

**ALLENDALE CHARTER TOWNSHIP
OTTAWA COUNTY, MICHIGAN**

**STANDARD CONSTRUCTION REQUIREMENTS
FOR**

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

June 2018

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 Precon 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	Benchmarks/control points must be provided
01000 – GENERAL REQUIREMENTS	1.50	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".
01000 – GENERAL REQUIREMENTS	1.37	Bonds or Letter of Credit
01000 – GENERAL REQUIREMENTS	1.37	Added Footnote regarding Exhibit A
02660 – WATER MAINS	1.03.A.4	All submittals approved prior to construction
02660 – WATER MAINS	2.02.B.2	Water service sizes clarified
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	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	Provide 2 measurements to permanent surface features. Provide GPS measurement coordinates.
02660 – WATER MAINS	3.02.F.2.a	Maintain minimum 5 feet separation from sewer laterals. Locate water services 10 feet from the left property line (facing lot)

SECTION	SUBSECTION	DESCRIPTION
02660 – WATER MAINS	3.02.F.2a	Prohibited services provided by easements
02660 – WATER MAINS	3.02.F.2.d	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	3.03.A.1.c	The Township must be notified 24 hours in advance for observation, and 48 hours for testing.
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
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 mandrelled.
02730 – SANITARY SEWERS	1.03.A.4	Material submittals to be approved by Township prior to construction.
02730 – SANITARY SEWERS	1.04.A	Contractor to provide by-pass pumping
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	Castings to be EJ 1040A with EJ 1045-21 frame.
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.
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.1	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

SECTION	SUBSECTION	DESCRIPTION
02730 – SANITARY SEWERS	3.02F.4.d	No laterals directly connected to manholes.
02730 – SANITARY SEWERS	3.02.F.7	Cover 2' x 2' wood marker and steel rerod with 4' long 4-1/2" I.D minimum pipe buried 1 feet.
02730 – SANITARY SEWERS	3.02.I	No excavation near sanitary sewer after backfilling which could impact its function as determined by Township DPW and/or Township Engineer.
02730 – SANITARY SEWERS	3.03.E	Water test for leakage (infiltration & exfiltration where eliminated)
02731 – CLEANING AND TELEVISIONING SANITARY SEWERS	1.03.A	Complete sewer cleaning and televising per N.A.S.S.C.O. standards.
02731 – CLEANING AND TELEVISIONING SANITARY SEWERS	2.01.B.1	Camera operator must be PACP certified
02731 – CLEANING AND TELEVISIONING SANITARY SEWERS	3.03.C	Should excavation be required to repair sewer, another 30-day waiting period will be mandatory.
02732 – SANITARY FORCE MAINS	1.03.A.4	Material submittals shall be approved by Township prior to construction.
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	Castings to be EJ1040A with EJ1045-21 frame.
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.
02800 – SURFACE RESTORATION	1.03.A	Place 4 inches of new topsoil, and HEAVY DUTY HYDROSEED & MULCH.
02800 – SURFACE RESTORATION Appendix G	3.04 Section 4.A	Use heavy duty hydro-seed and hydro-mulch for seeding operations. Lengthen reference to Developer or HOA or Occupant

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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.

DEFINITIONS

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

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.

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.

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 DPW 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 DPW 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 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 Environmental Quality (MDEQ) requirements.

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 Water and Sewer 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 Water and Sewer 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 MDEQ. 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 MDEQ 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.

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 Water and Sewer 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/FEEES

Water and 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
- H. Laterals marked correctly
- I. Force main pressure testing passed.
- J. Pump station testing passed.
- K. Letter of credit for uncompleted work provided to Township.
- L. Hydrant and valve inspection complete
- 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 sewer lateral connections into buildings. See pertinent Township Ordinances and the Township Water and 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 final, 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, 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 guaranties 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

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 (895-6295 ext. 5) and schools (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 MAIL BOXES

The Contractor shall temporarily relocate mail boxes interfering with the construction so that mail service is not interrupted. Mail boxes 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 MDEQ 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 sewer and water main and/or appurtenances.

An existing water main, including water services, shall be raised to pass over the sewer (where the elevation of the water main conflicts with the elevation of the sewer), provided a minimum cover of five feet is maintained on the water main. The existing water mains may be lowered where the elevation of the water main conflicts with the elevation of the 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 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 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 Allendale Communications 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 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 insure 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. The amount of the Letter of Credit shall be based on an estimate of the

construction cost 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 will not be reduced during the general course of construction on the Project. The Letter of Credit will be based upon the completion of the project and the Township's cost of completing the improvements identified on the approved plans. The improvements identified are to include all construction necessary to protect and preserve the integrity of the public infrastructure. Such construction improvements are expected to include but not be limited to items such as:

- Water and sewer mains
- Grading
- Structure adjustments (i.e. – fire hydrants, valve boxes, P.I.V's, manhole castings, curb stop boxes, etc.)
- Roadway and Paving (i.e. – wearing course)
- Applicable Sidewalks, non-motorized paths
- Restoration
- Flushing, cleaning, and televising
- Access lanes
- Storm sewers
- Refer to exhibit A for cost estimate regarding Letter of Credit

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.

1.39 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.

1.40 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.

1.41 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.

1.42 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.

1.43 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.

1.44 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.

1.45 WATER MAIN VALVE TURNING AND SANITARY SEWER PLUGS

The Township shall operate all valves in the water and 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 sewers or the proposed sewer shall be plugged to prohibit dirt and foreign material from entering the existing 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.

1.46 WASTEWATER PUMPING STATIONS

All wastewater pumping stations to be operated by the Township will be designed by the Township's Engineer. However, if individual (private) pump stations (grinder pumps) are required and approved by the Township, they can be designed by the Owner's Engineer provided they discharge into a public gravity sewer.

Plans and Specifications for all wastewater 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.

1.47 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.

1.48 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 above ground or to the sanitary sewer.

1.49 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.

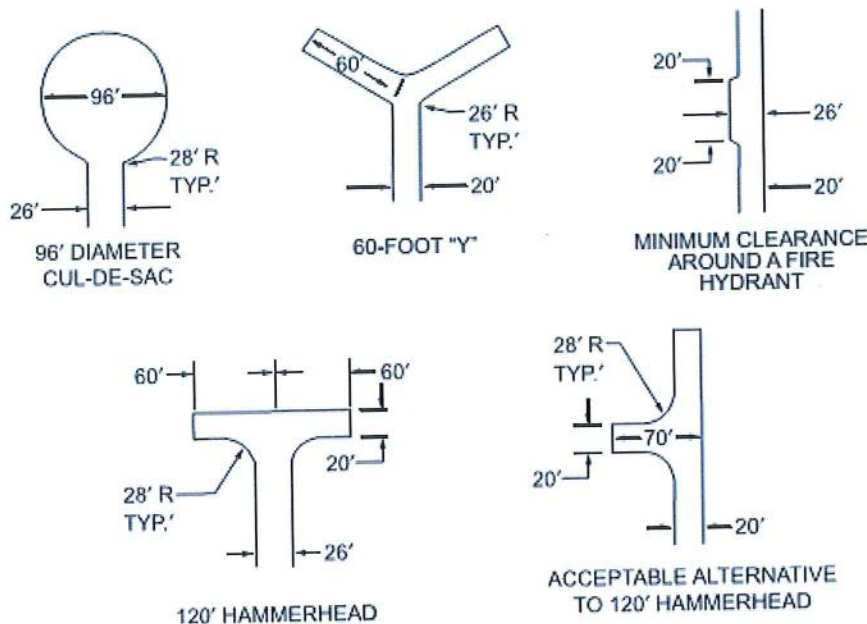
1.50 ALLENDALE FIRE DEPARTMENT REQUIRED ACCESS FOR FIRE FIGHTING AND WATER SUPPLY FOR FIRE PROTECTION

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. 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.

1.51 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 water, sewer, 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") _____

_____(the "Improvement").

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.

Dated: _____, 20____.

Witnessed By:

_____	By: _____
_____	Its: _____
_____	By: _____
_____	Its: _____

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 final acceptance by the Township (in writing), in accordance with paragraph 1.10 of the General Requirements of the Allendale Charter Township Standard Construction Requirements. 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:

(1) _____

(2) _____

(1) _____

(1) _____

DEVELOPER: _____

By _____

Its: _____

By _____

Its: _____

Dated: _____, _____

CONTRACTOR: _____

By _____

Its: _____

Dated: _____, _____

ALLENDALE CHARTER TOWNSHIP

By _____

Its: Supervisor _____

Dated: _____, _____



Water Department- Cross Connection Control

Allendale Charter Township

1162 40th Ave, Allendale MI 49401
Phone 616-895-5142- Fax 616-892-7320

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 01000-1.08, 02660

Connection to water system made 01000-1.08, 02660

Services marked correctly 2660-6

Asphalt installed to minimum of base grade 1000-1.08

Sanitary sewer castings set to asphalt grade, base as a minimum 1000-1.08

Sanitary sewer air testing, manhole inspection and
video inspection passed 01000-1.08, 02730

Rough grading complete

Laterals marked correctly 2730-5

Force main pressure testing passed 01000-1.08, 02732

Pump station testing passed 01000-1.08

Letter of credit for uncompleted work 01000-1.08, Appendix D

Hydrant and valve inspection complete 1000-1.08

DATE:

PROJECT NAME:

Jon Currier, Allendale Water and Sewer Department

- **Building connections can now be made**

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)

CONTRACTOR

By: _____
(signature)

(signature)

Printed Name: _____

Its: _____

Date: _____

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 TOWNSHIP ENGINEER

Date

ALLENDALE CHARTER TOWNSHIP

By: _____
(signature)

(date)

Printed Name: _____

Its: _____

**ALLENDALE CHARTER TOWNSHIP
DEPARTMENT OF PUBLIC WORKS**

"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.OB.A" describes how many copies of what type of print must be provided and to whom they must be provided.

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

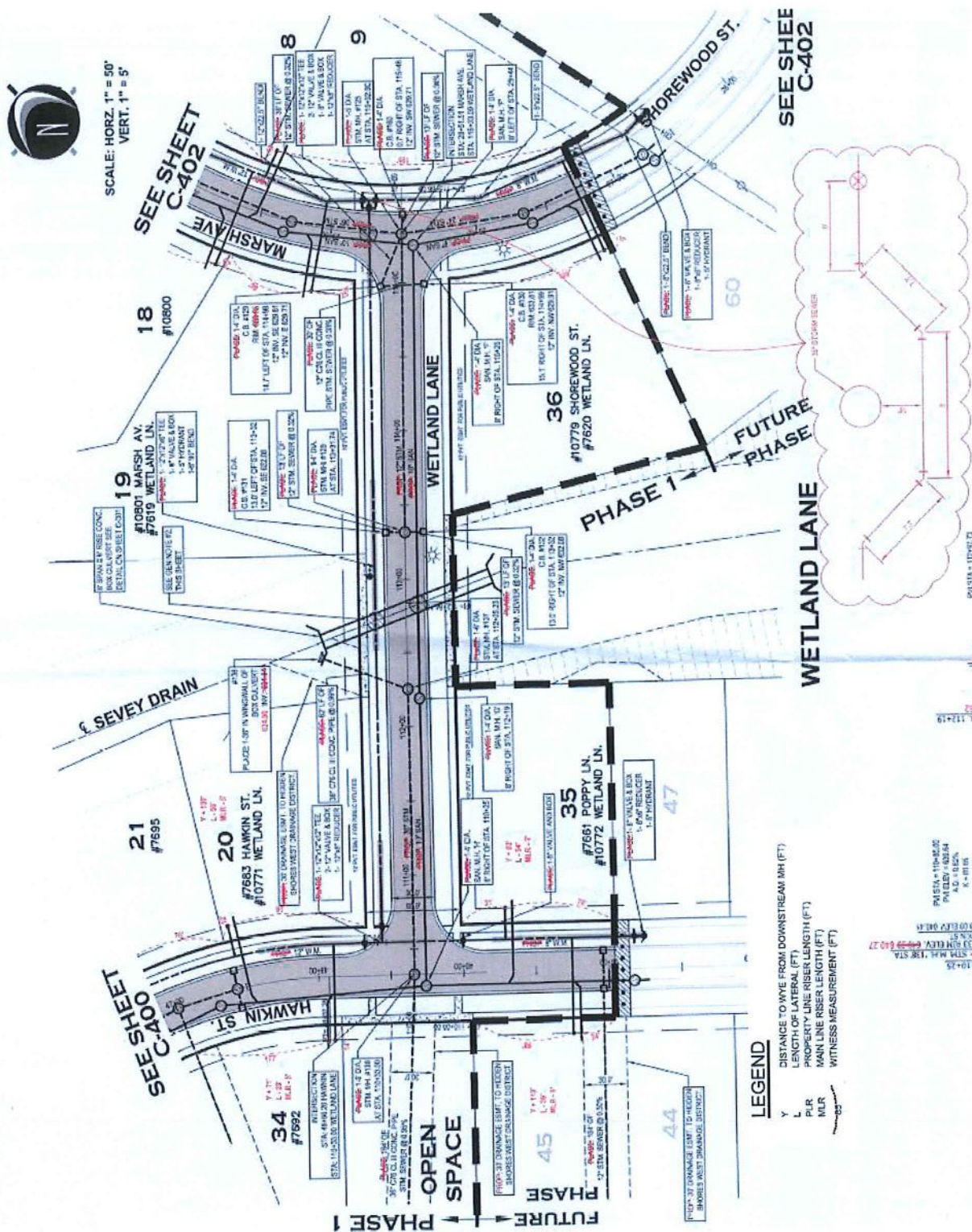
Sanitary Sewer

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

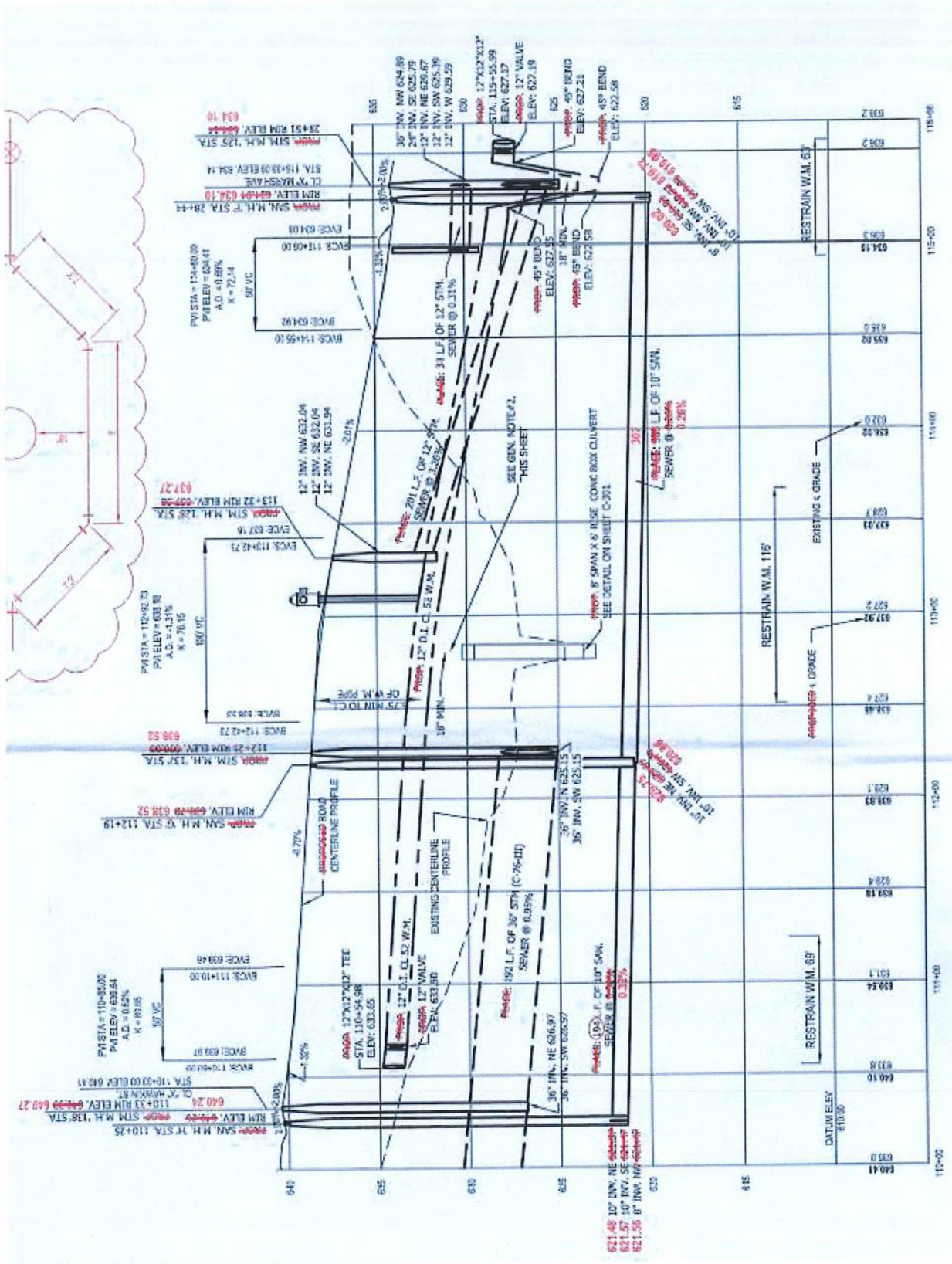
- Stubs and laterals – also need inverts and lengths
- Wye connections – need measurement from downstream manhole
- Manholes – need station numbers and length between manholes

Notes on Plan

Include name, address and phone number of Contractor



EXAMPLE OF RECORD DRAWING



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.
 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-2922 (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 702.01.
- 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 II 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, MIOSHA and ASHA regulations.

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 minimum 5-foot width with 2 – 18" plates on outside and 1 – 24" plate on inside.
 - 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 ¼ 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. 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.
 - 3. The elevation at the back of sidewalk shall be 6 inches above the road centerline, unless otherwise approved.
 - 4. 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 commercial driveways.
 - 5. 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.
 - 6. Sidewalk ramps shall be 8 inches thick with WW mesh reinforcement.
 - 7. 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.
 - 8. 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 40 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 ($\frac{1}{2}$) 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 $\frac{1}{4}$ the thickness

of the concrete. The cut joints shall not be less than 1/8-inch or more than 1/4 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.

