. The Township, as a consideration for our granting the right to construct and install such Bicycle Path and Walkway, shall be obligated to fill and grade to ground level the areas adjoining the Bicycle Path and Walkway and shall also be obligated to restore to their former condition, insofar as is reasonably possible, the drives, parking areas, shrubs and/or grass along side such Bicycle Path and Walkway. The Township further covenants and agrees that it will restore such piece or parcel of land to a similar condition, insofar as is reasonably possible, in the event it shall at any time become necessary to enter upon the easement for the purpose of maintenance, repair, replacement, construction or reinstallation of such Bicycle Path and Walkway.

The removal or demolition of any existing buildings, structures or fences required for the reasonable exercise of the foregoing powers shall be removed or demolished at the Township's expense.

The Township agrees to fully indemnify, save and keep harmless the Grantor from any and all claims for damage to real and personal property and injuries or death suffered by persons in any manner caused by or growing out of the construction, installation, repair, maintenance or presence of said Bicycle Path and Walkway over and across the piece or parcel of land of Grantor, except for the negligence of the Grantor, their heirs, representatives, successors or assigns. The Grantor further agrees that they will not construct a building, structure or improvement on such easement and right-of-way without first obtaining the written consent of the Township, and this conveyance includes a release of any and all claims to damage arising from or incidental to the exercise of any of the foregoing powers, except as above provided.

The pronouns and relative words herein are written in the masculine and singular only. If more than one joins in, or be of the feminine sex or a business entity, such words shall be read as if written in plural, feminine or neuter, respectively.

APPENDIX D

APPENDIX "D"

DEVELOPMENT, WATERMAIN EXTENSION or SEWER MAIN EXTENSION AGREEMENT

CONTRACT FACE PAGES

I. PARTIES

A. DEVELOPER (the "Developer"):

Name

Address

Type of legal entity, i.e. Corporation, Partnership, Limited Liability Company,
Individual, etc.

**B. ALLENDALE CHARTER TOWNSHIP (the "Township")
6676 Lake Michigan Drive, PO Box 539, Allendale, MI 49401**

II. DESCRIPTION OF THE IMPROVEMENTS (the "Project").

A. Public Utilities:

1. Watermain: _____ (LF) along _____ Streets
2. Sewer Main _____ (LF) along _____ Streets

B. Public Improvements:

1. Developer Sidewalk _____ (LF)
2. Street Lights along _____ Streets

III. PROJECT COMPLETION DATE (the "Completion Date"):

IV. IRREVOCABLE LETTER OF CREDIT

A. *Required prior to scheduling the pre-construction meeting.*

B. *Amount of Letter of Credit: \$ _____*

The amount of the Letter of Credit shall be based on the cost estimate for the construction prepared by the Owner's Engineer and approved by the Township Engineer.

V. **AGREEMENT OF THE PARTIES:**

In consideration of the mutual covenants and agreements contained in the attached Terms and Conditions, the parties mutually agree that the Developer will acquire and construct the Project at Developer's sole expense, that after completion and acceptance of the Project by the Township, ownership of the following items shall be transferred by the Developer to the Township for \$1.00 pursuant to the Township's standard form Bill of Sale:

<input type="checkbox"/>	Public Water Main and all Appurtenances
<input type="checkbox"/>	Public Sanitary Sewer Main and Public Sanitary Sewer Manholes
<input type="checkbox"/>	Sidewalk along Public Roads

All aspects of the acquisition, construction, completion, and transfer of the Project to the Township shall be governed by all applicable ordinances and construction standards, as well as the attached Terms and Conditions.

IN WITNESS WHEREOF, the parties have executed this Agreement.

Witnesses:

DEVELOPER:

(1) _____ (LS)
* _____

By: _____ (LS)
* _____

Dated: _____, 20__

Its: _____

Dated: _____, 20__

ALLENDALE CHARTER TOWNSHIP:

(1) _____ (LS)
* _____

By: _____ (LS)
* _____

Dated: _____, 20__

Its: Supervisor

Dated: _____, 20__

(2) _____ (LS)
* _____

By: _____ (LS)
* _____

Dated: _____, 20__

Its: Clerk

Dated: _____, 20__

* Printed Name
(LS) Legal Signature

DEVELOPMENT AGREEMENT

TERMS AND CONDITIONS

Section 1. **PRECONSTRUCTION MATTERS.** Before commencing construction of the Project, Developer shall accomplish all of the following:

- (a) Obtain all necessary permits for the installation and construction of the Project from all agencies having jurisdiction;
- (b) Submit to the Township for approval detailed plans and specifications for the Project prepared by a professional engineer licensed in Michigan. Construction of the Project shall not commence unless and until the Township approves these plans and specifications in writing. ***Developer shall pay in cash to the Township the Township Development Fee then in effect.***

The Development Fee amount paid by the Developer to the Township will be placed into an Escrow Account. Draws from the Escrow Account will be made by the Township for the actual costs incurred in plan review, design engineering, construction observation / inspection and administration by the Township and Township Engineer.

The Township may require additional funds to be placed in the Escrow Account should the account become depleted throughout the project. Monies remaining in the Escrow Account upon completion of the project and acceptance by the Township will be returned to the Developer within 30 calendar days after final acceptance of the project by the Township.

If the Township requests changes in the plans and specifications for the Project, Developer agrees to make such changes as shall be requested by the Township provided, however, the Township shall not withhold its approval of the plans and specifications unreasonably and, further, that if Township requirements with respect to the plans and specifications are in conflict with those of any agency having jurisdiction, the requirements of the agency shall control. The fact the Township may require higher quality materials or better construction practices than an agency shall not be deemed a conflict and the Township requirements shall control. The plans and specifications shall provide for complete restoration to original or better condition of all paved street surfaces and bicycle paths as well as replacement of all driveways and landscaping disturbed or damaged in the course of the construction of the Project;

- (c) ***Submit to the Township the names of the proposed general contractor and all subcontractors who will be constructing and completing the Project on behalf of Developer. Construction of the Project shall not commence unless and until the Township has approved in writing Developer's general contractor and all subcontractors, such approval not to be withheld unreasonably. On request, Developer shall submit to the Township such information concerning Developer's proposed contractors as the Township shall reasonably request;***

- (d) All easements shall be executed prior to the pre-construction meeting. All easements shall be in such form and substance as shall be required by the Township. All easements shall be perpetual and shall be at least as wide as required by the Township but no less than twenty (20) feet in width in any event. Developer shall provide to the Township such proof of title and other title documentation as the Township shall reasonably require in order to verify that the Township is receiving good title to all easements being transferred to the Township by the conclusion of the project.

- (e) Schedule and convene a preconstruction meeting per the terms described in Section 01000, General Requirements Part 1.06.

Section 2. **PROJECT CONSTRUCTION**. Developer shall cause the Project to be constructed in accordance with the approved plans and specifications in a good and workmanlike manner and so as to meet all quality standards and tests which would apply and be conducted if the Township itself constructed and acquired the Project. During construction of the Project, the Township shall be free itself or with third party contractors or consultants to undertake such inspection of the Project as the Township shall deem appropriate. No change order shall be issued with respect to the approved plans and specifications without prior written approval of the Township, such approval not to be withheld unreasonably.

Section 3. **DEWATERING**. If the Project requires dewatering, Developer agrees that Developer alone, at Developer's sole cost and expense, is responsible for any negative impact including, but without limitation, quantity, quality and taste, caused to the well water supply of any lands affected by Project dewatering. No Project shall be transferred to the Township, and the Township will not approve any Project or accept ownership thereof, unless and until the Township is satisfied that all negative impact to well water supplies caused by the Project have been fully and satisfactorily corrected. The Township may require written documentation from the owner of lands whose well water supply has been affected by Project dewatering that such land owner is satisfied with his/her/their well water supply if the lands have not been connected to the public water system. In the event of a disagreement between the Township and the Developer as to whether a particular well has been adversely affected by the Project, the Township Engineer shall make a written determination and this determination shall be final and binding on the Township and the Developer.