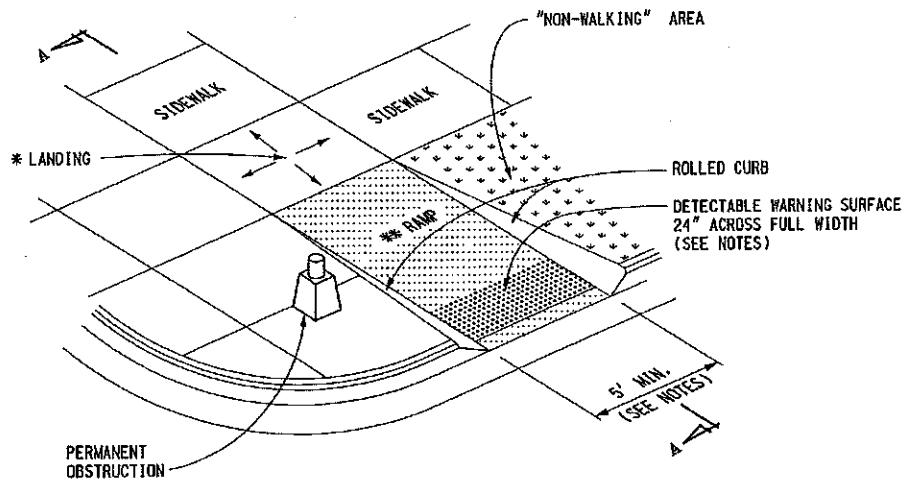
3.06 SCHEDULES:

- 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).

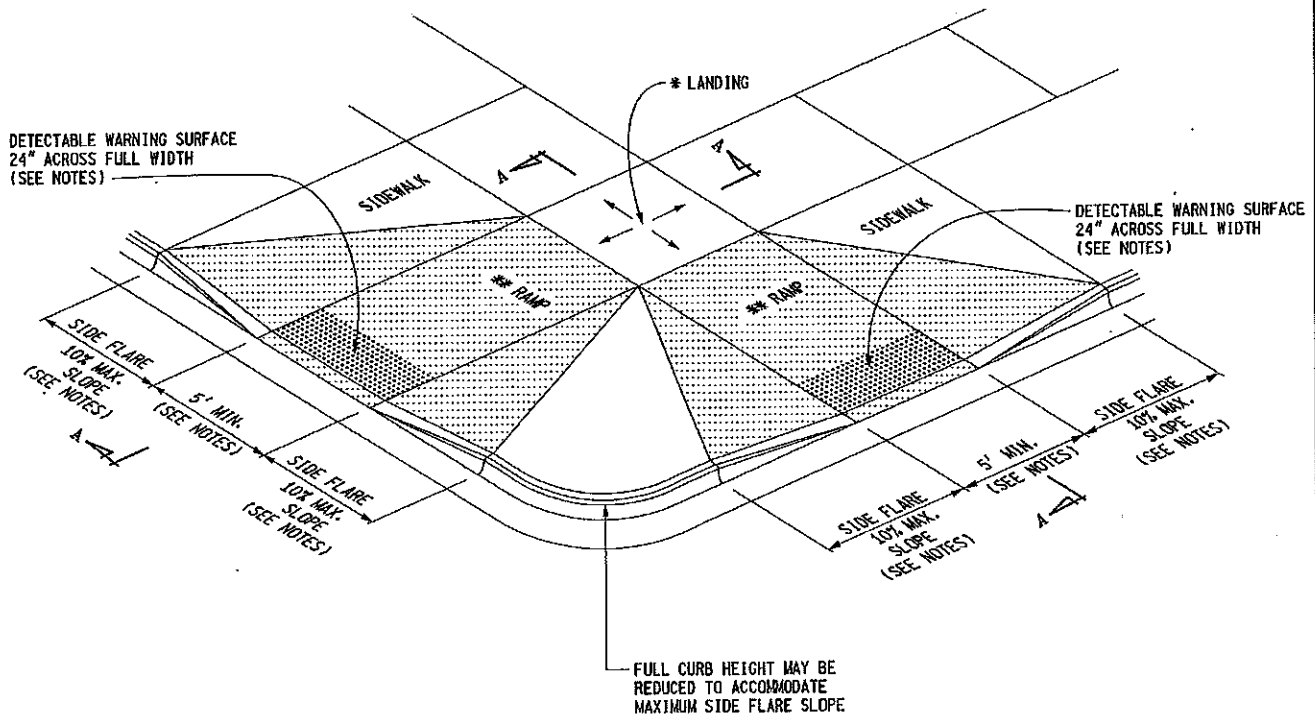
END OF SECTION

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. 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
Kirk T. Steudle

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

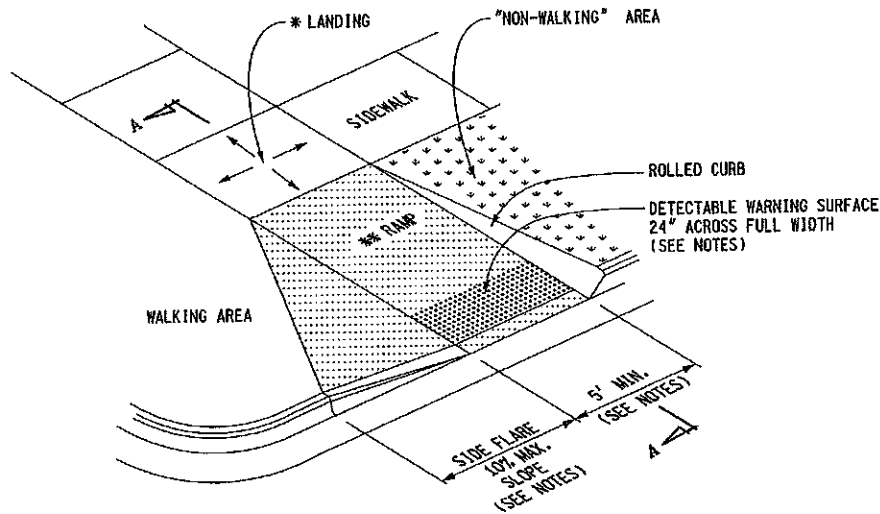
3-15-2016
PLAN DATE

R-28-J

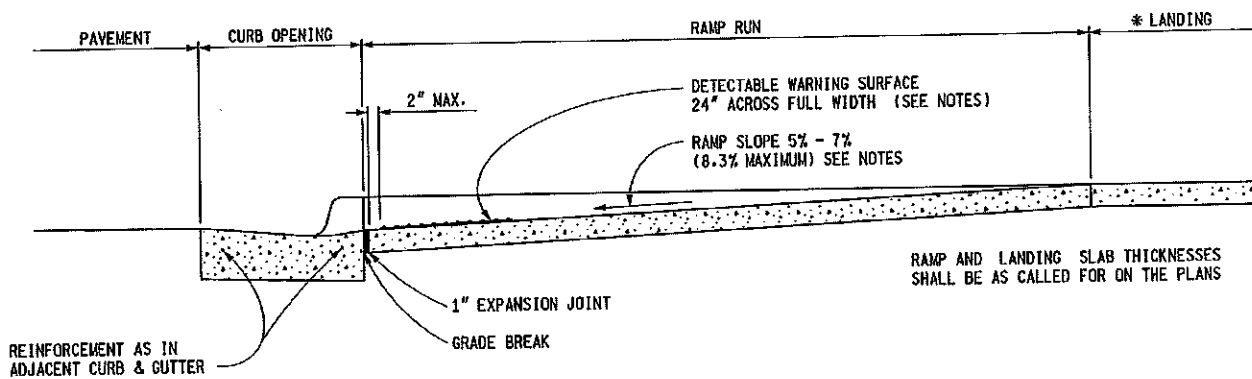
SHEET
1 OF 7

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

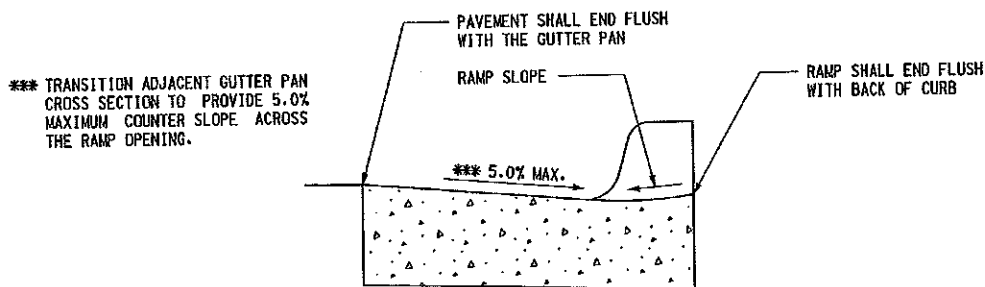
** MAXIMUM RAMP CROSS SLOPE IS 2.0%. RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



SIDEWALK RAMP TYPE RF
(ROLLED / FLARED SIDES)



SECTION A-A



SECTION THROUGH CURB 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

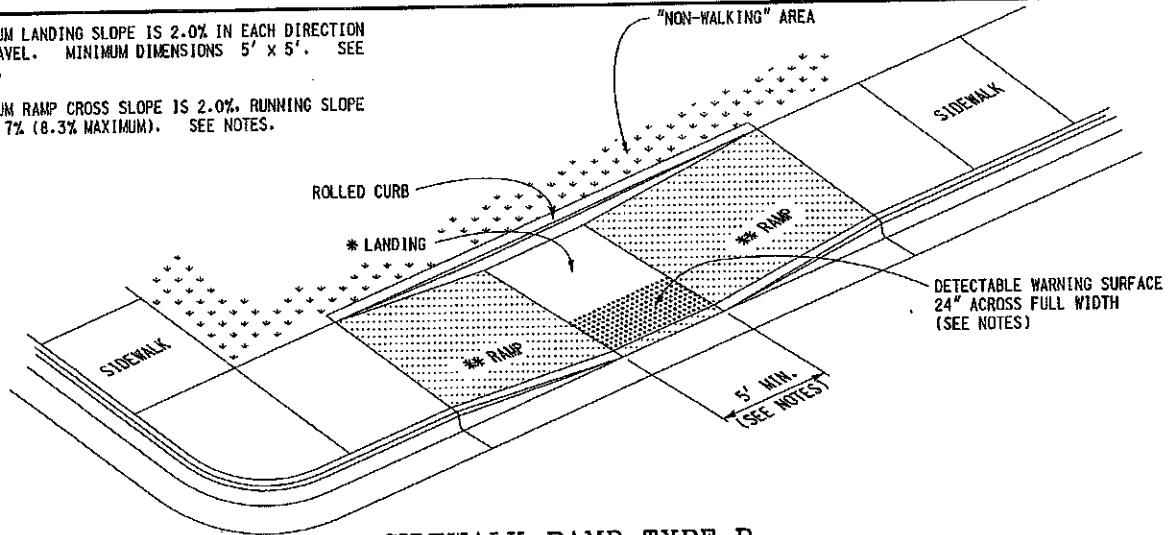
3-15-2016
PLAN DATE

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2 OF 7

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

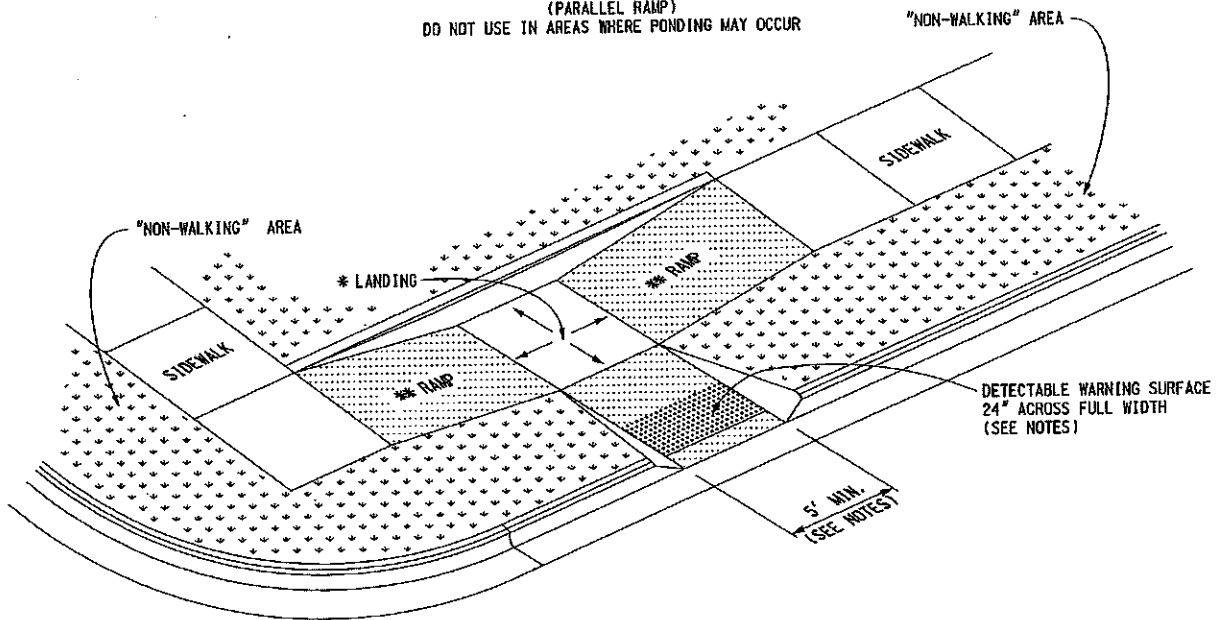
** MAXIMUM RAMP CROSS SLOPE IS 2.0%. RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



SIDEWALK RAMP TYPE P

(PARALLEL RAMP)

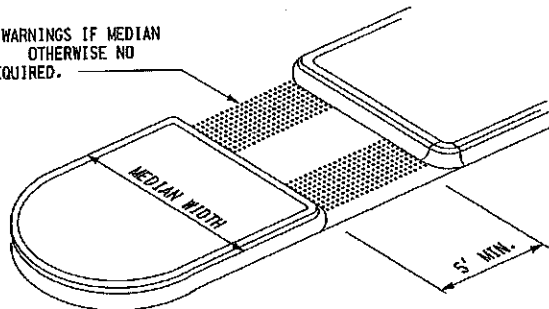
DO NOT USE IN AREAS WHERE PONDING MAY OCCUR



SIDEWALK RAMP TYPE C

(COMBINATION RAMP)

USE 24" DEEP DETECTABLE WARNINGS 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

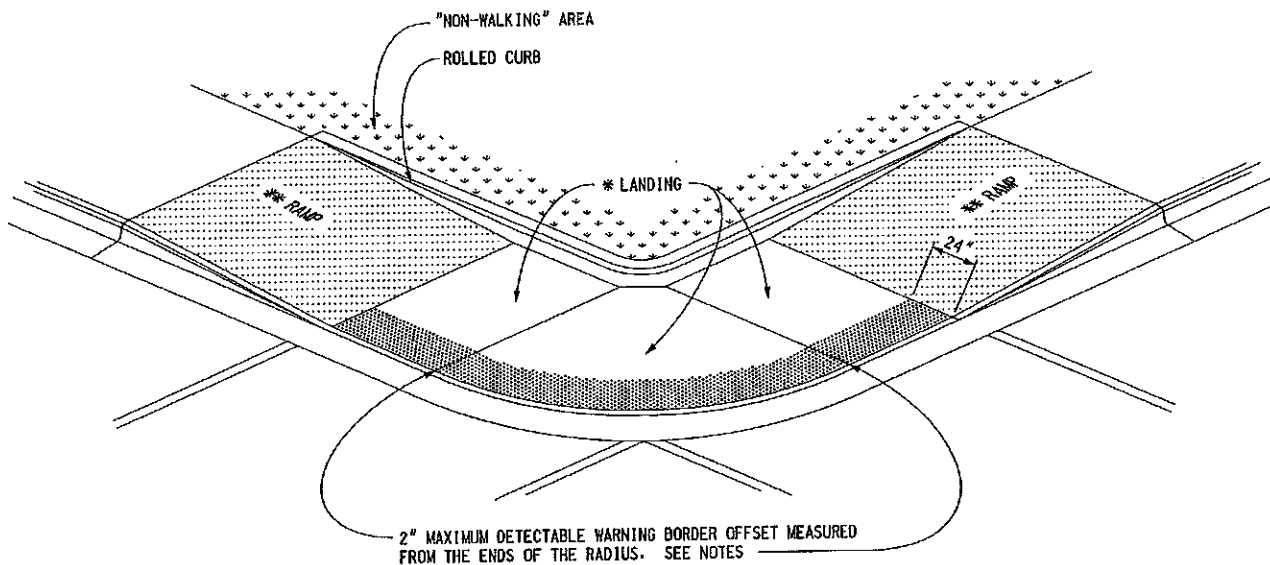
3-15-2016
PLAN DATE

R-28-J

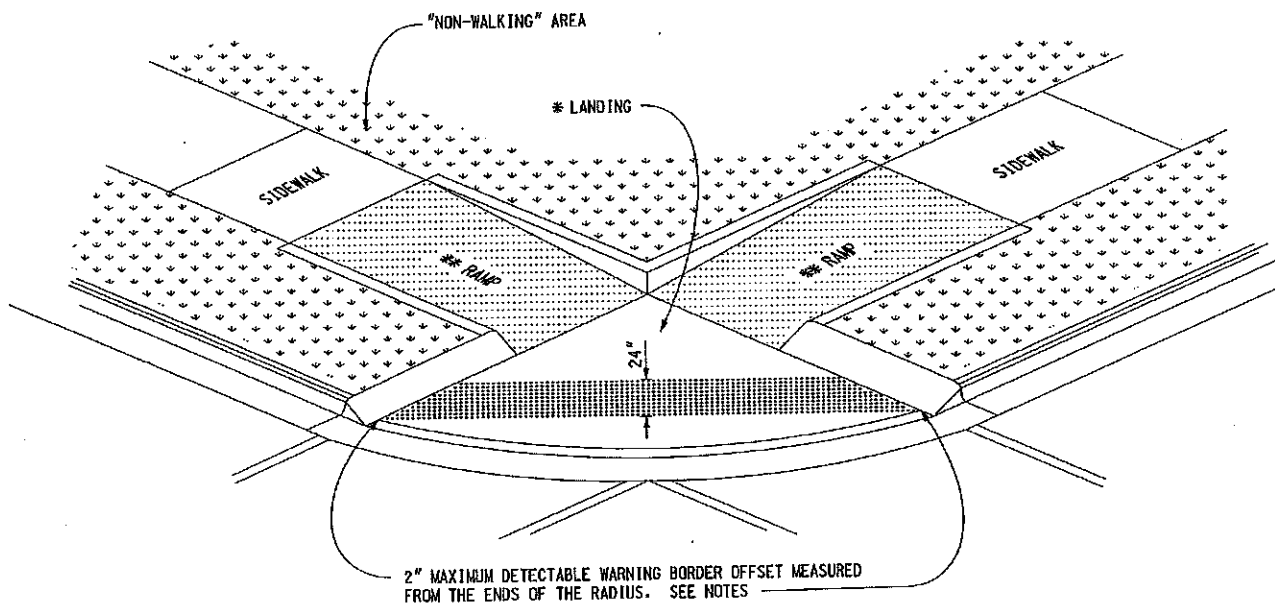
SHEET
3 OF 7

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. 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)



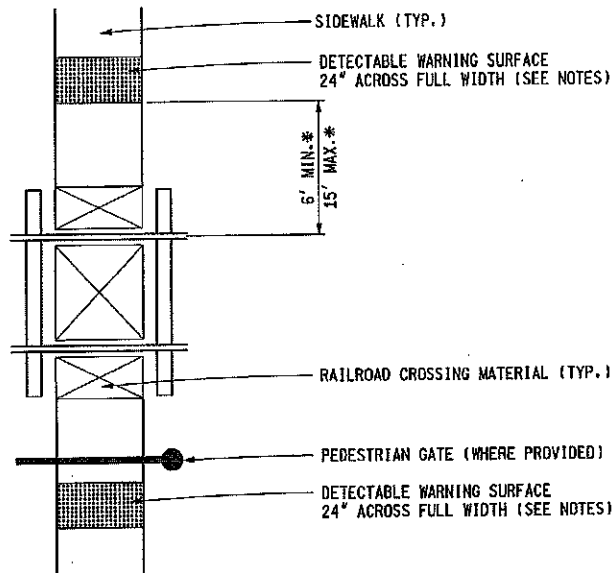
(TANGENT DETECTABLE WARNING SHOWN)

SIDEWALK RAMP TYPE D (DEPRESSED CORNER)

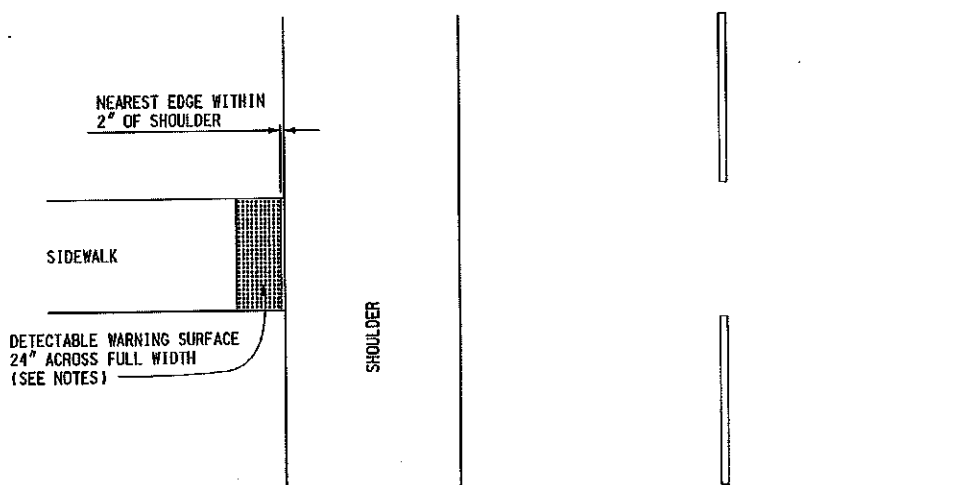
USE ONLY WHEN INDEPENDENT DIRECTIONAL RAMPS CAN NOT BE CONSTRUCTED FOR EACH CROSSING DIRECTION

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR			
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS			
F.H.W.A. APPROVAL	3-15-2016 PLAN DATE	R-28-J	SHEET 4 OF 7

* 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

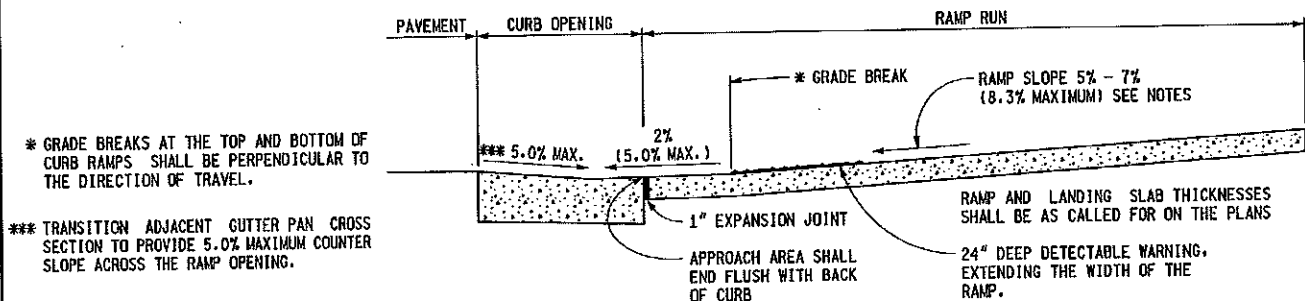
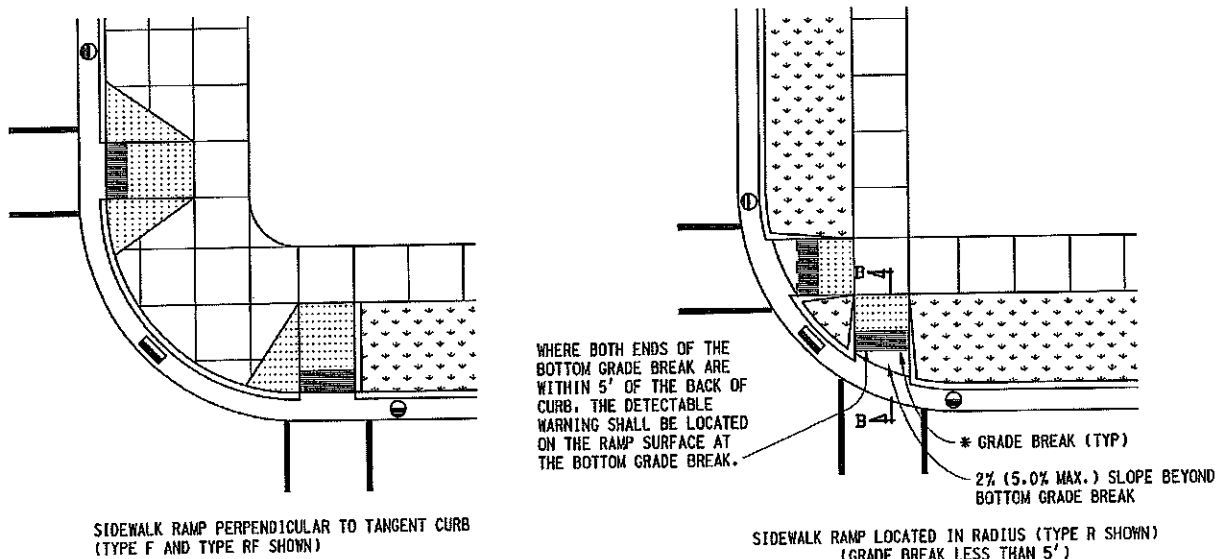
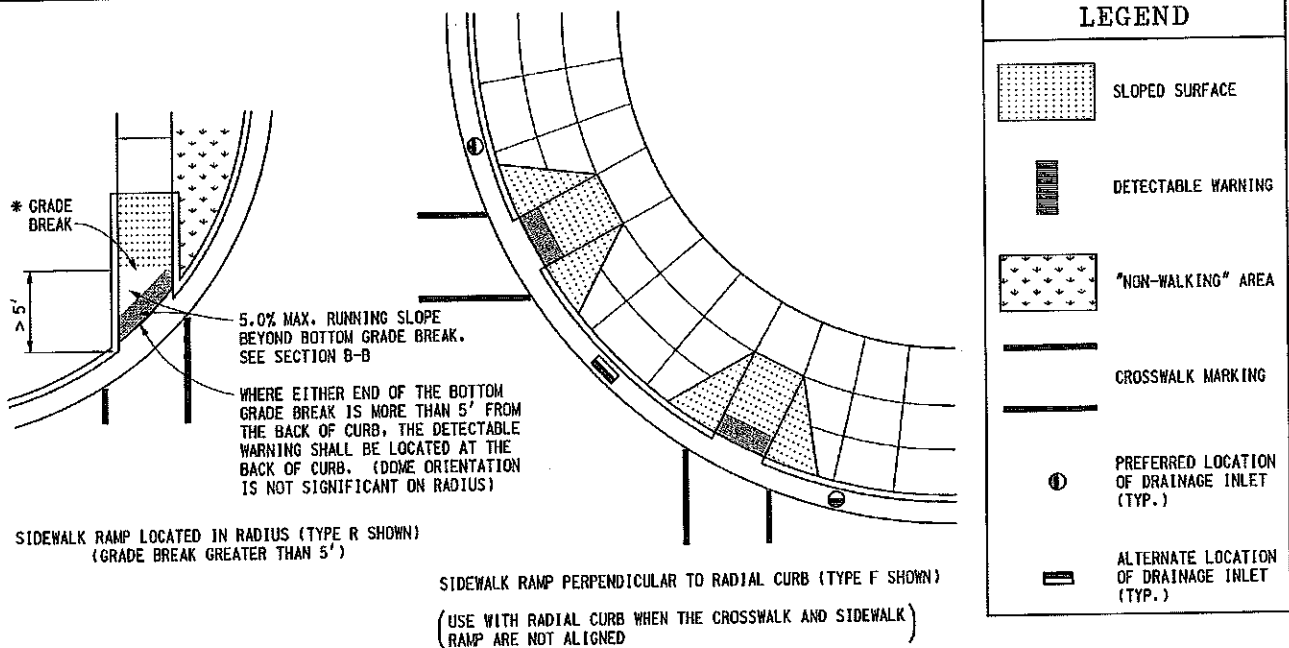
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL

3-15-2016
PLAN DATE

R-28-J

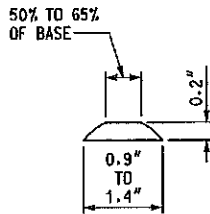
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5 OF 7



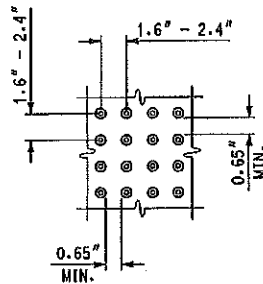
SECTION B-B SIDEWALK RAMP ORIENTATION

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

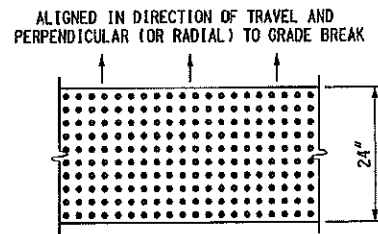
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS



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 FEASIBLE, RAMP WIDTH MAY BE REDUCED TO NOT LESS THAN 4' AND LANDINGS TO NOT LESS THAN 4' x 4'.

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.

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 1/2". ELONGATED OPENINGS SHALL BE PLACED SO THAT THE LONG DIMENSION IS PERPENDICULAR TO THE DOMINANT DIRECTION OF TRAVEL.

TRANSITION THE GUTTER PAN CROSS SECTION SUCH THAT THE COUNTER SLOPE IN THE DIRECTION OF RAMP TRAVEL IS NOT GREATER THAN 5.0%. MAINTAIN THE NORMAL GUTTER PAN CROSS SECTION ACROSS DRAINAGE STRUCTURES.

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 OF 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

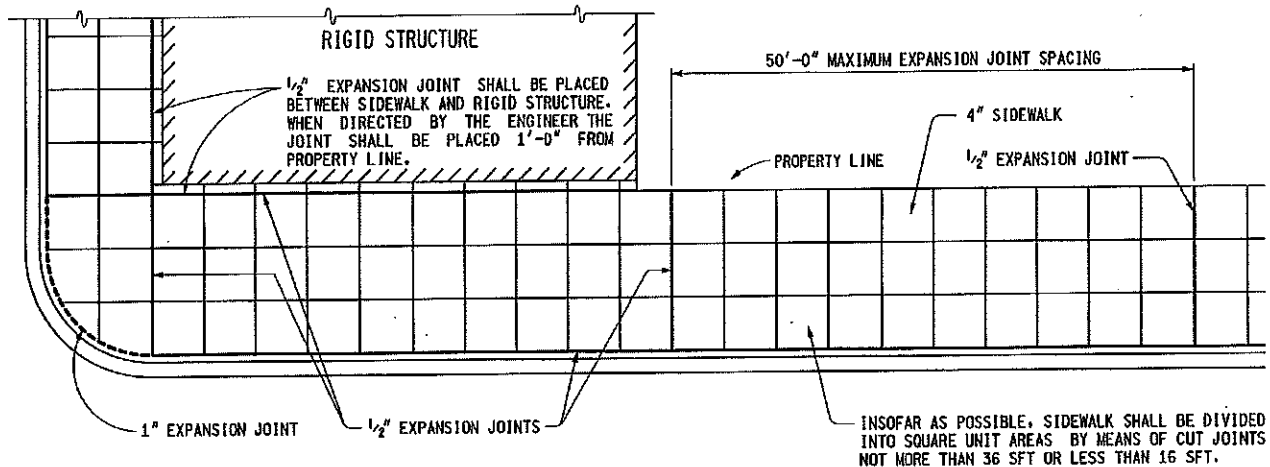
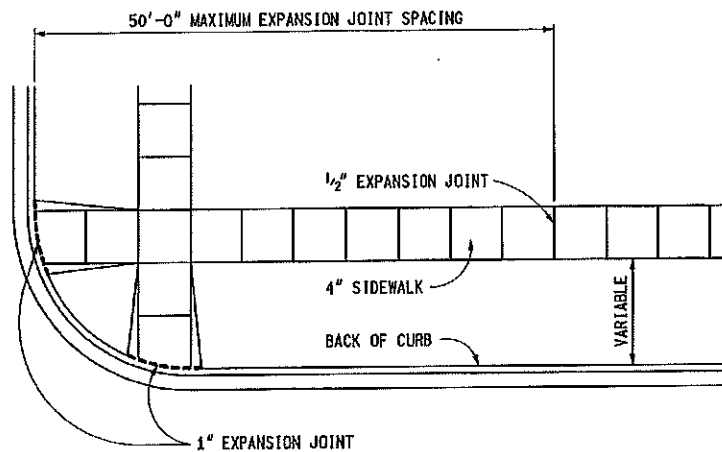
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL

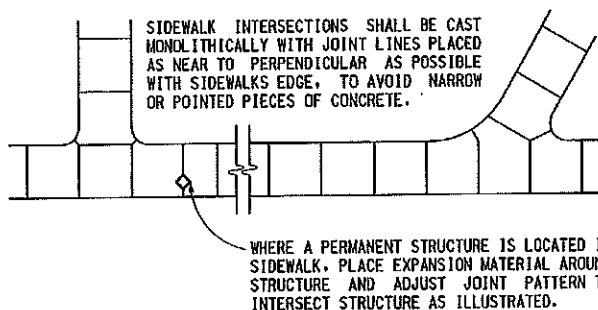
3-15-2016
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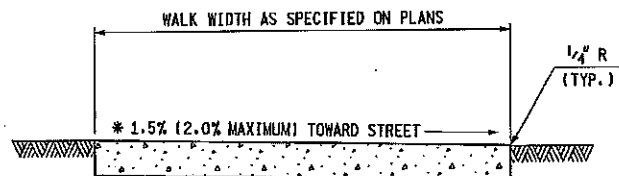
SHEET
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LOCATION OF JOINTS IN CONCRETE SIDEWALK



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 Van Pelt
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

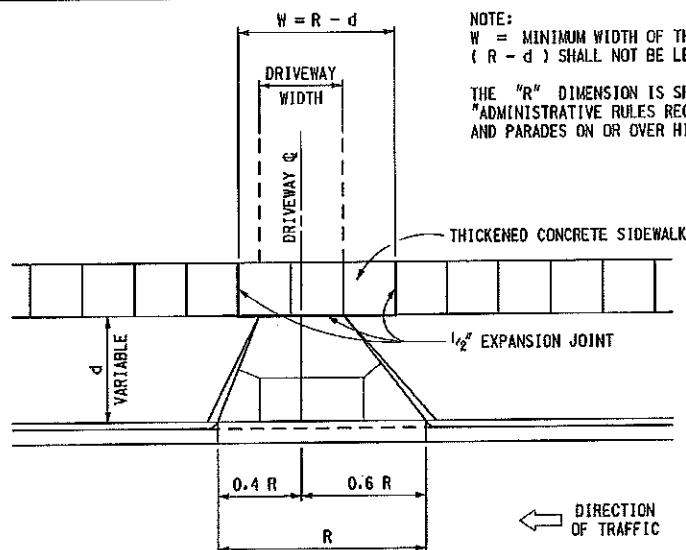
F.H.W.A. APPROVAL

7-1-2014

PLAN DATE

R-29-I

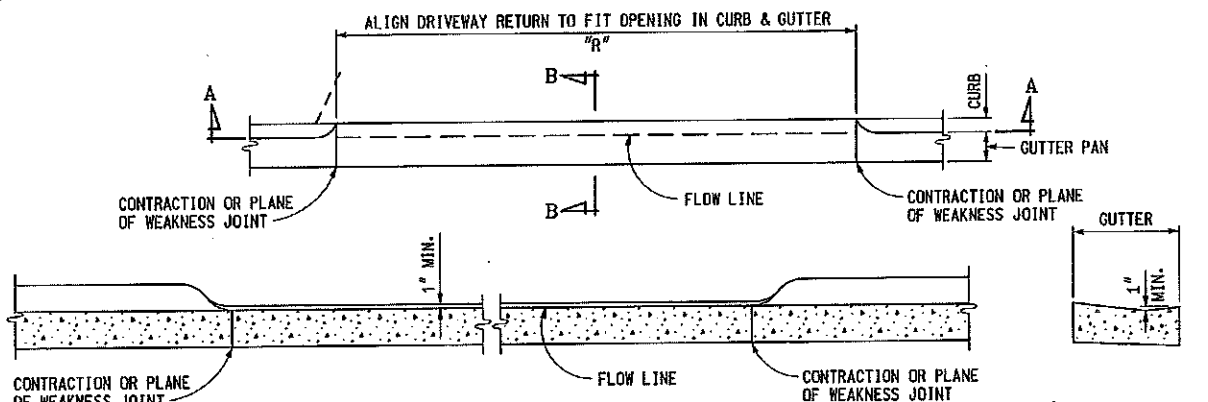
SHEET
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NOTE:
 W = MINIMUM WIDTH OF THICKENED CONCRETE SIDEWALK.
 (R - d) SHALL NOT BE LESS THAN DRIVEWAY WIDTH.