Section 4. **COMPLETION OF THE PROJECT**. The Project shall be completed and made available to the Township for final inspection and approval no later than the completion date. Upon completion of the Project and after final inspection and written approval by the Township, such approval not to be withheld unreasonably, the public utilities shall be transferred by the Developer to the Township pursuant to the Township's standard form Bill of Sale.

The Township shall not be obligated to approve the Project or accept unless and until it is satisfied the Project has been constructed in accordance with approved plans and specifications and in a good workmanlike manner and, further, that the Project meets all quality standards and tests which would apply and be conducted if the Township itself acquired and constructed the Project. In addition, the Township shall not be obligated to approve the Project and accept unless and until all of the restoration has been fully completed.

Prior to the Township's approval of the Project and an acceptance the Township shall receive from the Developer such waivers of lien, affidavits and other documentation as the Township shall reasonably deem necessary to be assured that all contractor(s) and all pipe and other equipment suppliers in connection with the project have been paid in full and that there are no liens or other unpaid obligations outstanding with respect to the Project.

Prior to approval and acceptance, the Township requires a written opinion from the Developer's consulting engineer that the Project has been constructed and completed in accordance with the approved plans and specifications.

If the Contract face pages require that the Developer provide an irrevocable letter of credit prior to commencement of construction in order to guarantee completion of the Project by the Completion Date, this irrevocable letter of credit shall be issued by a bank in favor of the Township in the amount shown on the Contract face pages. The letter of credit to be provided shall be in such form and with such provisions as the Township shall reasonably require. A standard format for the Letter of Credit is included in Appendix D of the Standard Construction Requirements. In lieu of a Letter of Credit, the Developer may deposit a check with the Township for the full amount of the completion guarantee.

Said check will be deposited and held by the Township in an escrow account. The escrow account shall be used for the same purpose as a Letter of Credit with draws being made in a similar manner.

The Project shall not be connected to the Township sewer and/or water systems unless and until the Township has completed its final inspection and approved the Project in writing. ***If the Developer desires to connect the Project to the water and/or sewer systems after substantial completion but in advance of this final inspection and written approval, Developer shall provide to the Township an irrevocable letter of credit issued by a bank in favor of the Township in such amount and duration as the Township shall reasonably determine is necessary to pay all costs and expenses related to completing the Project. The letter of credit to be provided shall be in such form and with such provisions as the Township shall reasonably require.***

The amount on the Letter of Credit will not be reduced during the general course of construction on the Project, but may only be reduced as agreed upon by the Township at the time of substantial completion of the Work, provided that the amount of the Letter of Credit after the proposed reduction is still deemed by the Township to be sufficient to complete the project as determined by the Township or their authorized representatives.

If the Project is not completed by the Completion Date, the Township shall have the right to complete the Project at Developer's expense and to pay the full cost of such completion by making a draw or draws against Developer's letter of credit. Developer shall reimburse the Township for all costs incurred in completing the Project including, but without limitation, engineering, third party contractors and the charges of the Township personnel necessary to supervise the completion of the Project. To the extent the Township costs to complete the Project are not fully paid by a draw or draws on a letter of credit, Developer shall pay such amounts to the Township on demand. Amounts not paid on demand shall bear interest at a rate of 1% per month or fraction of a month that the amount remains unpaid.

Section 5. **GUARANTEE.** The Developer shall guarantee the completed Work for one year after final completion and shall promptly repair, replace, restore, or rebuild, as the Township may determine, any finished work in which defects of materials or workmanship may appear or to which damage may occur (or has occurred) because of such defects during the one-year period, except where other periods or maintenance and guarantee are provided. The one-year period shall begin when the Certificate of Final Completion is signed by the Township and issued to the Developer (see Guarantee Period Agreement form at the end of Section 01000 – General Requirements). The one-year guarantee period shall be extended for an additional year from the time that any of the finished Work is repaired, replaced, restored or rebuilt pursuant to the guarantee agreement as determined by the Township. (See Guarantee Period Agreement Form at the end of Section 0100 – General Requirements.)

Section 6. **INSURANCE.** Beginning as and when construction of the Project is commenced, and continuing at all times while the Project or any part thereof is under construction, Developer and/or its contractor(s) shall continuously carry and maintain the same insurance coverage which is routinely required by the Township with respect to the construction of its own water and sewer projects. The Township and its Township Board members, officers, agents and employees, the Township Engineer and its directors, officers, agents and employees, and the Ottawa County Road Commission and its board members, officers, agents and employees, shall all be named as additional insureds under such insurance, and such insurance shall also provide that it is the primary source of coverage for all such parties named as additional insureds with respect to the Project and the acts of omission of Developer and its contractor(s) related thereto.

Certificates evidencing the acquisition of all insurance required by this section and that such insurance is in full force and effect shall be deposited with the Township before construction of the Projects is commenced. Developer shall furnish, or cause to be furnished, upon request of the Township, certified copies of all policies required pursuant to this section as well as all amendments and

renewals. All insurance policies required pursuant to this section shall contain a provision that they are non-cancelable and not subject to material modification by the insurer except upon 30 days' prior written notice to the Township. At least 30 days prior to the expiration or cancellation of any such insurance policy, there shall be furnished to the Township evidence satisfactory to it that the policy has been renewed or replaced by another policy. Construction of the Project shall not commence unless and until the Township has approved the insurance required to be provided by Developer and its contractor(s) pursuant to this section in writing, such approval not be withheld unreasonably.

With respect to the Project, Developer agrees to indemnify the Township and its Township Board members, officers, agents and employees, as well as all of the other additional insureds named in the first paragraph of this section, from and against any and all claims, costs, actions, causes of action, losses, or expenses (including reasonable attorney's fees and other expense of defense) resulting from or caused by the acts or omissions of Developer or its contractor(s) in acquiring, constructing and completing the Project.

Section 7. **CONNECTION CHARGES/RATES.** *Developer shall pay all applicable connection and other charges imposed by the Township pursuant to the local rate ordinance or rate resolution with respect to the Project. The Township shall be entitled to establish such water rates and/or sewer usage rates as the Township deems appropriate. The fact the Developer has installed the Project at its expense shall not excuse Developer or any party owning or utilizing lands and premises within the development served by the Project or any part thereof from being obligated to pay water rates and sewer rates or any other charges levied by the Township generally against water and/or sanitary sewer customers.*

Section 8. **TOWNSHIP UTILIZATION OF THE PROJECT.** As and when the public utilities have been transferred to the Township pursuant to the Bill of Sale referred to above, the Project shall become part of the Township water and/or sewer system, as the case may be, and may be utilized by the Township in such manner as the Township utilized other portions of its water and sewer systems. Without limiting the generality of the preceding sentence, the Township may connect other water and/or sewer customers to the Project itself and may also connect water and/or sewer extensions to the Project and connect additional customers to those extensions, all without any obligation to make any payment or reimbursement to the Developer on account of the Developer having constructed the Project at Developer's expense, unless there is a written agreement to the contrary.

Section 9. **ENFORCEMENT.** In the event the Township has to take legal action to enforce the terms of this Agreement, the Developer agrees and shall be responsible to pay all of the Township's expenses, including reasonable attorney fees and engineering fees, associated with the legal action.