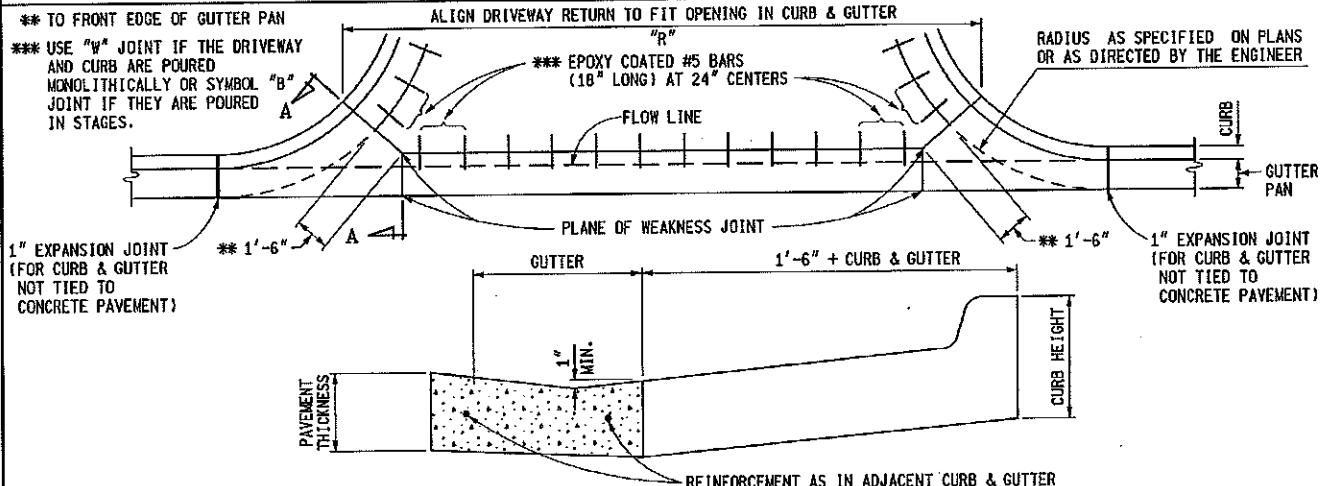
THE "R" DIMENSION IS SPECIFIED IN THE PUBLICATION
 "ADMINISTRATIVE RULES REGULATING DRIVEWAYS, BANNERS
 AND PARADES ON OR OVER HIGHWAYS".

CONCRETE DRIVEWAY OPENING LAYOUT



SECTION A - A
 CONCRETE DRIVEWAY OPENING, DETAIL L

SECTION B - B



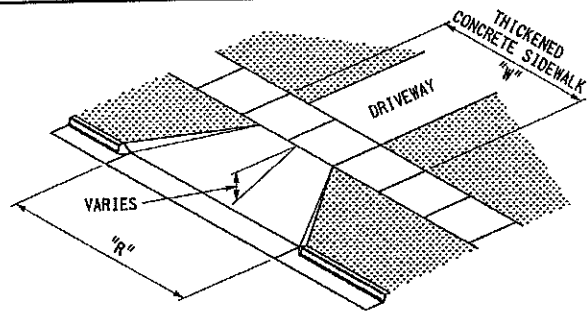
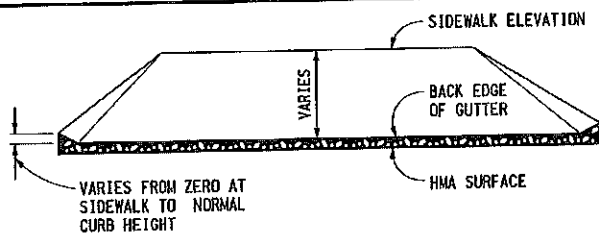
SECTION A - A
 CONCRETE DRIVEWAY OPENING, DETAIL M

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.

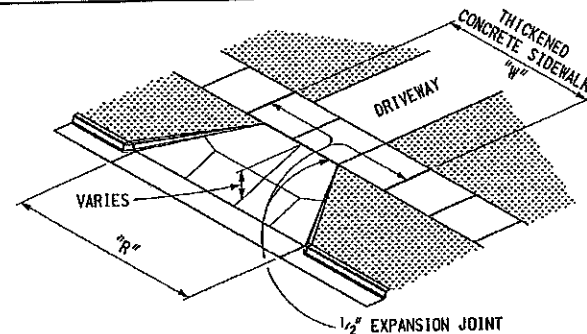
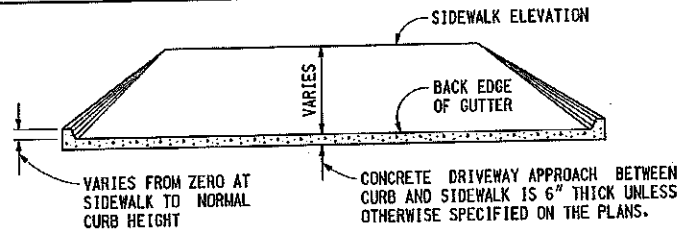
MICHIGAN DEPARTMENT OF TRANSPORTATION
 BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

DRIVEWAY OPENINGS
 & APPROACHES,
 AND CONCRETE SIDEWALK

9-30-2014 F.H.W.A. APPROVAL	7-1-2014 PLAN DATE	R-29-I	SHEET 2 OF 4
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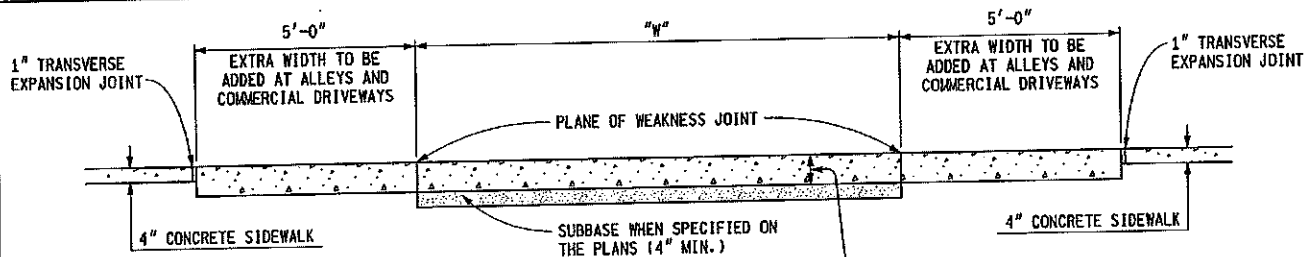
HMA DRIVEWAY APPROACH (TO BE USED WITH DETAIL L)



NOTES:
MONOLITHIC CURB IS INCLUDED IN THE CONCRETE DRIVEWAY APPROACH QUANTITY.

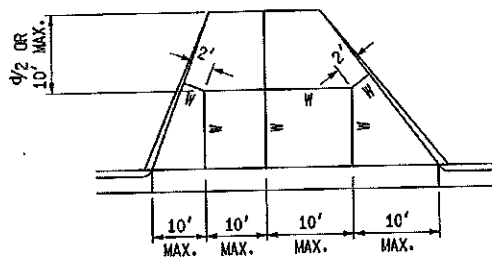
REINFORCEMENT IS NOT REQUIRED UNLESS SPECIFIED ON THE PLANS. WHEN REINFORCEMENT IS SPECIFIED, SEE CHART ON THIS SHEET.

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

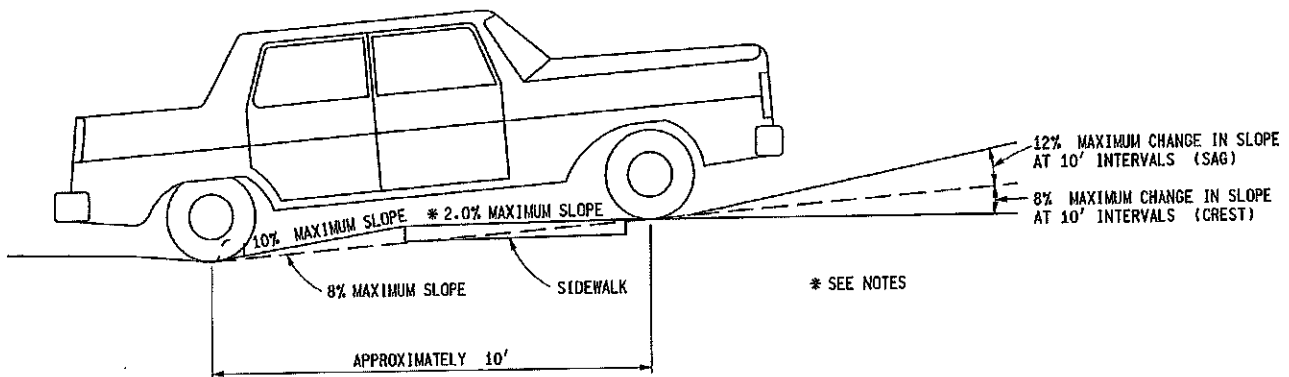
DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

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

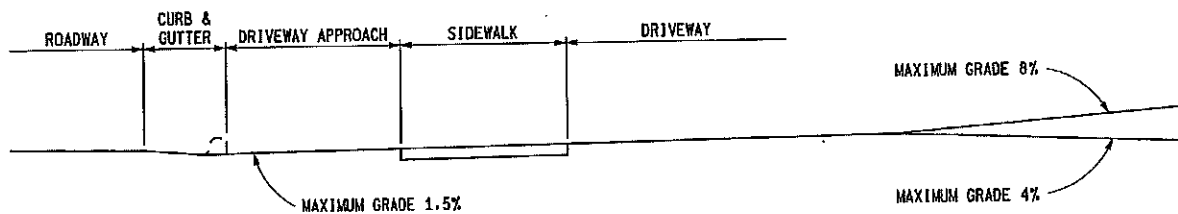
7-1-2014
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LOW VOLUME COMMERCIAL OR RESIDENTIAL DRIVEWAY SLOPES



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

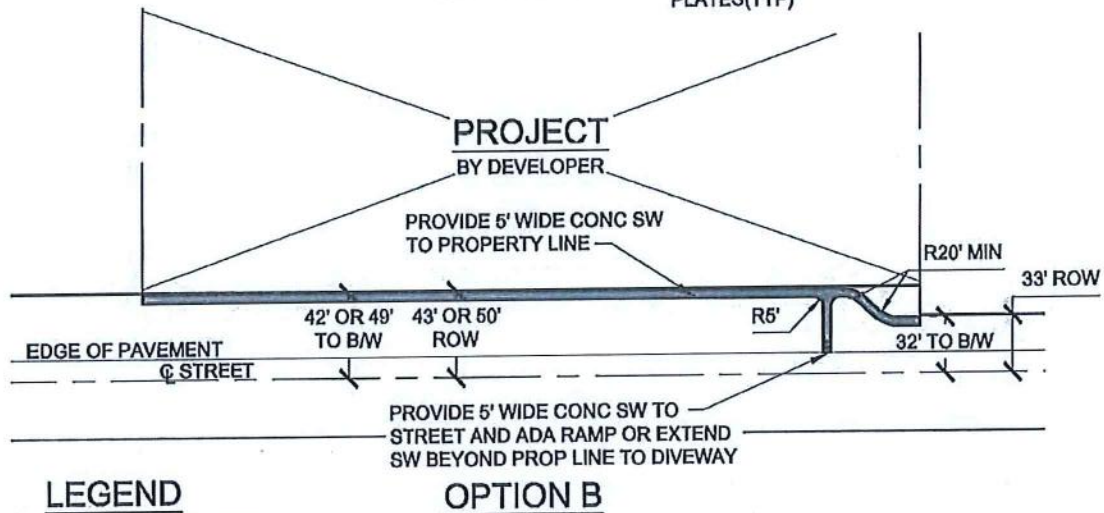
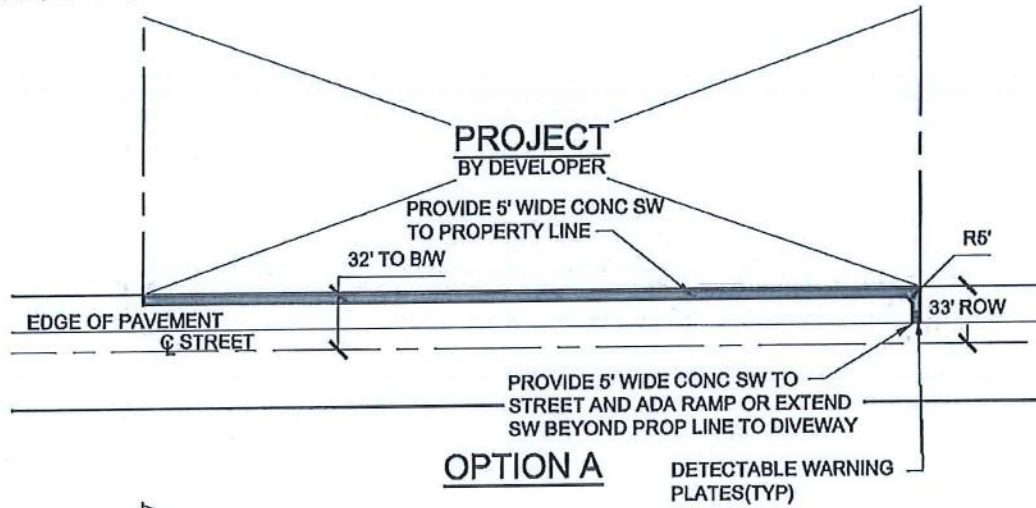
DRIVEWAY OPENINGS & APPROACHES, AND CONCRETE SIDEWALK

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

7-1-2014
PLAN DATE

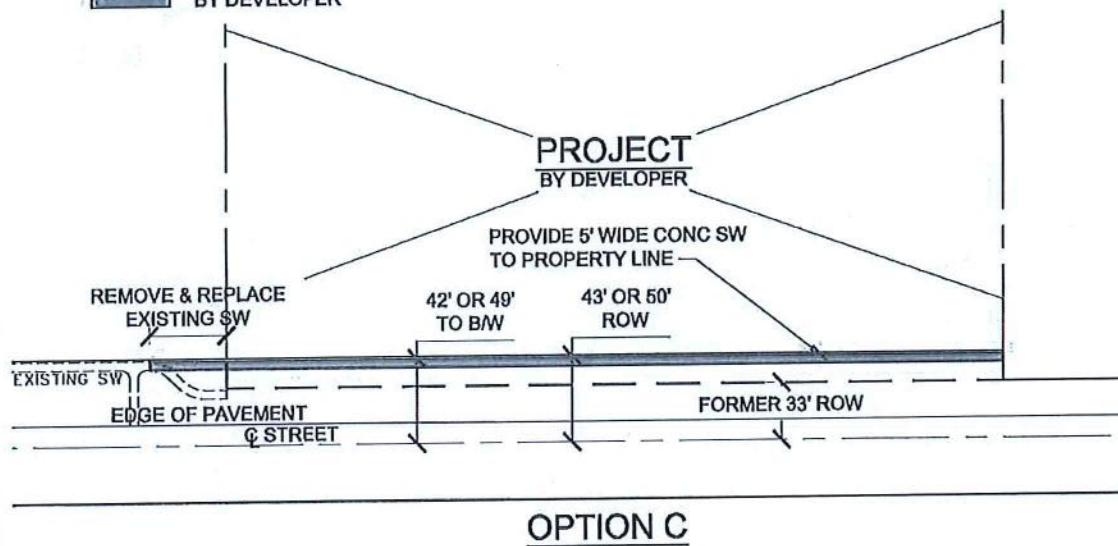
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4 OF 4



LEGEND

BY DEVELOPER

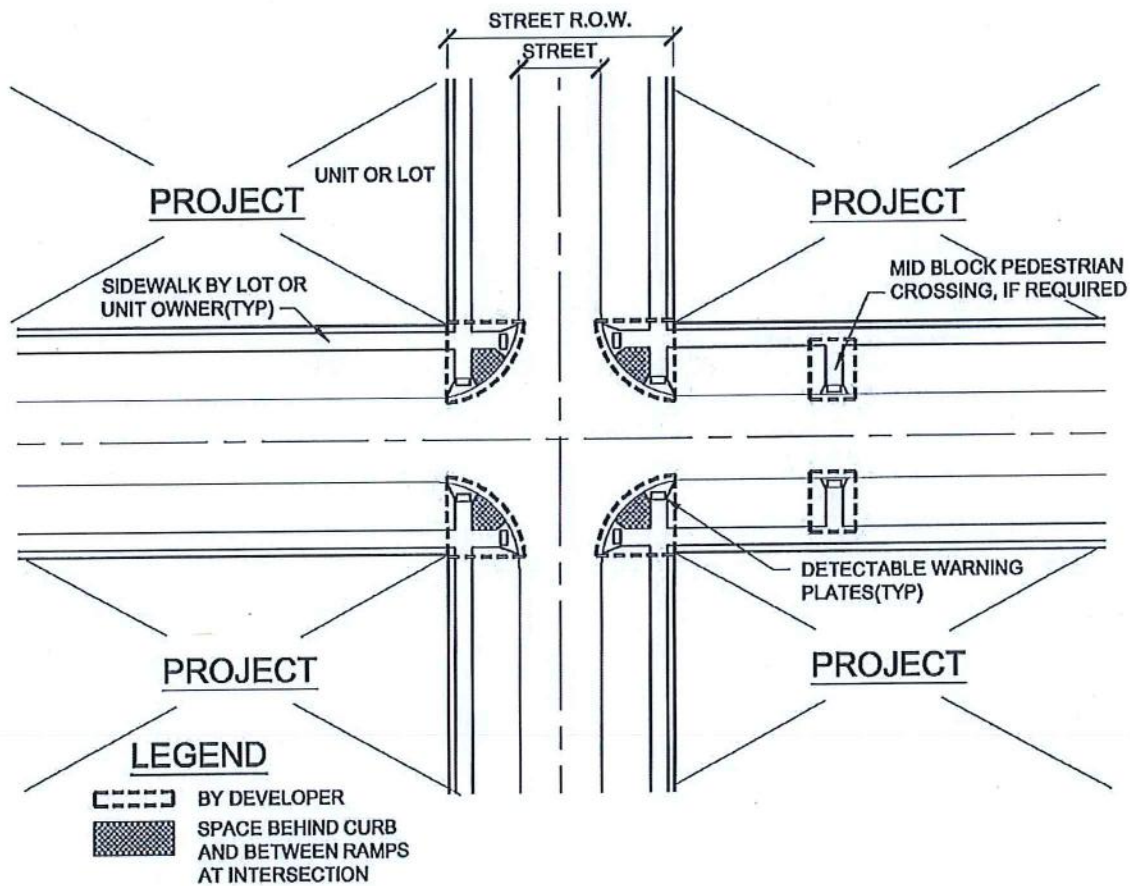
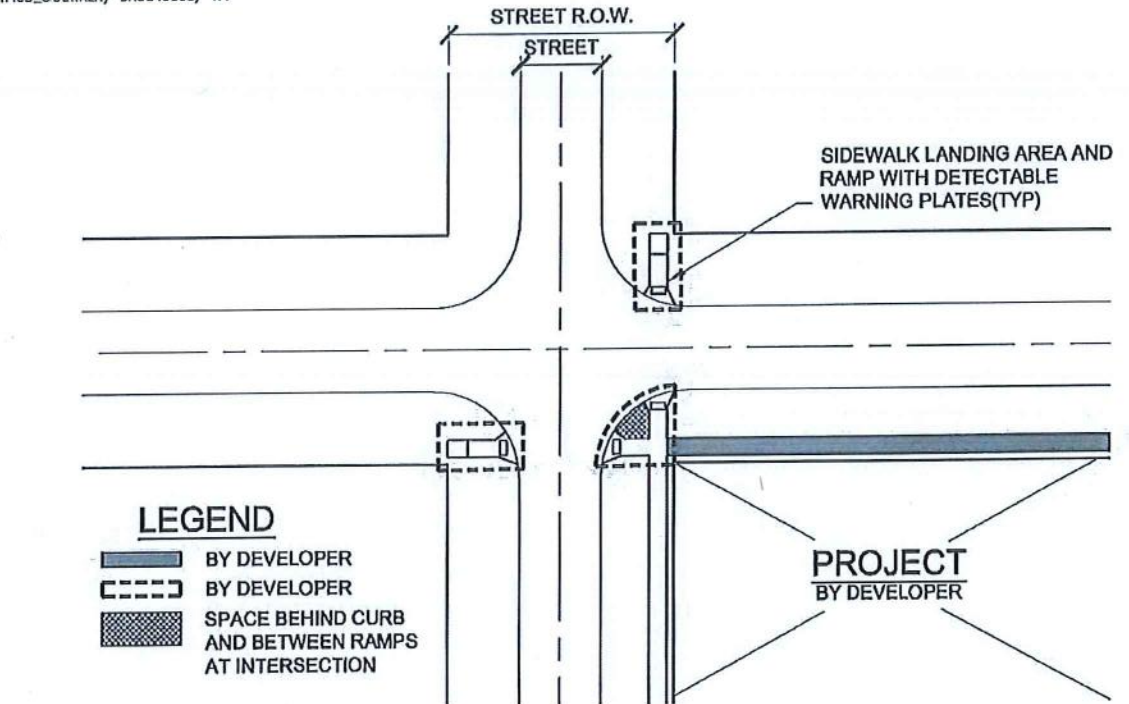


TYPICAL SIDEWALK REQUIREMENTS

NTS

PAGE 1 OF 2

NO SCALE
02501_SW



TYPICAL SIDEWALK REQUIREMENTS

NTS

PAGE 2 OF 2

NO SCALE
02501_SW

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 side walks 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 by 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 roadways or 6 inches higher than the top of the back of the curb on standing curb roadways.

The sidewalk max slope is 1/4 inch per foot toward the street, unless otherwise directed.

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

Control joints 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 from their designated position.
- B. All edges and joints must be rounded to 1/2".

Expansion joints:

- A. Expansion joint filler shall extend the full depth of the joint with the top slightly below the finished sidewalk surface.
- B. 1/2 inch expansion joint must be used on both sides of walk through driveway.
- C. 1/2 inch expansion joint at all transitions between 4 inch and 6 inch sidewalk.
- D. 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 sub base must be compacted to 95% maximum density.

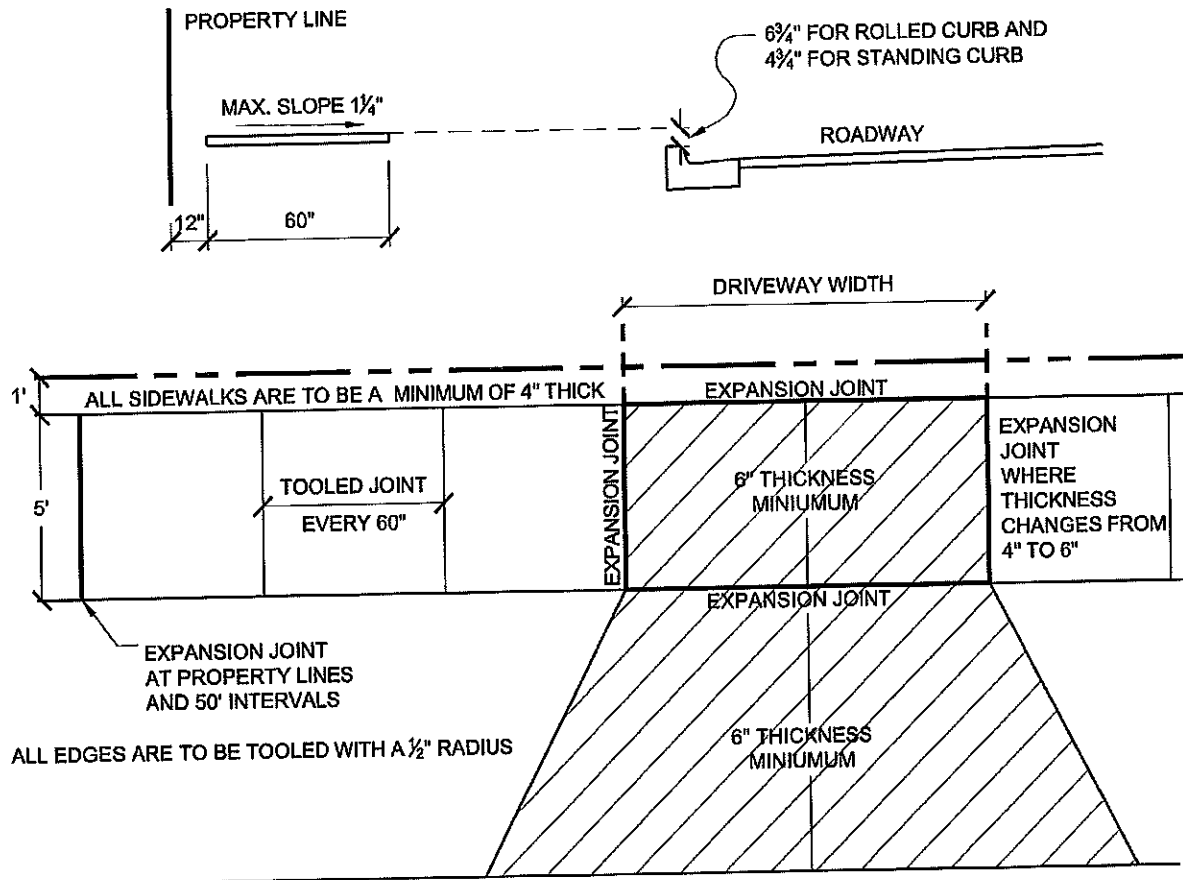
All edges and joints must be rounded to 1/2 inch radius.

The surface shall be slightly broomed transversely.

Pouring of concrete shall not take place in temperature of less than 40 Fahrenheit.

The sidewalk must pass through the driveway as show in attached graphic.

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 in 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. Allow access to the hot mix asphalt plant for verification of mix proportions, aggregate gradation, and temperatures.

G. 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.

H. 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.

I. 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.
 - b. Provide minimum 2-foot wide graded shoulders.
 - c. 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 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:
 - d. Provide for tactile and visual warning that contrast visually with adjacent walking surfaces, either light-on-dark or dark-on-light.
 - e. 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.
 - f. 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 faces 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.

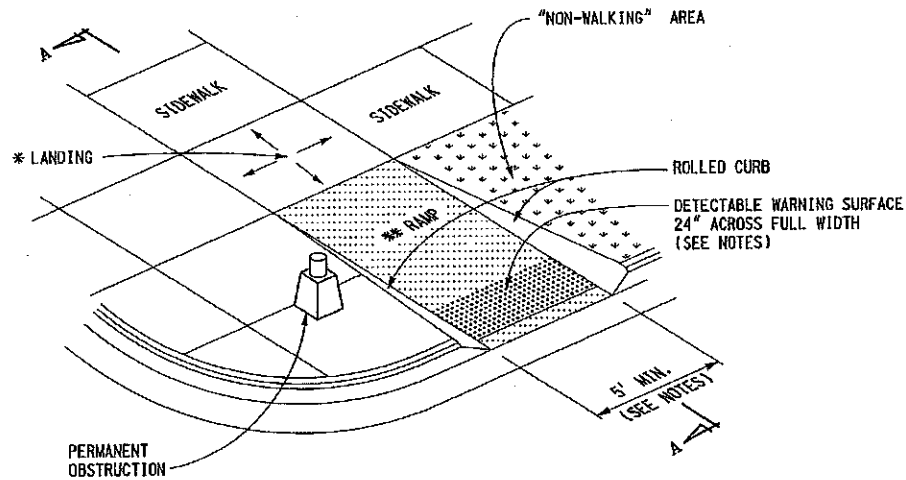
3.09 SCHEDULES:

- 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.

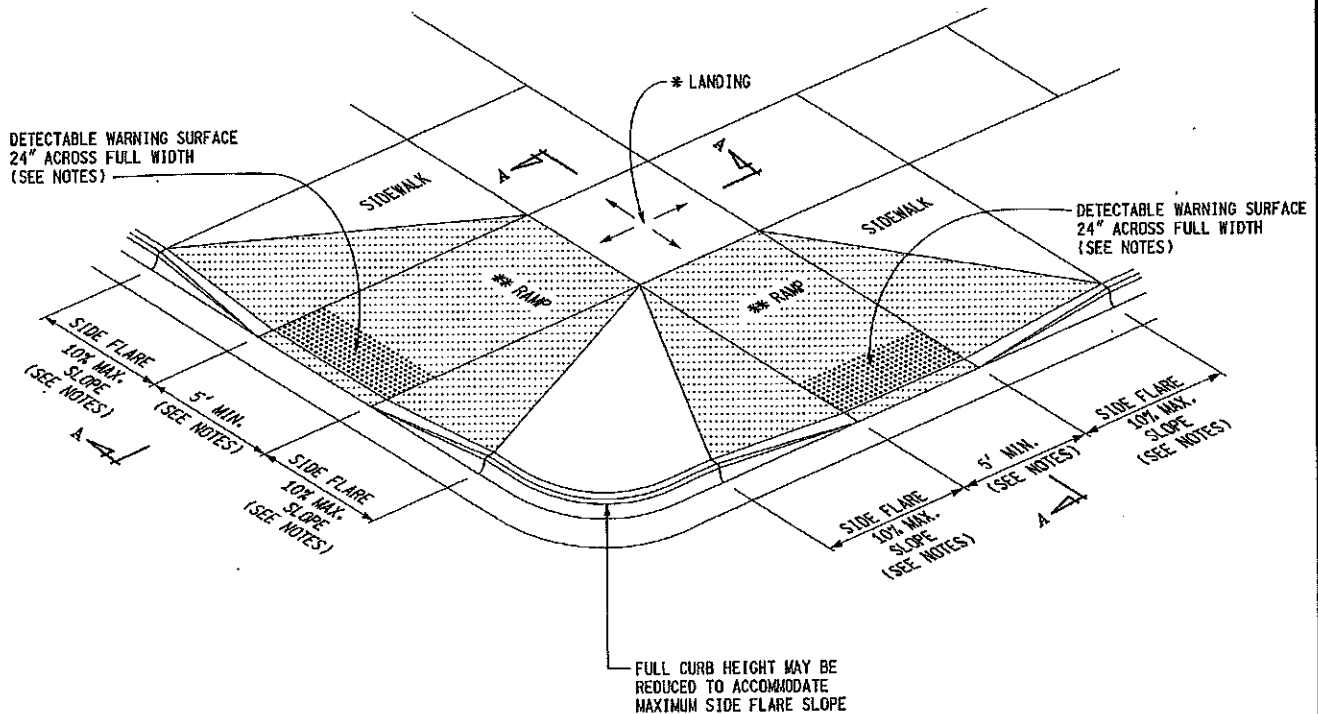
END OF SECTION

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. 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
Kirk T. Steudle

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

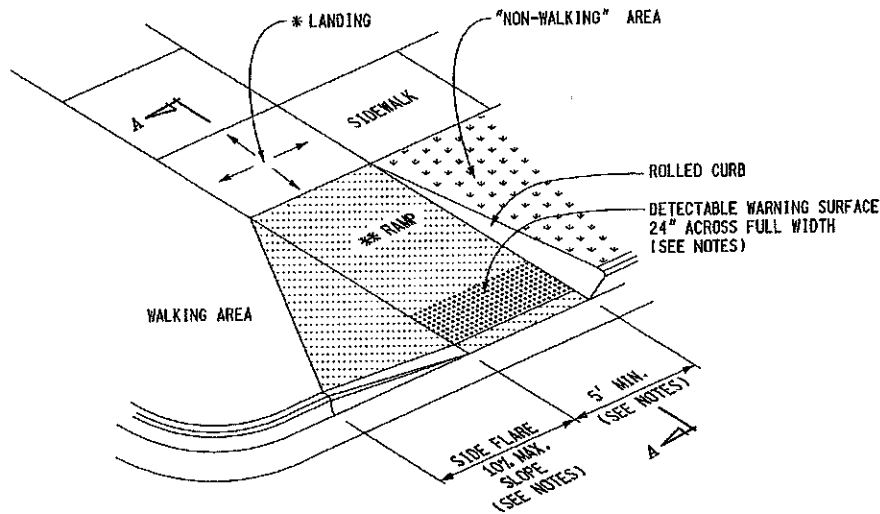
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PLAN DATE

R-28-J

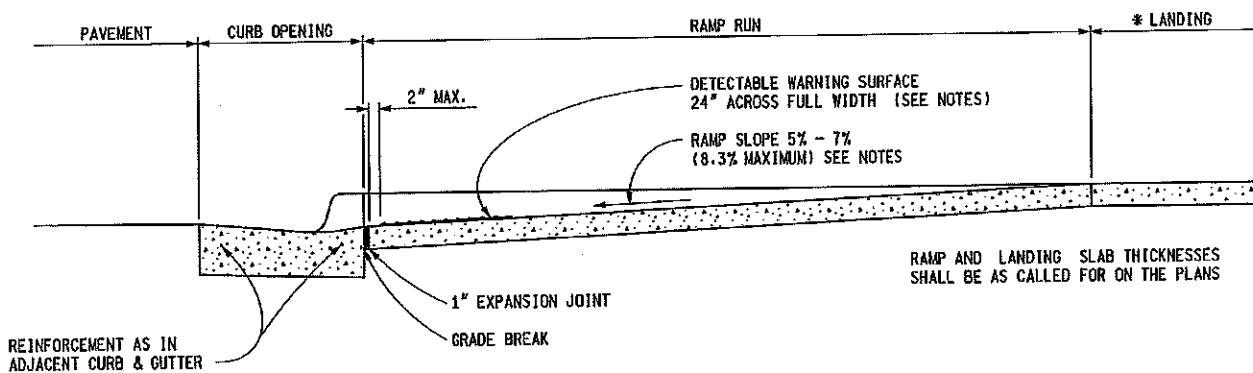
SHEET
1 OF 7

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

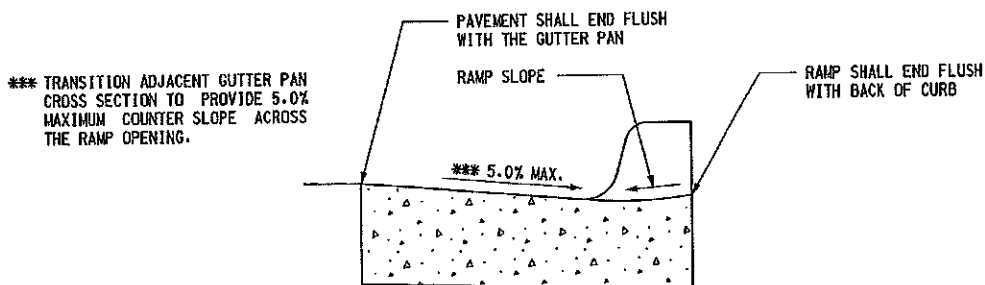
** MAXIMUM RAMP CROSS SLOPE IS 2.0%, RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



SIDEWALK RAMP TYPE RF
(ROLLED / FLARED SIDES)



SECTION A-A

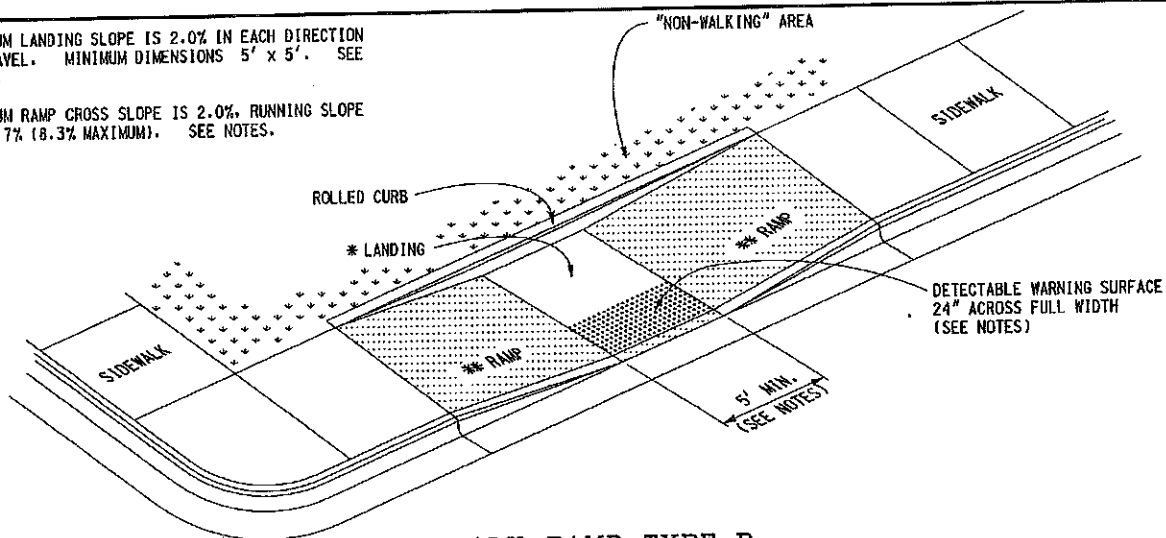


SECTION THROUGH CURB OPENING
(TYPICAL ALL RAMP TYPES)