Section 10. **MISCELLANEOUS.** Neither this Contract nor any rights under it may be assigned nor may any duty be delegated without prior written consent of the non-assigning nor non-delegating party. Any attempt to assign or delegate rights or duties without prior written consent shall be void. This Contract shall inure to the benefit of and be binding upon the parties hereto and their respective successors and permitted assigns.

All notices and other documents to be served and transmitted hereunder shall be in writing and addressed to the respective parties hereto at the addresses stated on the Contract face pages or such other address or addresses as shall be specified by the parties hereto from time to time and may be served or transmitted in person or by ordinary or certified mail properly addressed with sufficient postage. This is an integrated contract. It contains the full understanding of the parties and supersedes all other understandings, agreements or conditions, written or oral, regarding the subject matter of this Contract. This Contract has been executed in the State of Michigan and shall be governed by Michigan law, except as to matters pertaining to choice of law. The waiver by any party hereto of a breach or

violation of any provision of the Contract shall not be a waiver of any subsequent breach of the same or any other provision of this Contract. If any section or provision of this Contract is unenforceable for any reason, the unenforceability thereof shall not impair the remainder of this Contract, which shall remain in full force and effect. It is contemplated that this Contract will be executed in multiple counterparts, all of which together shall be deemed to be one contract. The captions in this Contract are for convenience only and shall not be considered as part of this Contract or in any way to amplify or modify the terms and provisions hereof. This Contract shall be enforceable only by the parties hereto and their successors in interest by virtue of any assignment which is not prohibited under the terms of this Contract and no other person shall have the right to enforce any of the provisions contained herein. No amendment, modification or waiver shall be effective unless in writing and signed by both parties. All rights and remedies set forth in this Contract are cumulative and are in addition to any other legal or equitable rights and remedies.

[END OF CONTRACT TERMS]

LETTER OF CREDIT FORM

Bank:

[Name and address]

Irrevocable Standby Letter of Credit

Bank Reference No. _____

Issued: _____

Beneficiary:

Allendale Charter Township

6676 Lake Michigan Drive

PO Box 539

Allendale, MI 49401-0539

Applicant:

[Developer Name and address]

Project:

[Description of Public Improvements]

Date: _____

Expiration Date: _____ [3 months after **Project** completion date]

Amount: USD _____

Bank Reference No.: _____

Gentlemen:

We hereby establish our Irrevocable Standby Letter of Credit No. _____ in your favor for the account of **Applicant** up to an aggregate amount of USD _____ available by your draft(s) at sight drawn on **Bank**.

Drafts to be accompanied by the following document(s):

1. Beneficiary's statement signed by the Supervisor of Allendale Charter Township, stating:
 "**Applicant** has failed to satisfactorily install the **Project**."
2. Copy of Letter of Credit and any amendments.

Partial drawings are permitted.

Draft(s) must be marked "Drawn under **Bank** Irrevocable Standby Letter of Credit No. _____ dated _____."

We hereby agree with you that drafts drawn under and in strict compliance with the terms of this credit will be duly honored by us upon presentation at this office on or before our close of business on **Expiration Date**.

Except as otherwise expressly stated herein, this Letter of Credit is issued subject to the International Standby Practices of the International Chamber of Commerce ("ISP98"). This Letter of Credit shall be

deemed to be a contract made under the laws of the State of Michigan and shall, as to matters not governed by ISP98, be governed by and construed in accordance with the laws of the State of Michigan, other than its conflict of laws rules, which would result in the application of the law of any jurisdiction other than the laws of the State of Michigan.

Sincerely,

Bank

Authorized Signature

Printed Name and title

APPENDIX E

APPENDIX “E”

PAYBACK AGREEMENT

The Developer may enter into a Payback Agreement with the Township where the Developer is required to extend sanitary sewer and/or water main to the Development and across the frontage of the Development where future connections could be made on the opposite side of the street. The Payback Agreement requires the Township to reimburse to the Developer any future “front footage” charges and “Lateral Fees” (less an administrative fee of 10%) collected on future connections to the utilities for a 10-year period. This reimbursement is intended to defray the Developers upfront investment in extending the utilities to the Development and across the frontage of the Development.

Extension of sanitary sewer, water main, sidewalk, and other related improvements to the Development, across the Project frontage and within the Development shall be the Developer’s responsibility. “Front footage” charges and “Lateral Fees” are not assessed to the Developer when the utility improvements are made by the Developer.

Included at the end of this Appendix “E” are sketches of various Development examples illustrating the Developer’s responsibilities for the extension of sanitary sewer and/or water main.

The following “Payback Agreement” form will be used where appropriate.

PAY BACK AGREEMENT

THIS AGREEMENT entered into this _____ day of _____, 20____, by and between _____

hereinafter referred to as the "Developer", and ALLENDALE CHARTER TOWNSHIP, a Michigan Charter Township, whose address is 6676 Lake Michigan Drive, P.O. Box 539, Allendale, MI 49401, hereinafter referred to as the "Township":

WHEREAS, the Developer is the owner of the following described property:

and,

WHEREAS, the Developer desires having _____

provided by the Township to the Property and,

WHEREAS, other property owners within the area do not desire _____

at this time; and

WHEREAS, the Developer is willing to pay the entire cost of the construction of _____

to this property and which is to be constructed under plans entitled: _____

NOW, THEREFORE, IT IS AGREED by and between the parties hereto as follows:

1. The Township shall have the right to allow other properties abutting said _____

to connect thereto upon payment by the property owner applying for said services of Frontage Charges and Lateral Fees regularly due. The Township shall pay such Frontage Charges and Lateral Fees received by it (less an administrative charge of 10%) to the Developer. The Township does not guarantee that any property owner shall connect to said _____.

2. The limits of the _____ for which charges will be collected by the Township and paid back to the Developer shall be as follows: _____

3. The Developer hereby waives any and all claims for damage against the Township arising out of any temporary discontinuance of services, no matter what the cause, no matter by whom the same is caused. Should damages be awarded, it is stipulated and agreed that one dollar (\$1.00) shall be in full settlement thereof.

4. The Developer after a period of ten (10) years, hereby waives any right to collect fees thereafter, and it is mutually agreed that any fees collected thereafter shall be the sole and exclusive monies of the Township.

5. Upon construction of the _____, all such construction, as may be in the right-of-way and/or public easement, shall become the sole and exclusive property of the Township and shall be under its sole and exclusive control.

6. All notices and other documents to be served and transmitted under this agreement shall be in writing and addressed to the respective parties at the addresses stated on the Contract face pages or such other address or addresses as shall be specified by the parties from time to time and may be served or transmitted in person or by ordinary or certified mail properly addressed with sufficient postage. This is an integrated contract. It contains the full understanding of the parties and supersedes all other understandings, agreements or conditions, written or oral, regarding the subject matter of this Contract. This Contract has been executed in the State of Michigan and shall be governed by Michigan law, except as to matters pertaining to choice of law. The waiver by any party of a breach or violation of any provision of this Contract shall not be a waiver of any subsequent breach of the same or any other provision of this Contract. If any section or provision of this Contract is unenforceable for any reason, the unenforceability thereof shall not impair the remainder of this Contract, which shall remain in full force and effect. It is contemplated that this Contract will be executed in multiple counterparts, all of which together shall be deemed to be one contract. No amendment, modification or waiver shall be effective unless it is made in writing and signed by both parties. All rights and remedies set forth in this Contract are cumulative and are in addition to any other legal or equitable rights and remedies.

6. This Agreement shall be binding on the heirs, successors and assigns of the parties of the first part.

IN WITNESS THEREOF, the parties have set their hands and seals on the day and year first above written.