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF DEVELOPMENT STANDARD PLAN FOR			
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS			
F.H.W.A. APPROVAL	3-15-2016 PLAN DATE	R-28-J	SHEET 2 OF 7

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

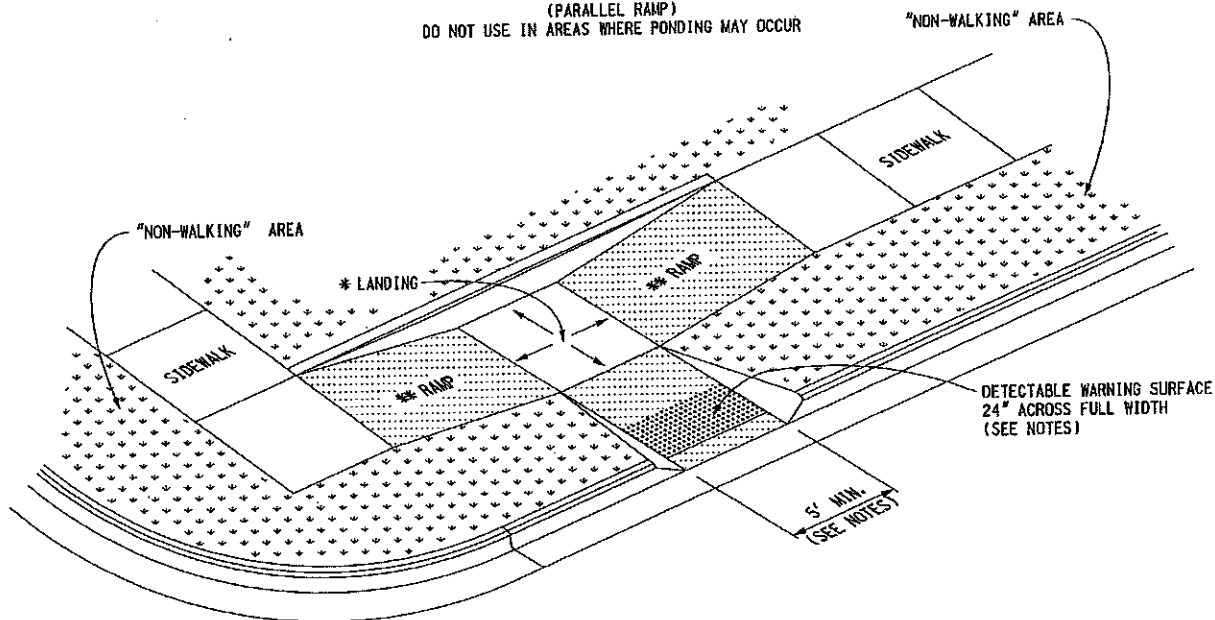
** MAXIMUM RAMP CROSS SLOPE IS 2.0%. RUNNING SLOPE 5% - 7% (8.3% MAXIMUM). SEE NOTES.



SIDEWALK RAMP TYPE P

(PARALLEL RAMP)

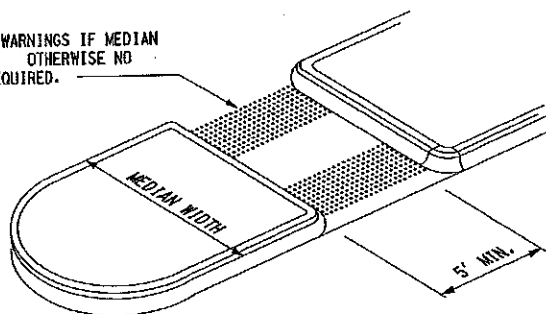
DO NOT USE IN AREAS WHERE PONDING MAY OCCUR



SIDEWALK RAMP TYPE C

(COMBINATION RAMP)

USE 24" DEEP DETECTABLE WARNINGS 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

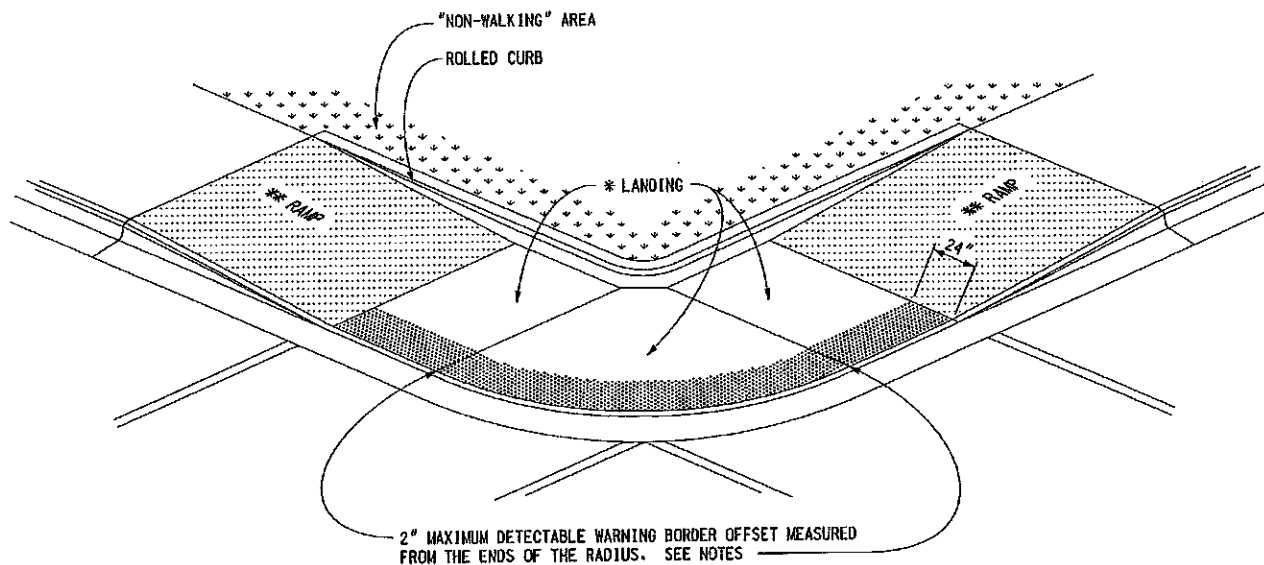
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PLAN DATE

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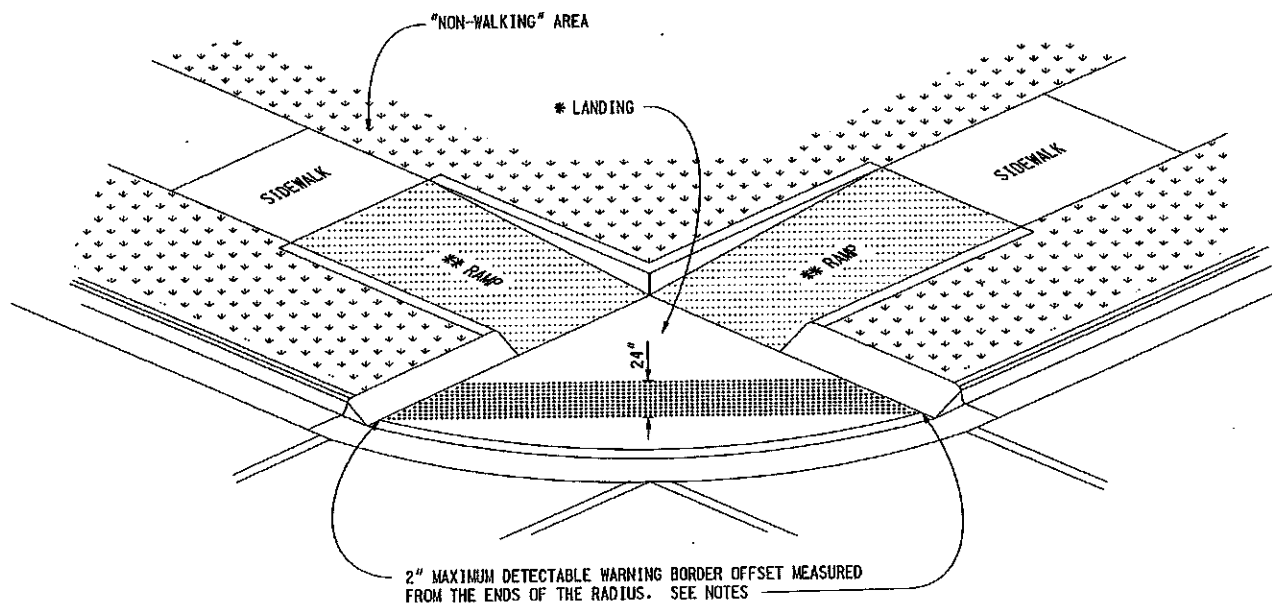
SHEET
3 OF 7

* MAXIMUM LANDING SLOPE IS 2.0% IN EACH DIRECTION OF TRAVEL. 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

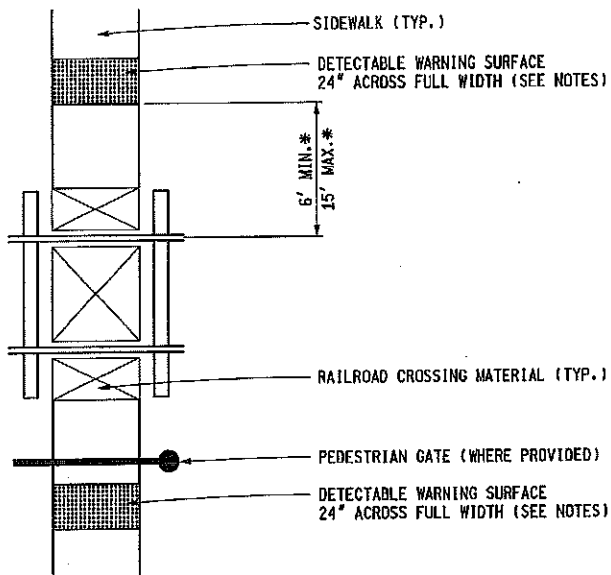
F.H.V.A. APPROVAL

3-15-2016
PLAN DATE

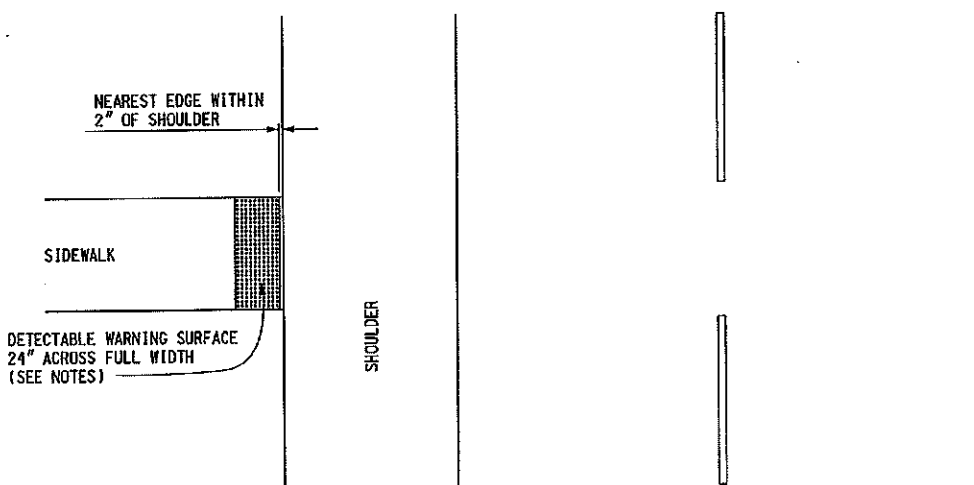
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* THE DETECTABLE WARNING SURFACE SHALL BE LOCATED SO THAT THE EDGE NEAREST THE RAIL CROSSING IS 6' MINIMUM AND 15' MAXIMUM FROM THE CENTERLINE OF THE NEAREST RAIL. DO NOT PLACE DETECTABLE WARNING ON RAILROAD CROSSING MATERIAL.



DETECTABLE WARNING AT RAILROAD CROSSING



DETECTABLE WARNING AT FLUSH SHOULDER OR ROADWAY

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

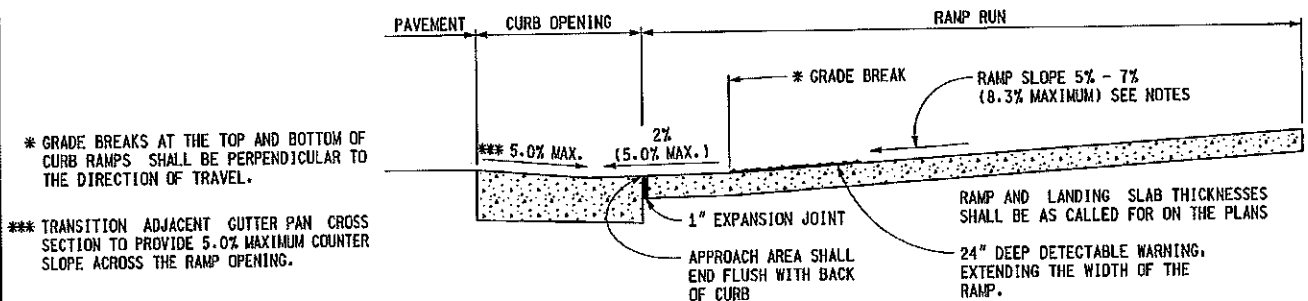
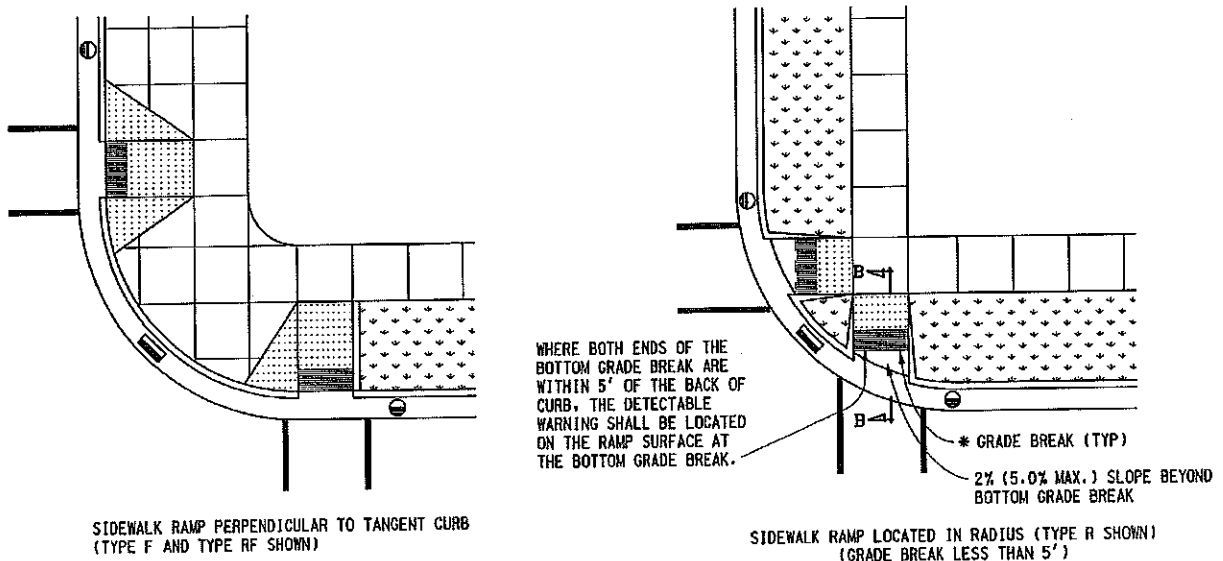
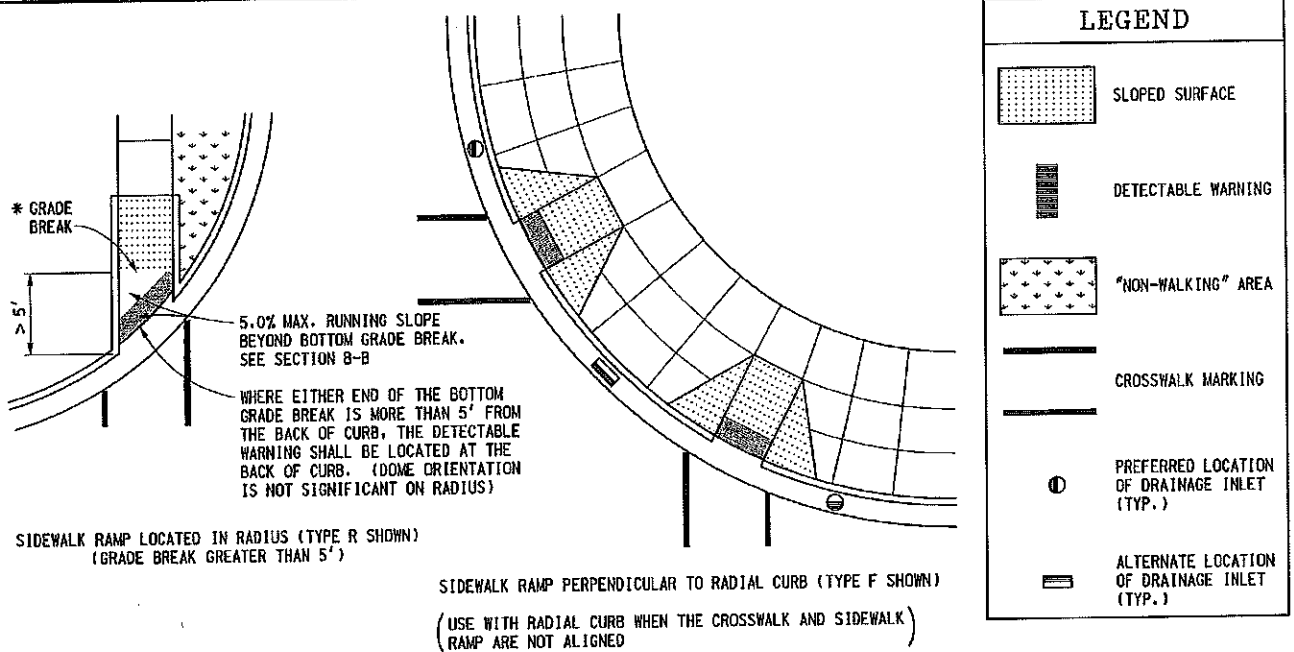
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL

3-15-2016
PLAN DATE

R-28-J

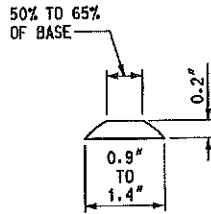
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5 OF 7



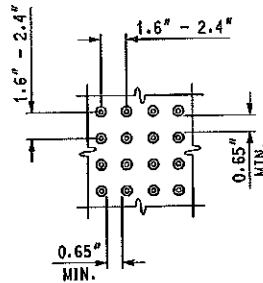
SECTION B-B SIDEWALK RAMP ORIENTATION

MICHIGAN DEPARTMENT OF TRANSPORTATION
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

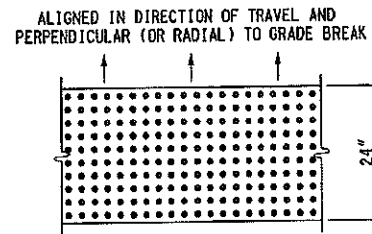
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS



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 BROUING, 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 FEASIBLE, RAMP WIDTH MAY BE REDUCED TO NOT LESS THAN 4' AND LANDINGS TO NOT LESS THAN 4' x 4'.

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.

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 1/2". ELONGATED OPENINGS SHALL BE PLACED SO THAT THE LONG DIMENSION IS PERPENDICULAR TO THE DOMINANT DIRECTION OF TRAVEL.

TRANSITION THE GUTTER PAN CROSS SECTION SUCH THAT THE COUNTER SLOPE IN THE DIRECTION OF RAMP TRAVEL IS NOT GREATER THAN 5.0%. MAINTAIN THE NORMAL GUTTER PAN CROSS SECTION ACROSS DRAINAGE STRUCTURES.

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 OF 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

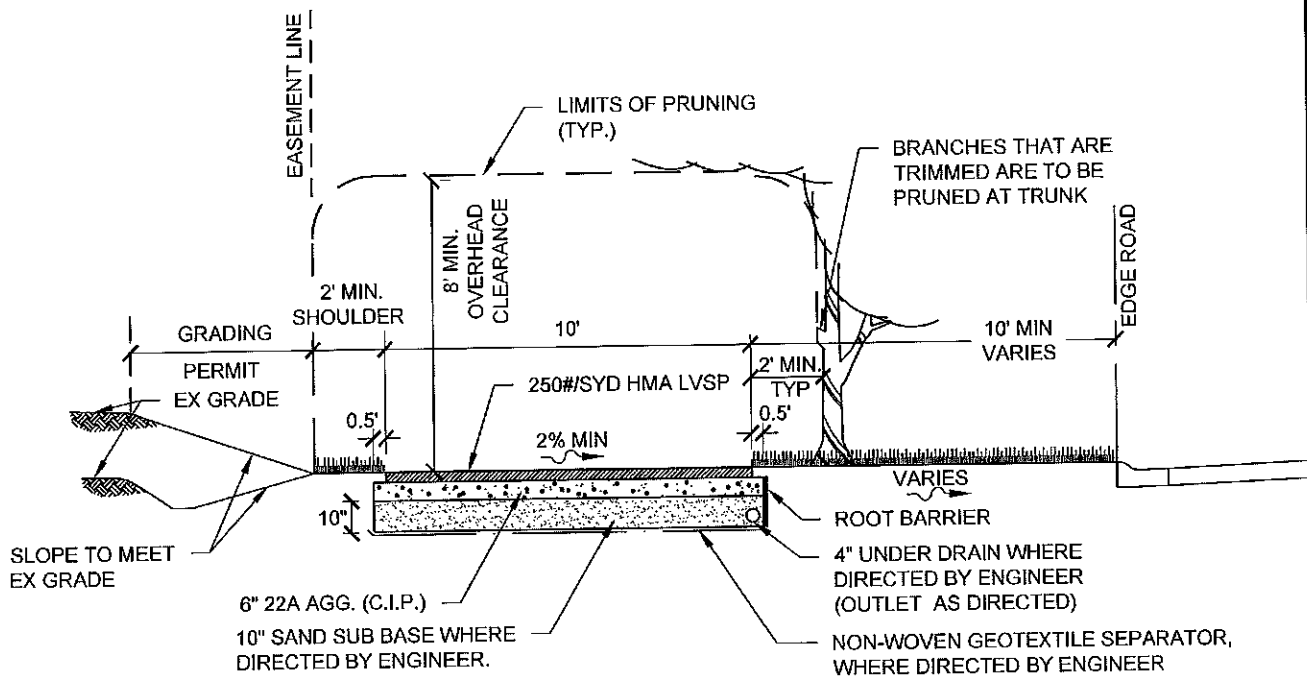
SIDEWALK RAMP AND DETECTABLE WARNING DETAILS

F.H.W.A. APPROVAL

3-15-2016
PLAN DATE

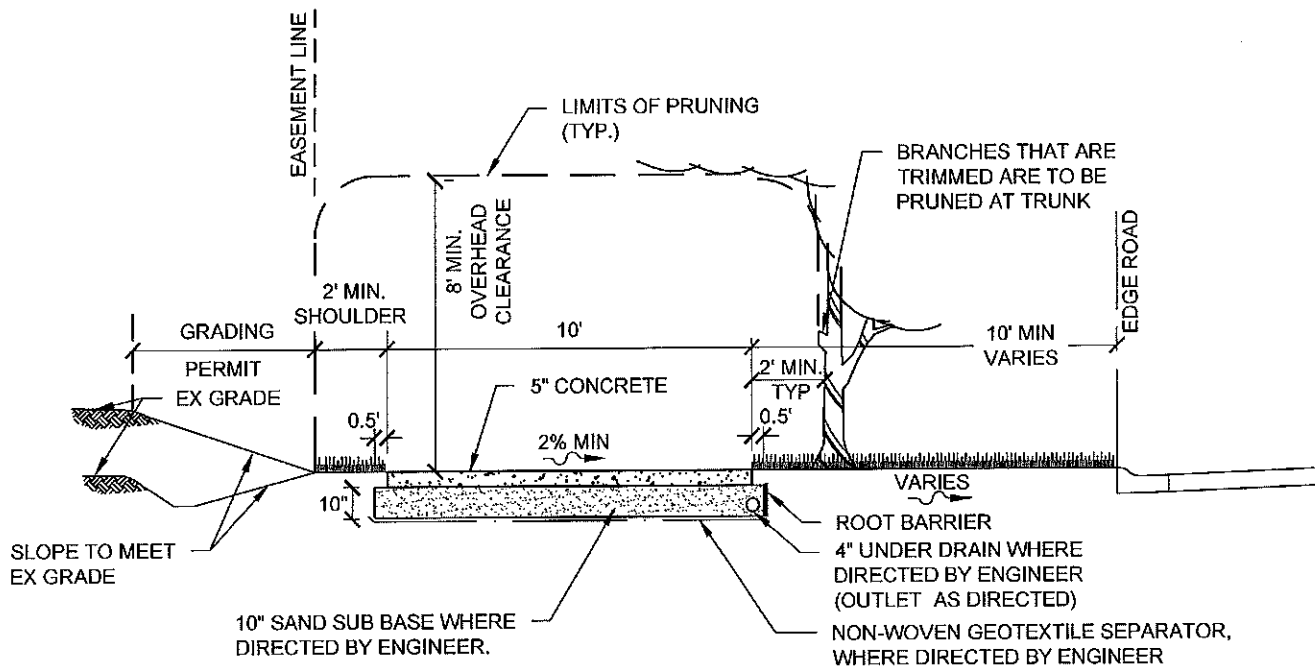
R-28-J

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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

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 DPW prior to construction.
- B. Report witness measurements on valves, fittings 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 as-built plans: Provide the Township 2 printed sets and 1 electronic file and the Township Engineer (1) one electronic file in PDF format record drawings (as-builts) with as-constructed dimensions and witnesses.

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.

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. 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.

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.
- B. Service Tubing and Fittings:
 - 1. Copper: Match TOWNSHIP's standard. Provide electrical 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.

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.
- 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.

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 in accordance with the pipe restraint table in Paragraph 3.02 H.1. 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. 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.**
 - 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.
 - f. 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"	1 ½"	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.

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. Equipment and assistance: Provide.
- d. Required water: By TOWNSHIP where available from municipal system.
(1) Provide backflow prevention device on connection to existing water system.
- e. Opening of valve to existing water main: After passing pressure / leakage and chlorination tests.
- f. Meet requirements of AWWA C600 and these specifications.

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

3. Pressure/Leakage Test:

- a. Conditions: Air or air-water methods of applying pressure prohibited.
- b. Sequence: After flushing, prior to Chlorination.
- c. Procedure: Fill system slowly, expel air through corporation stop at high points and apply pressure.
- d. Pressure: Maintain 150 psi.
- e. Duration: Two (2) hours.
- f. Make-up water: From measurable source.
- g. 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.

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 110 psi for 5 minutes on tapping valve.
 - b. 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 DPW staff or by the Township Engineer/Inspector.
- Discharge hoses shall not be used.

3.05 DISINFECTION:

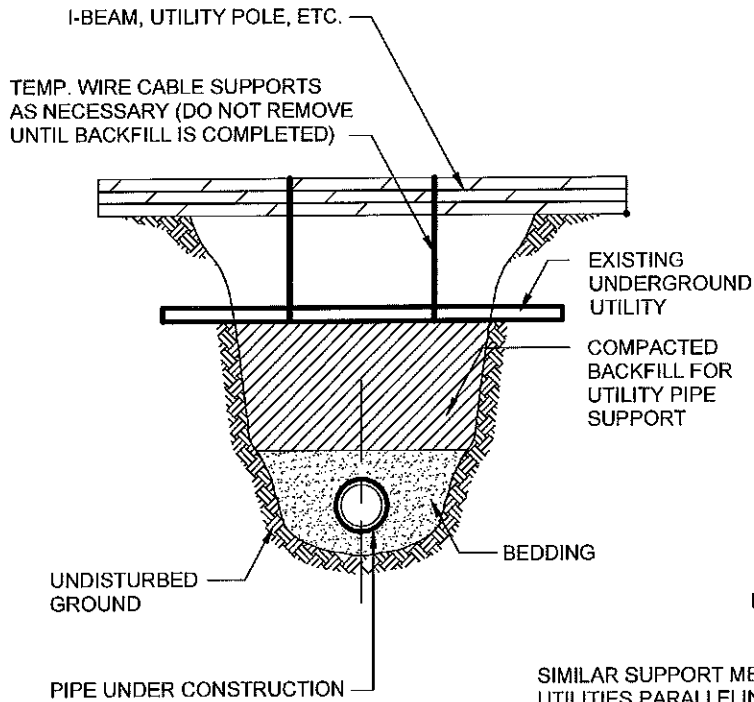
- A. Chlorination:
1. Meet the requirements of ANSI/AWWA C651-92 (AWWA Standard for Disinfecting Water mains), continuous-feed method.
 2. Observation: By TOWNSHIP or TOWNSHIP's ENGINEER.
 3. Required water: By TOWNSHIP where available from municipal system.
 4. Equipment and Assistance: Provide.
 5. 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 SCHEDULES:

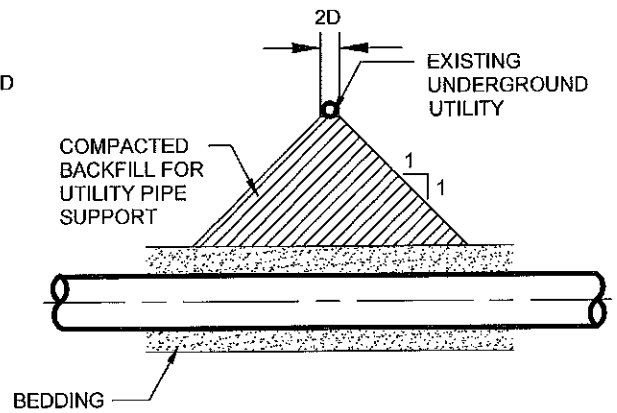
- A. Standard Details:
 1. Special supports for underground utilities / pipe saddles
 2. Methods of bedding pipe
 3. Water main offset / relocation detail
 4. Joint restraint requirements
 5. Hydrant assembly
 6. Hydrant berm
 7. Fire hydrant detail
 8. Copper service lead connection / sample point.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

END OF SECTION



SECTION

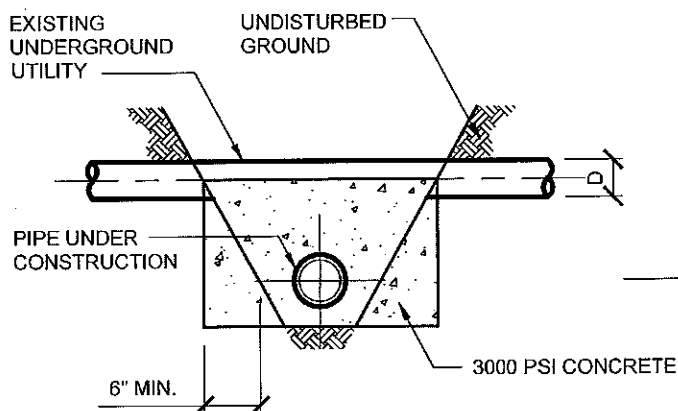
NOTE: MAINTAIN EXISTING COATING ON UTILITY



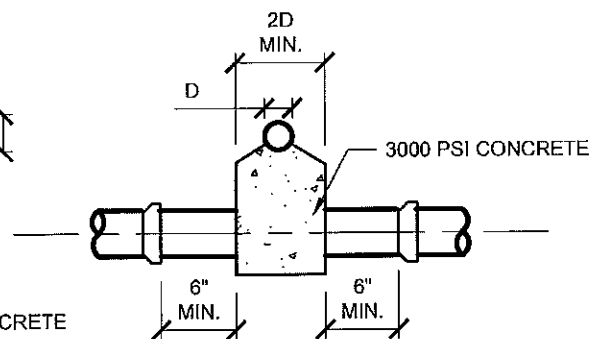
ELEVATION

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

SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES



SECTION

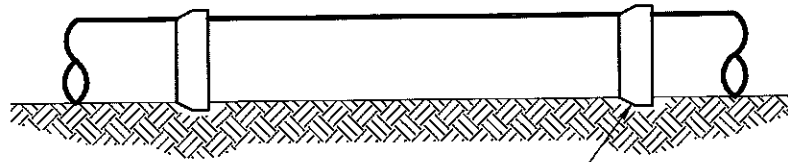


ELEVATION

NOTE:

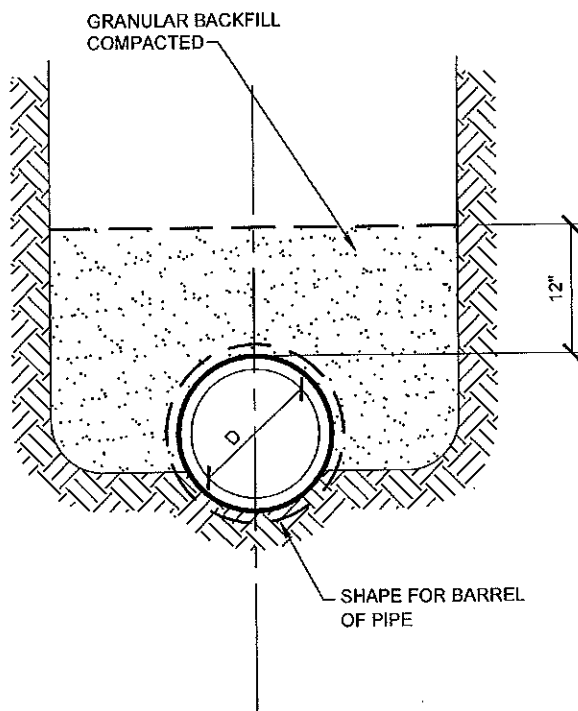
1. PIPE SADDLE IS NOT REQUIRED FOR PLASTIC, STEEL, LEAD OR COPPER PIPE 2" OR SMALLER.