WITNESSES:

DEVELOPER:

BY:
Its _____

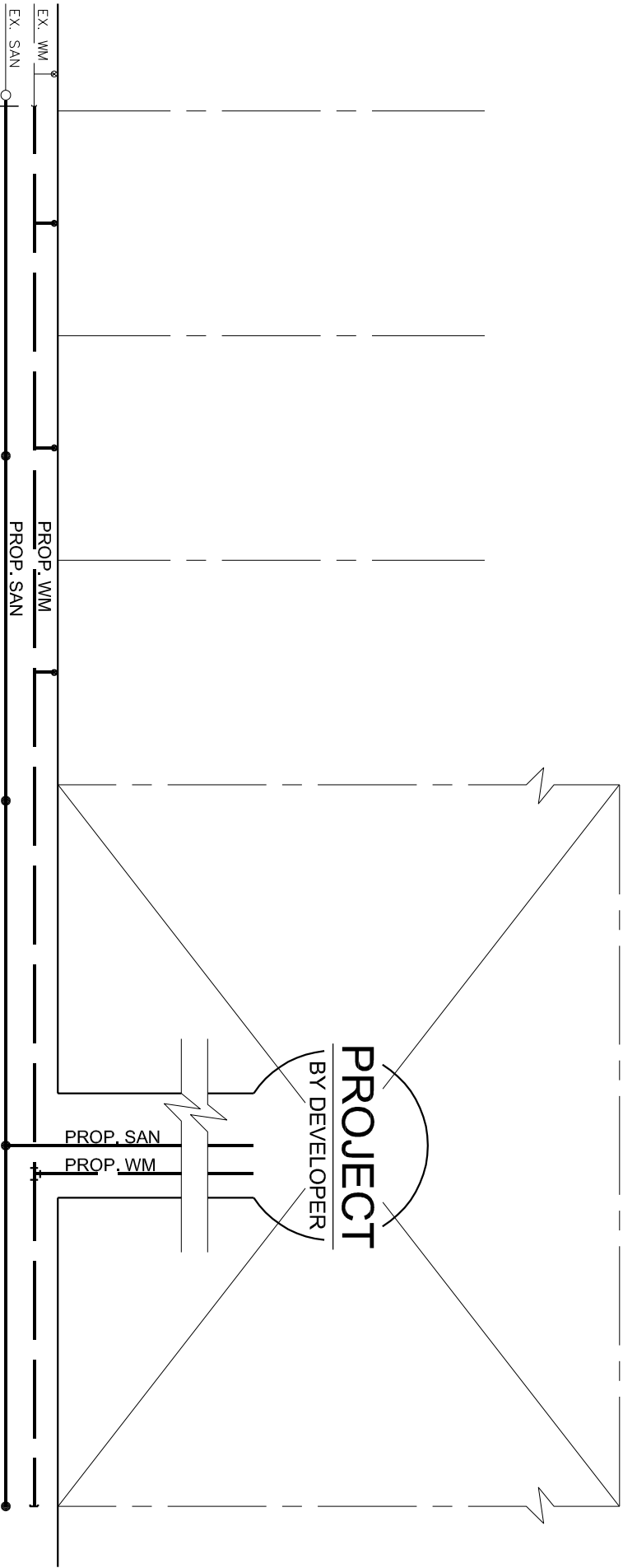
BY:
Its _____

WITNESSES:

ALLENDALE CHARTER TOWNSHIP

BY:
Its Supervisor

BY:
Its Clerk



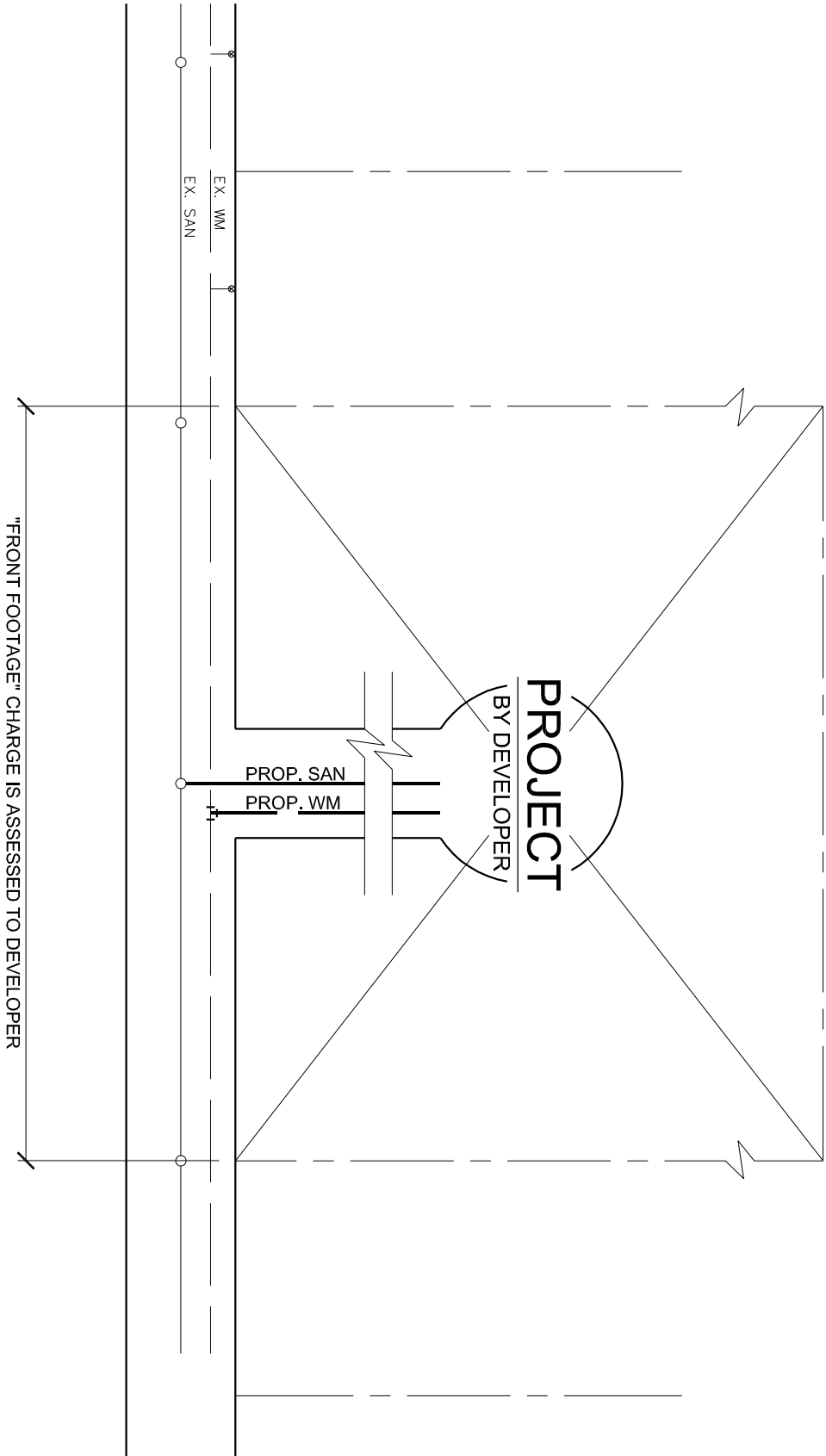
PAYBACK AGREEMENT

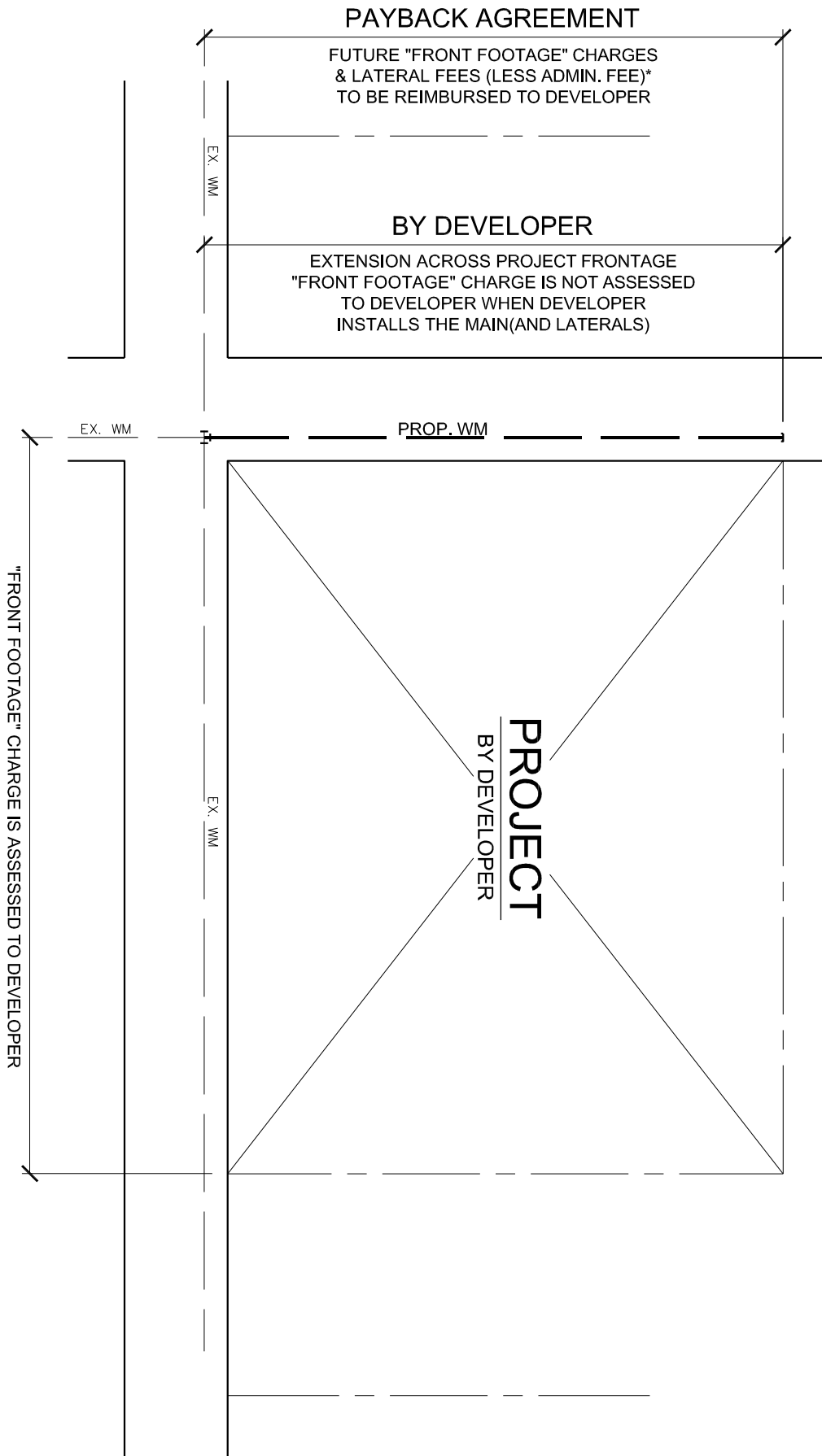
FUTURE "FRONT FOOTAGE" CHARGES &
LATERAL FEES (LESS ADMIN. FEE)*
TO BE REIMBURSED TO DEVELOPER

BY DEVELOPER

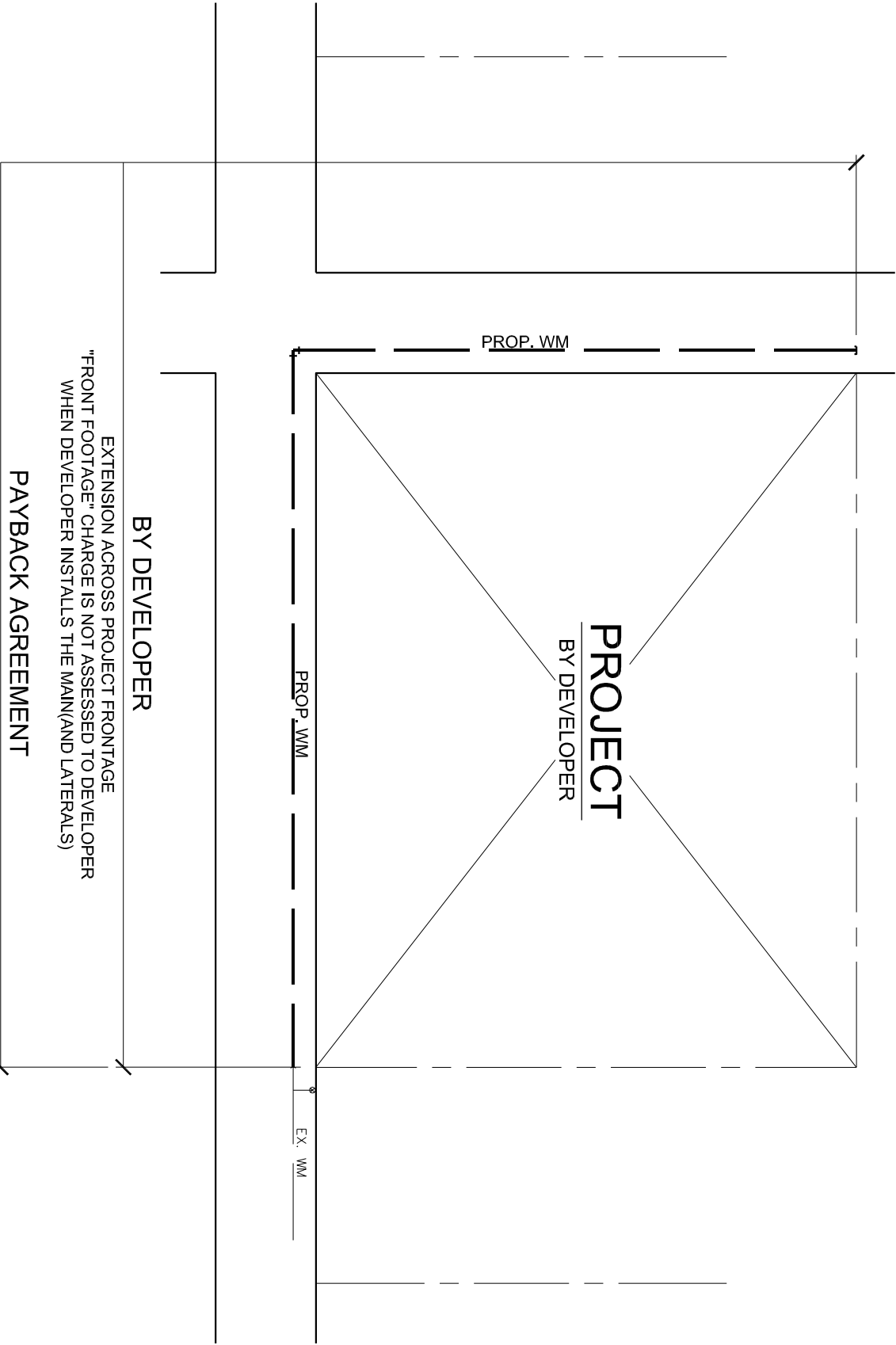
EXTENSION TO PROJECT SITE & ACROSS PROJECT FRONTAGE
"FRONT FOOTAGE" CHARGE (AND LATERAL FEE) IS NOT ASSESSED TO
DEVELOPER WHEN DEVELOPER INSTALLS THE MAIN (AND LATERALS)

* ADMIN. FEE = 10%





* ADMIN. FEE = 10%



FUTURE "FRONT FOOTAGE" CHARGES
& LATERAL FEES (LESS ADMIN. FEE)*
TO BE REIMBURSED TO DEVELOPER

PAYBACK AGREEMENT

BY DEVELOPER

EXTENSION ACROSS PROJECT FRONTAGE

"FRONT FOOTAGE" CHARGE IS NOT ASSESSED TO DEVELOPER
WHEN DEVELOPER INSTALLS THE MAIN(AND LATERALS)

PROP. WM

PROP. WM

EX. WM

* ADMIN. FEE = 10%

APPENDIX F

APPENDIX “F”

TOWNSHIP POLICY ON PARTICIPATION TOWARDS OVERSIZING

WATER MAIN

- Developer required to meet Water System Master Plan.
- If Master Plan is not clear, the following minimum pipe sizes will be required:

Residential Area	-	8”
Commercial/Industrial Area	-	12”
Section Line Roads	-	12”
- Looping of water main may be required.
- Township to participate in oversizing where deemed appropriate (construction cost only).
- Participation for oversizing shall be based on actual bid prices not-to-exceed \$2.00 per inch diameter of oversizing per linear foot of water main.

SANITARY SEWER AND FORCE MAIN

- Developer required to meet Sanitary Sewer System Master Plan.
- Township to participate in oversizing where deemed appropriate (construction cost only).
- Participation for oversizing shall be based on actual bid prices not-to-exceed \$2.00 per inch diameter of oversizing per linear foot of sanitary sewer and/or force main.
- No participation for extra depth.

PUMP STATION

- Township to participate in construction cost of pump station if the ultimate service area (as defined in the master sewer map/plan; i.e. sub-district area) is at least 50% greater than the Development area.
- Participation shall be based on actual bid prices not-to-exceed \$30,000.
- Upgrade of existing pump stations may be required.

WATER MAIN AND SEWER OVERSIZING AGREEMENT FORMS

See Attached

WATERMAIN OVERSIZING AGREEMENT

THIS AGREEMENT, entered into this _____ day of _____, 20____,
between ALLENDALE CHARTER TOWNSHIP, 6676 Lake Michigan Drive, P.O. Box 539, Allendale,
MI 49401, hereinafter referred to as the "Township" and _____

hereinafter referred to as the "Developer".

WITNESSETH:

WHEREAS, the Developer, at his own expense, is installing _____ lineal feet of _____
inch diameter water main as a part of a project known as: _____

And,

WHEREAS, said water main has, at the request of the Township, been oversized from a
normal _____ inch diameter water main to a _____ inch diameter water main for purposes of
providing transmission capability,

NOW, THEREFORE, it is agreed as follows:

1. The Developer will construct said water main in accordance with the Township's
Standard Construction Requirements.

2. The Township will, within thirty days of acceptance of said water main by the Township,
pay to the Developer the sum of _____ which
sum represents the difference in material cost of normal _____ inch diameter water main and said
_____ inch diameter oversized water main.

3. All rights, title and interest in the aforesaid oversized water main shall remain in the Township. Should it be determined in any court of law that the Developer owns in whole or in part any legal or equitable interest in said oversized water main it is agreed between the Township and Developer that such interest may be purchased by the Township for the sum of One Dollar (\$1.00).

4. All notices and other documents to be served and transmitted under this agreement shall be in writing and addressed to the respective parties at the addresses stated on the Contract face pages or such other address or addresses as shall be specified by the parties from time to time and may be served or transmitted in person or by ordinary or certified mail properly addressed with sufficient postage. This is an integrated contract. It contains the full understanding of the parties and supersedes all other understandings, agreements or conditions, written or oral, regarding the subject matter of this Contract. This Contract has been executed in the State of Michigan and shall be governed by Michigan law, except as to matters pertaining to choice of law. The waiver by any party of a breach or violation of any provision of this Contract shall not be a waiver of any subsequent breach of the same or any other provision of this Contract. If any section or provision of this Contract is unenforceable for any reason, the unenforceability thereof shall not impair the remainder of this Contract, which shall remain in full force and effect. It is contemplated that this Contract will be executed in multiple counterparts, all of which together shall be deemed to be one contract. No amendment, modification or waiver shall be effective unless it is made in writing and signed by both parties. All rights and remedies set forth in this Contract are cumulative and are in addition to any other legal or equitable rights and remedies.

5. This Agreement shall be binding on the parties hereto, their successors and assigns.

IN WITNESS THEREOF, the parties have set their hands and seals on the day and year first above written.

Witnesses:

DEVELOPER:

(1) _____ (LS)
* _____

By: _____ (LS)
* _____

Dated: _____, 20__

Its: _____

Dated: _____, 20__

ALLENDALE CHARTER TOWNSHIP:

(1) _____ (LS)
* _____

By: _____ (LS)
* _____

Dated: _____, 20__

Its: Supervisor

Dated: _____, 20__

(2) _____ (LS)
* _____

By: _____ (LS)
* _____

Dated: _____, 20__

Its: Clerk

Dated: _____, 20__

* Printed Name
(LS) Legal Signature

APPENDIX G

APPENDIX "G"

STORM WATER OPERATION AND MAINTENANCE AGREEMENT

This Storm Water Operation and Maintenance Agreement (the "Agreement") is executed this ____ day of _____, 20__, between Allendale Charter Township, a Michigan charter township, whose address is 6676 Lake Michigan Drive, PO Box 539, Allendale, Michigan 49401-0539 (the "Township") and _____, a Michigan _____, whose address is _____ (the "Developer").

RECITALS

A. The Developer is the owner of real property located in the Township at _____, and is legally described on attached Exhibit A incorporated by reference herein (the "Property") (PP No. 70-09-_____). The Property comprises approximately _____ acres of land.

B. The Property is zoned _____. The Developer has sought approval from the Township to improve the property by constructing _____ (the "Project").

C. The Township has reviewed the proposed improvement plan, and, during the Township's consideration of the Project, areas of concern were identified including the potential for soil erosion, storm water drainage and storm water retention or detention.

D. Article 24 of the Township's Zoning Ordinance requires that before a site plan can be approved to permit certain development, the Township must find that it complies with certain identified criteria, including proper surface water drainage (Section 24.07 D).

E. Section 2.01 of the Township's Storm Water Ordinance prohibits a developer from installing or constructing any impervious surfaces that require approval of a site plan, plat, site condominium, special land use, planned unit development, rezoning, land division, or private road or other approvals without first obtaining a storm water permit from the Township. Section 2.02 of the Township's Storm Water Ordinance requires that a developer seeking Township storm water permit approval must provide the Township with an operation and maintenance agreement ensuring the reasonable routine, emergency and long-term maintenance of all storm water management facilities constructed in accordance with a development project, unless dedicated as part of a Drainage District under the jurisdiction of the Ottawa County Drain Commissioner.

F. The Township's Engineer and the Ottawa County Drain Commissioner have indicated that the storm water drainage facilities and systems, as detailed in the plans prepared by _____ and dated _____, 20__, are adequate, provided that the Developer executes an agreement for the ongoing maintenance of the referenced storm water drainage facilities as described and detailed in the plans prepared by _____ and dated _____, 20__, which plans are hereby incorporated by reference.

AGREEMENT

For good and valuable consideration including, but not limited to, the covenants and pledges contained herein and the Township's willingness to forego the posting of performance guarantees to ensure construction and maintenance of the drainage improvements described, the sufficiency of which is acknowledged, the parties agree as follows:

Section 1. Compliance with Laws, Ordinances, Permits. Developer agrees to construct, install, and operate the Project in accordance with approvals received from the Township and other governmental entities with applicable jurisdiction. In constructing the Project, Developer agrees to comply with all state and local laws, ordinances, and regulations as well as the terms of this Agreement.

Section 2. Alterations or changes. No alterations or changes to the storm water systems, as defined in this Agreement, shall be permitted unless they are approved, in writing, by the Township, and any such approved changes will be deemed to comply with this Maintenance Agreement.

Section 3. Easements to be secured and recorded. The Developer, at its expense, shall secure from any affected owners of land all easements and releases of rights-of-way necessary for utilization of the storm water systems, as defined in this Agreement, and shall record them with the Ottawa County Register of Deeds. Copies of easements shall be provided to the Township. These easements and releases of rights-of-way will not be altered, amended, vacated, released or abandoned without prior written approval of the Township. Shrubs, trees or permanent structures shall not be located within the easements utilized by the Developer without the prior written approval of the Township.

Section 4. Operation and Maintenance of Storm Water System. As used in this Section, "storm water system" shall mean all storm water systems, catch basins, storage structures, drains, leaching basins, ponds, pipes, porous pavement and appurtenances located on the Property including, but not limited to, all pollution-control devices utilized as part of the storm water system, as detailed in the plans prepared by _____, dated _____, 20__. As used herein, "maintain" or "maintenance" shall mean inspecting, cleaning out, mowing, repairing, and removing accumulated sediment, leaves, weeds, debris, and obstructions from all ponds, leach basins, pollution-control devices, or similar appurtenances of the storm water system such that failure to maintain is likely to result in impeding the functioning of the storm water system.

- A. Operation of Storm Water System. The Developer shall at all times or until such time that another governing body such as but not limited to a Home Owner's Association or Ottawa County Water Resources Commission assumes responsibility, operate the storm water system in a manner consistent with generally accepted storm water management practices. Not less than annually, the Developer shall maintain the storm water system located on the Property. The Developer shall submit certified reports of the maintenance performed to the Township.
- B. Maintenance of Storm Water Detention / Retention System. At a minimum, the following maintenance procedures shall be performed by the Developer:
- (1) Inspect the facilities regularly for clogging and clean / repair as necessary several times during the first few months after construction and then quarterly or after a large rain event thereafter.
 - (2) Check banks and bottom surface of basin for erosion and repair as necessary.
 - (3) Trim or harvest any aquatic vegetation as appropriate, and frequently mow grassy areas.
 - (4) Remove sediment when accumulation reaches 6 inches, or if re-suspension is observed or is probable.
 - (5) The Developer shall submit certified reports of the maintenance performed to the Township.
- C. Maintenance of Storm Water System with porous pavement. At a minimum, the following maintenance procedures shall be performed by the Developer:
- (1) Inspect the system several times during the first few months after construction.
 - (2) Inspect the system 2 times per year and after heavy storms. Check for standing water on the surface and within the stone bed under the porous pavement.
 - (3) Clean the surface of the porous pavement at least 2 times per year by vacuum sweeping followed by high pressure jet hosing.
 - (4) The Developer shall limit the use of deicing chemicals and shall not use sand on porous pavement surfaces. Repairs of porous pavement by sealing or repaving with non-porous materials shall be avoided and limited to 10 percent of the total surface area.
 - (5) The Developer shall submit certified reports of the maintenance performed to the Township.

In the event that storm water facilities maintenance is not conducted, an authorized representative of the Township shall notify the Developer, specifying the necessary maintenance. Within thirty (30) days of the notice, the Developer shall perform the specified maintenance at his expense. Within thirty-six (36) hours of notice, the Developer shall perform any specified emergency maintenance as may be required in the Township's notice.

C. Failure to Maintain. In the event the Developer does not operate and maintain the storm water system as required under the terms of this Agreement, the Township shall be entitled, and is hereby expressly authorized by the Developer, to take one or more of the following actions (or any combination of the same):

(1) The Township or its agent may go onto the Property and maintain the storm water system. Not less than ten (10) days before taking such action, the Township shall provide to the Developer and any other owners (as shown on the latest Township tax assessment roll), by first-class mail, notice of its intention. The Developer hereby grants to the Township and its agents a non-revocable license to go onto the Property to carry out the provisions of this subsection. The Township will invoice the cost of the specified maintenance, and the Developer shall pay the amount of the invoice within thirty (30) days of the Township's mailing the invoice by first class mail. If the Developer shall fail to pay the amount of the invoice, all costs, fees, or expenses incurred by the Township in maintaining the storm water system pursuant to this subsection may be, without further notice, assessed as a lien on the Property, to be collected in the same manner as ad valorem property taxes.

(2) If requested, the Developer shall provide a letter of credit in an amount sufficient to ensure maintenance of the storm water system, in a form satisfactory to the Township. The Developer shall provide the requested letter of credit within fifteen (15) business days of receiving such a request from the Township. The letter of credit shall provide that the payment to the Township shall be assured upon submission by the Township of notice that the Developer has not maintained the storm water system as required by this Agreement.

Section 5. Violation of Agreement. The parties acknowledge that monetary damages for a breach of this Agreement would be inadequate to compensate the parties for the benefit of their bargain. Accordingly, the parties expressly agree that in the event of a violation of this Agreement, the non-breaching party shall be entitled to receive specific performance. Nothing herein shall be deemed a waiver of the Township's rights to seek enforcement of this Agreement or zoning approvals previously granted, to the extent otherwise authorized by law. A violation of the terms and conditions of this Agreement by the Developer or its successors subsequent to the completion of the Project shall entitle the Township, in the event of litigation to enforce this Agreement, to receive its reasonable attorney and consulting fees incurred.

Section 6. Recording. The obligations under this Agreement are covenants that run with the land, and bind successors in title of the Developer. It is the parties' intent that this Agreement shall be recorded with the Ottawa County Register of Deeds.

Section 7. Miscellaneous.

A. Severability. The invalidity or unenforceability of any provision of this Agreement shall not affect the enforceability or validity of the remaining provisions and this Agreement shall be construed in all respects as if any invalid or unenforceable provision were omitted.

B. Notices. All notices permitted or required to be given shall be in writing and sent either by mail or by personal delivery to the address first above given.

C. Waiver. No failure or delay on the part of any party in exercising any right, power, or privilege under this Agreement shall operate as a waiver thereof, nor shall any single or partial exercise of any right, power, or privilege under this Agreement preclude further exercise thereof or the exercise of any other right, power, or privilege. The rights and remedies provided in this Agreement are cumulative and not exclusive of any rights and remedies provided by law.

D. Governing Law. This Agreement is being executed and delivered and is intended to be performed in the State of Michigan and shall be construed and enforced in accordance with, and the rights of the parties shall be governed by, the laws thereof.

E. Amendment. This Agreement may only be amended in writing, signed by all parties.

Notary Public, _____ County, Michigan
My Commission Expires: _____

WITNESSES:

(DEVELOPER)

_____(LS)

_____(LS)

*

By: * _____

_____(LS)

Its: _____

*

* Printed Name

STATE OF MICHIGAN)
) ss.
COUNTY OF)

On this _____ day of _____, 20____, before me a Notary Public, personally appeared _____, the _____ of _____, who, being first duly sworn, did say he signed this document on behalf of said _____.

Notary Public, _____ County, Michigan
By Commission Expires: _____

PREPARED BY:
Fleis & VandenBrink Engineering, Inc.
2960 Lucerne Drive SE
Grand Rapids, MI 49546
(616) 977-1000

EXHIBIT A

LEGAL DESCRIPTION

(Insert legal description of parcel indicated in RECITALS, (A), page 1)

APPENDIX H

APPENDIX H

PRE-CONSTRUCTION MEETING AGENDA / MINUTES

Meeting Date: _____ Time: _____

Project Title / Public Improvements: _____

PARTIES

Owner (Developer): _____ Phone Number: _____
As Noted in Definitions

Owner's Engineer: _____ Phone Number: _____
As Noted in Definitions _____ Phone Number: _____

Contractor: Section 0100, Part _____
1.12
As Noted in Definitions

Manager: _____ Phone Number: _____
Site Superintendent: _____ Phone Number: _____
Sect. 1.12.05
Safety Representative: _____ Phone Number: _____
Sect. 1.12.03

Township: _____
Supervisor: Adam Elenbaas Phone Number: 616.895.6295 x12
DPW Superintendent: Chad Doornboss Phone Number: 616.895.6295 x13
DPW Inspector: Jon Currier Phone Number: 616.895.5142
Fire Department: Dave Pelton Phone Number: 616.895.6295 x30
Maintenance Dept.: Larry Haveman Phone Number: 616.895.6295 x8
Sidewalks

Township Engineer: Fleis & VandenBrink Phone Number: 616.977.1000
Engineer: Bruce Pindzia Phone Number: 616.260.4306
Inspector: Dudley Pierce Phone Number: 616.291.9088

PERMITS

Agencies / Permits: Ottawa County Road Commission (work within ROW)
Section 1.04 Ottawa County Water Resources Commissioner (SESC, County
Drain / Storm Water Management)
MDOT (work within ROW)
MDEQ (Wetland, Inland Lakes and Streams, Notice of Coverage,
Water Main, Sanitary Sewer)
Other: _____

FROM PROJECT CHECKLIST

Confirm receipt of the following:

- ☐ Letter of Credit
- ☐ Certificate of Insurance
- ☐ Copy of DEQ Permits
- ☐ Copies of Permits from OCRC, OCWRC & MDOT

- ☐ Executed Easements
- ☐ Executed Storm Water O&M Agreement

SCHEDULE

Anticipated Start Date: _____

Detailed Schedule: _____

Completion Date(s): _____

UTILITIES

Identify potential conflicts / scheduling concerns

Electric: Consumers Energy

 Great Lakes Energy

Gas: DTE Energy / Michcon

 SEMCO

Telephone: AcenTek

 AT&T, SBC / Ameritech

Cable Vision: Charter Communications

 AcenTek

Water Transmission: City of Grand Rapids (M-45 & Fillmore)

 City of Coopersville (60th Avenue north of M-45)

MISCELLANEOUS

Subcontractors / Material
Suppliers:

Shop Drawings / Submittals (to Township & Township Engineer): Prior to Construction

Certifications on pipe
Product data – pipe fittings, valves, hydrants, etc.
Concrete mix design - sidewalk

Staking: Sect. 1.18

By (firm name):

Notice:

2 working days

Contact Person:

Phone Number:

Materials Testing:
Sect. 1.18 & 1.36

By (firm name):

Notice:

Contact Person:

Phone Number:

Compaction:

Bituminous:

Concrete:

Other:

Public Safety /
Convenience:

Dust Control, Tracking and Access
Barricades & Signing
Protection of Work Areas

Anticipated Road Closures / Detours:

Notice to Police, Fire Department, Schools:

Notify Township and Township will Notify

SPECIAL REQUIREMENTS

OCRC	IDR's	_____
	Inspection / Testing	_____
	Detours	_____

OCWRC	SESC	_____

MDOT	Notification	_____
	Inspection	_____

ALLENDALE TOWNSHIP

Date of Approved Plans: _____

Record Drawings: Sketches, Dimensions, Witnesses:
Sect. 1.12.07

By Contractor (with assistance of Township Inspector)

Preparation of Record Drawings:
By Owner's Engineer

24 Hour notice needed for Visual Inspections

48 Hour notice needed for Pressure Testing / Televising Inspections

All deviations and revisions from approved plans must be reviewed and approved by Township and Township Engineer

Connection Fees: Obtain current fact Sheet for water and/or sewer from Township

Allendale Fire Department: Sections 1410 – Access for Fire Fighting and Section 1412 – Water Supply for Fire protection of the most recent edition International Fire Code will be enforced (see Section 1.49 of the general Requirements of the Township Standard Construction Requirements)

Stationary rods for curb stops shall be obtained from East Jordan.

Sanitary Sewer:

Testing: Exfiltration Air Test
Video Televising (30 days
after last backfill)

Water Main:

Testing: Pressure / Leakage Test
Flushing
Chlorination: Samples / testing of bacteriological requirements by Township

Sidewalk / Shared Use Path: Inspection / approval of forms required prior to pouring concrete

Construction Progress Checklist

Job Name:				
Contractor & Supervisor:				
Name:				
Address:				
Email:				
Phone:		Office		Cell
Owner:				
Name:				
Address:				
Email:				
Phone:		Office		Cell
Construction Manager:				
Name:				
Address:				
Email:				
Phone		Office		Cell
Engineer:				
Name:				
Address:				
Email:				
Phone		Office		Cell

Sanitary	
Install Completed	
Pressure Test After Backfill	
Televising (30 Days after pressure test)	
Manhole Inspection	
(after casting set to grade – can vary with each project)	
All Laterals Marked Properly	
Final After Top Coat of BIT and/or Green Area Grading	
Water Main:	
Install Complete	
Pressure Test	
Chlorinate	
Bac T Test	
Services Complete	
F.D. H&V Inspection	
Hydrant & Valve Inspection	
Services Marked Properly	
Final After Top Coat of BIT and/or Green Area Grading	
Substantial Completion (water & sewer)	
Punch List:	
Final Punch List to Contractor	
Final Punch List Completed	
Asbuilt Filed	
(Send to Steve and Bruce for final billing and paperwork.)	

NOTE: Water and Sewer hook ups only allowed after Substantial Completion.

PAPER WORK CHECK LIST

Copy of recorded easements –

Complaints resolved –

Guarantee period agreement in writing –

Storm water operation and maintenance agreement recorded –

Engineer's certificate signed –

Warranty bill of sale signed –

Allendale Charter Township
Allendale Water & Sewer

Site Inspector: _____

Date: _____

PRE-CONSTRUCTION MEETING CHECKLIST

Name of Development _____

Contractor(s) for Underground Utilities

Water _____

Sewer _____

Most recent plans available to Township _____

Township Standard Construction Requirements with 2017 updates _____

Water and sewer fact sheet containing required connection fees _____

Approximate Start Date _____

DOUBLE CHECK ELEVATIONS (existing hydrants may have been raised)

24 hour notice needed for visual inspections

48 hour notice needed for pressure testing and televising inspections

All deviations and revisions from approved plans must be reviewed and approved by the TOWNSHIP and the TOWNSHIP ENGINEER. TOWNSHIP site inspector is not authorized to approve revisions.

Curb Stop Box Rods only spec from EJ

30 days after backfill completion to televise sewer – see spec book for instructions

“As-Built” measurements are the contractor’s responsibility (not TOWNSHIP site inspector)



2960 Lucerne Drive SE
Grand Rapids, MI 49546
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F: 616.977.1005
www.fveng.com