PIPE SADDLES

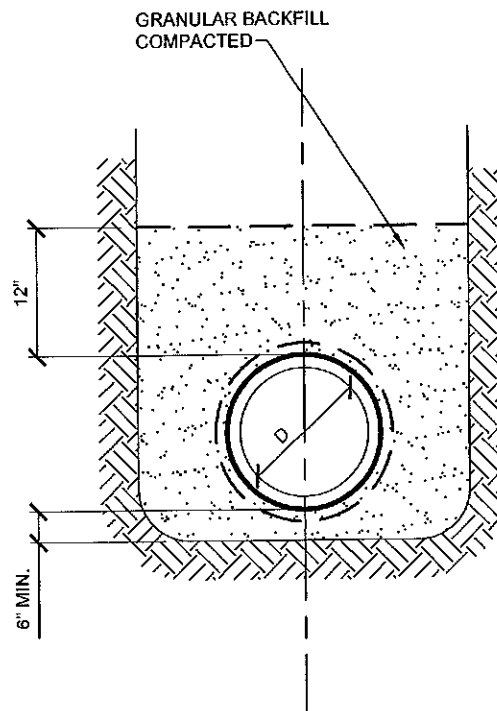


BELL HOLE EXCAVATIONS
REQUIRED FOR METHODS I & II

EXCAVATION FOR BELLS



METHOD I

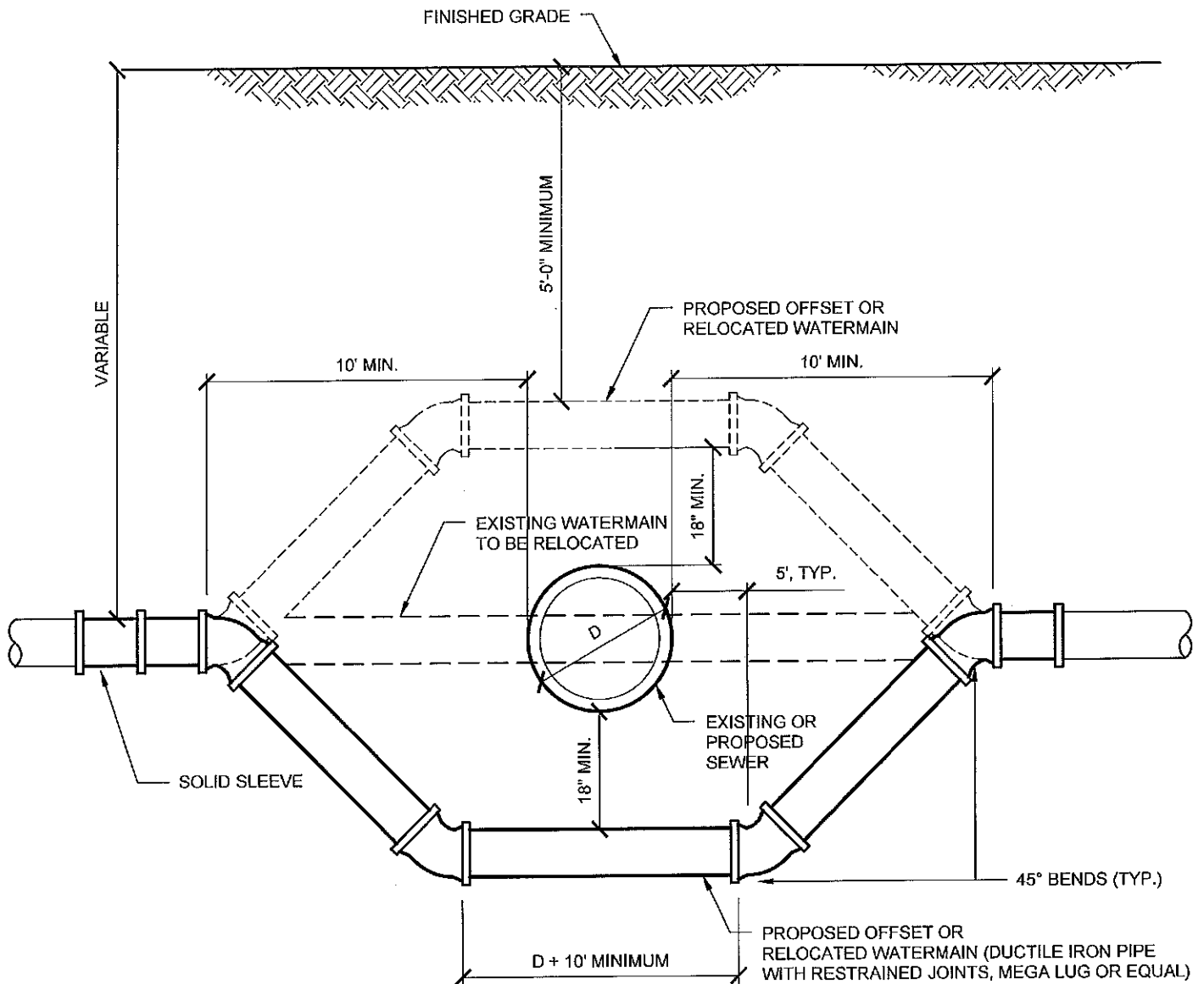


METHOD II

NOTES:

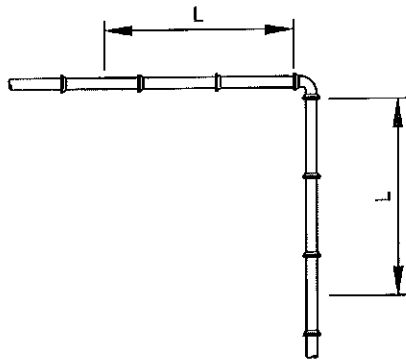
1. METHOD I: IN AREAS OF UNCONSOLIDATED SOILS
(SAND, GRAVEL, ETC.)
2. METHOD II: IN AREAS OF CONSOLIDATED SOILS
(CLAY, HARDPAN, ROCK, ETC.)

METHODS OF BEDDING PIPE

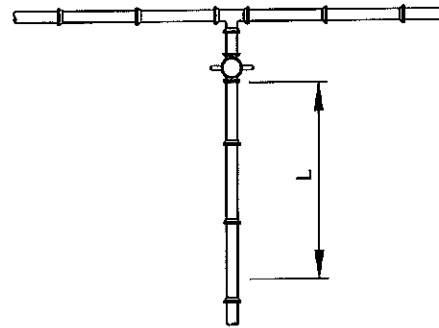


NOTE: WHEN THE MINIMUM CLEARANCE AND COVER CAN BE OBTAINED, THE WATERMAIN IS TO BE RELOCATED ABOVE THE SEWER. OTHERWISE, ANY SANITARY SEWER JOINTS WITHIN 10 FEET OF WATERMAIN SHALL BE ENCASED IN CONCRETE (REF. SECTION 02220, PARAGRAPH 2.01.A.3).

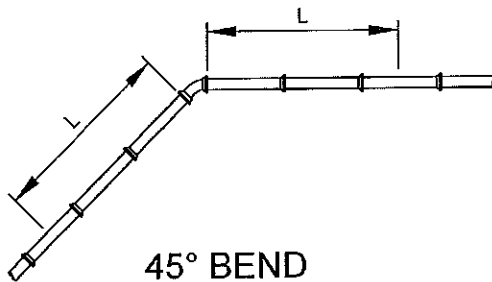
WATERMAIN OFFSET / RELOCATION DETAIL



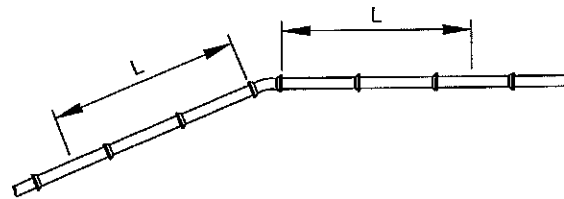
90° BEND



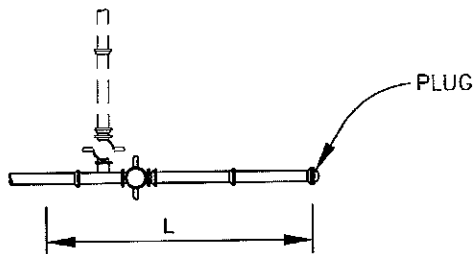
TEE



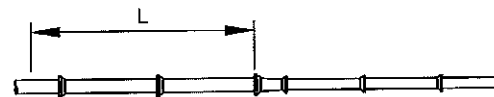
45° BEND



22 1/2° BEND OR LESS



DEAD END



REDUCERS

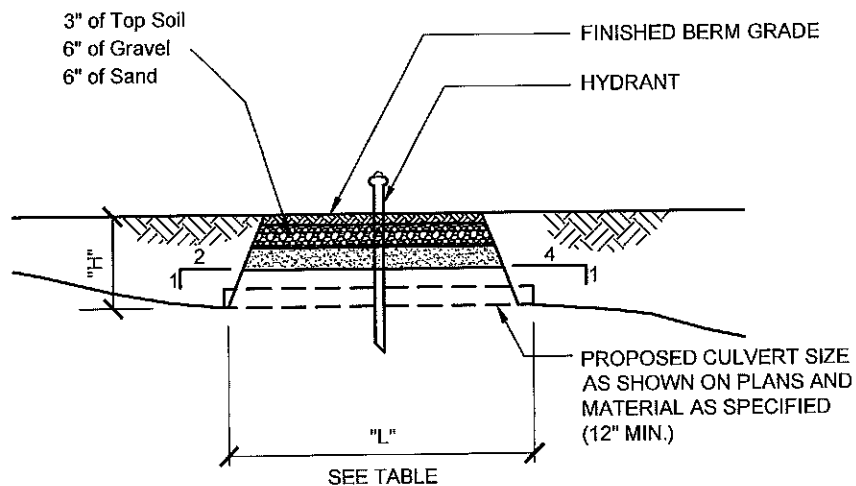
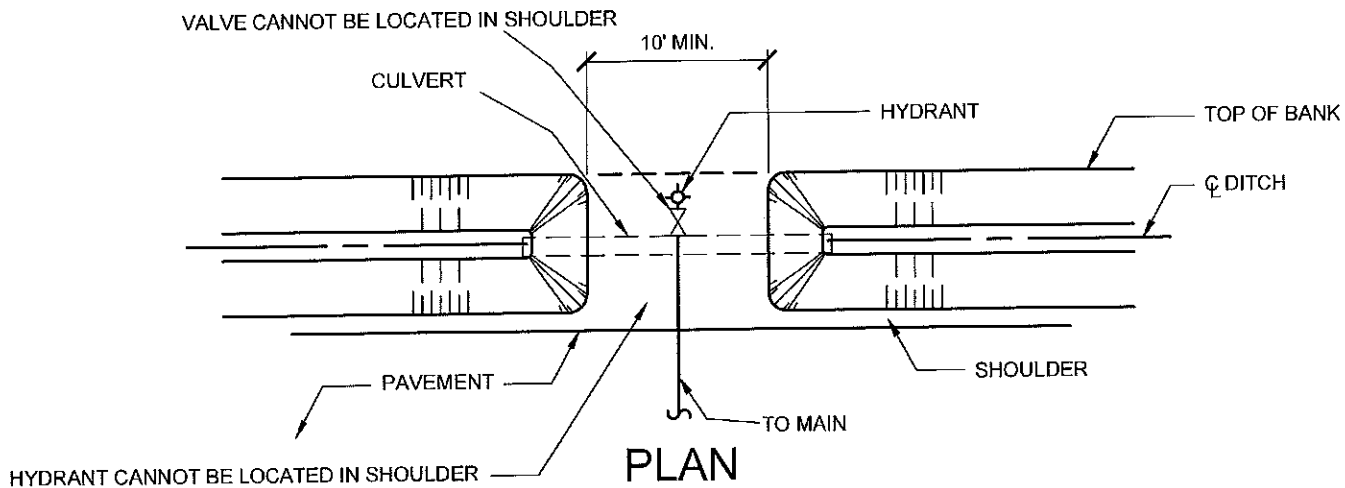
"L" = MINIMUM LENGTH OF MECHANICAL JOINT
RESTRAINT SHOWN IN TABLE

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

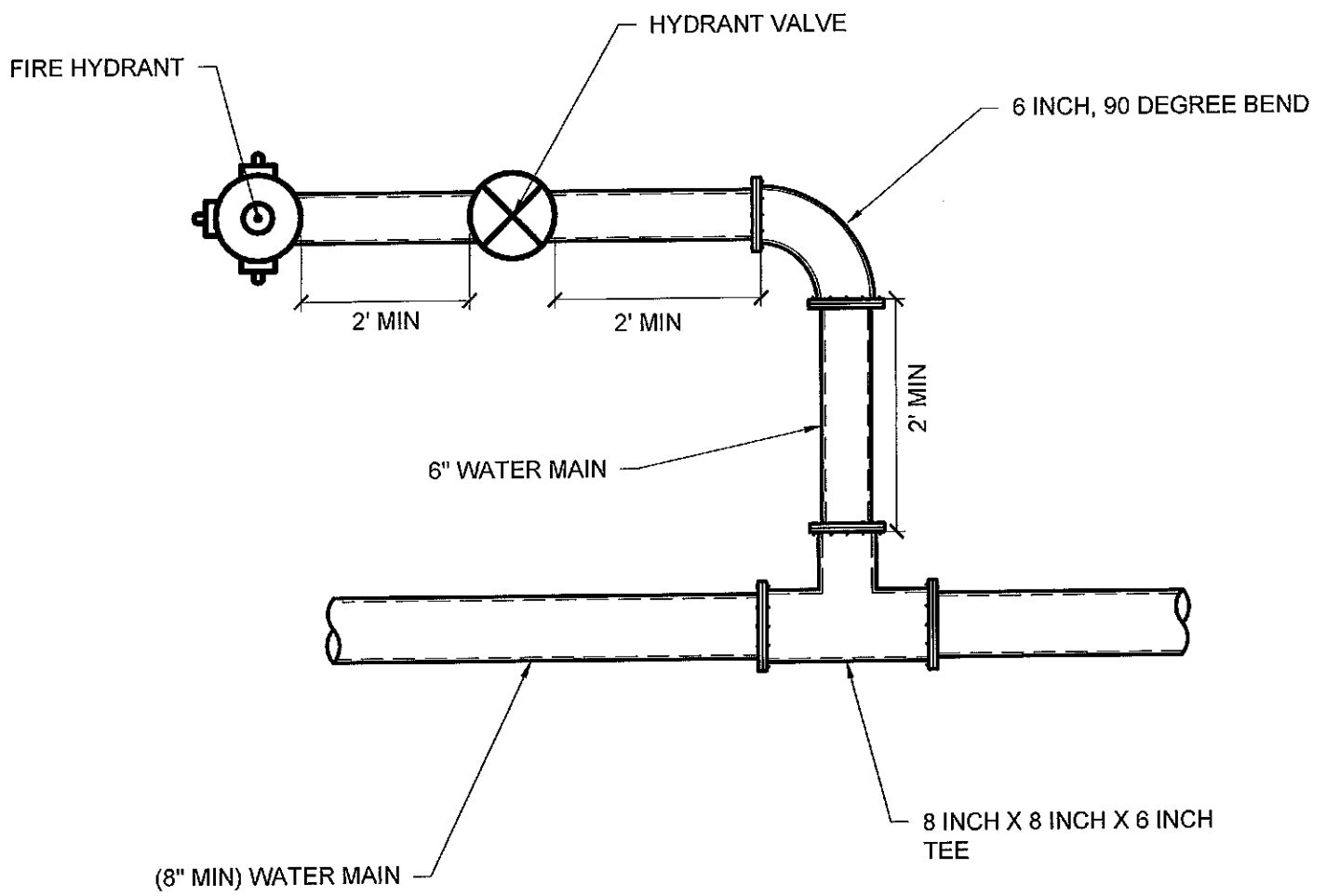




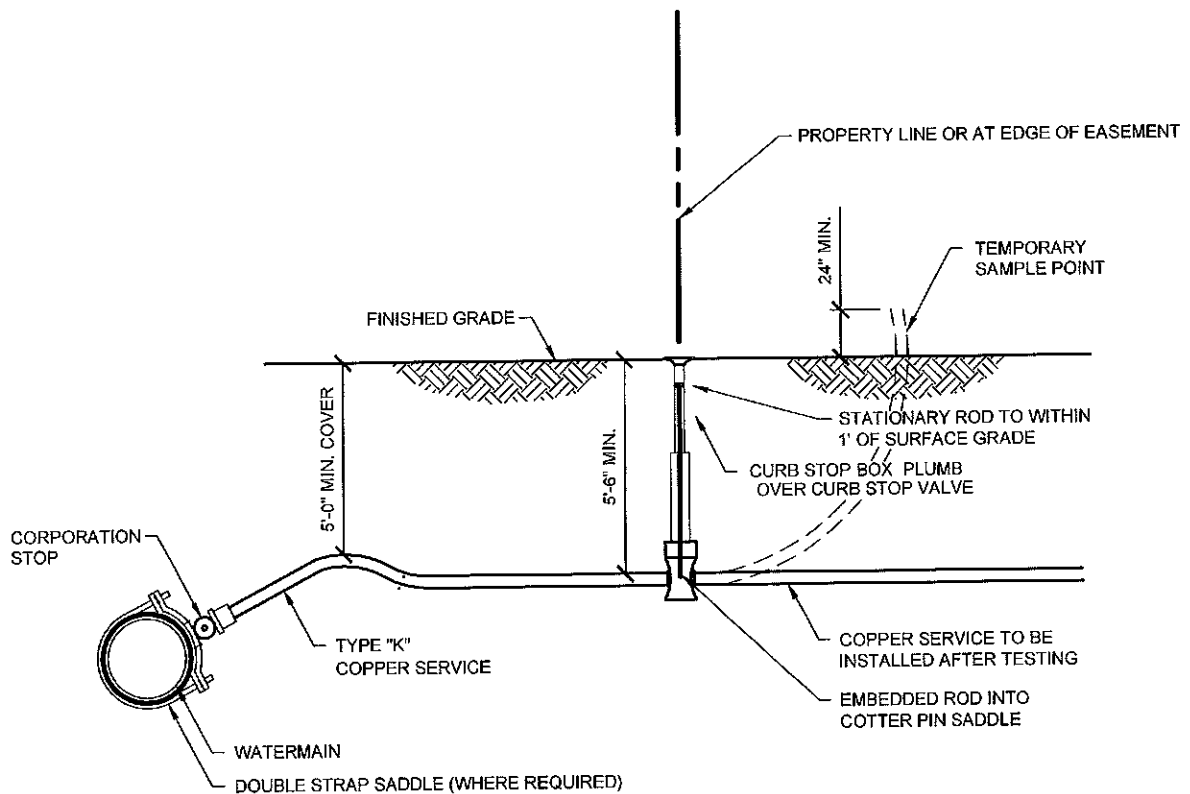
ELEVATION

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



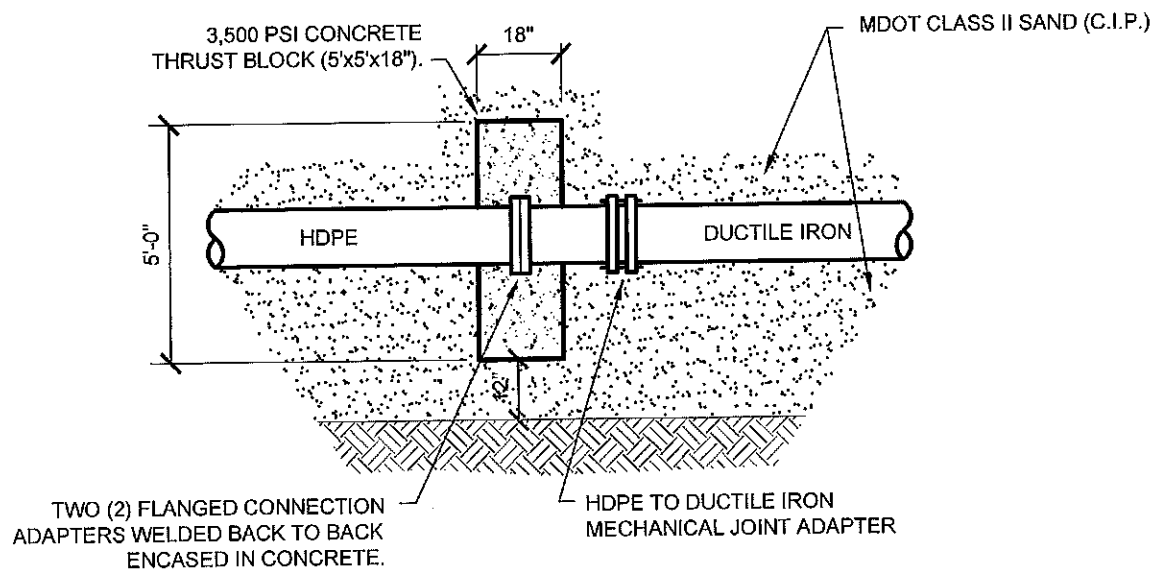
FIRE HYDRANT DETAIL



NOTES:

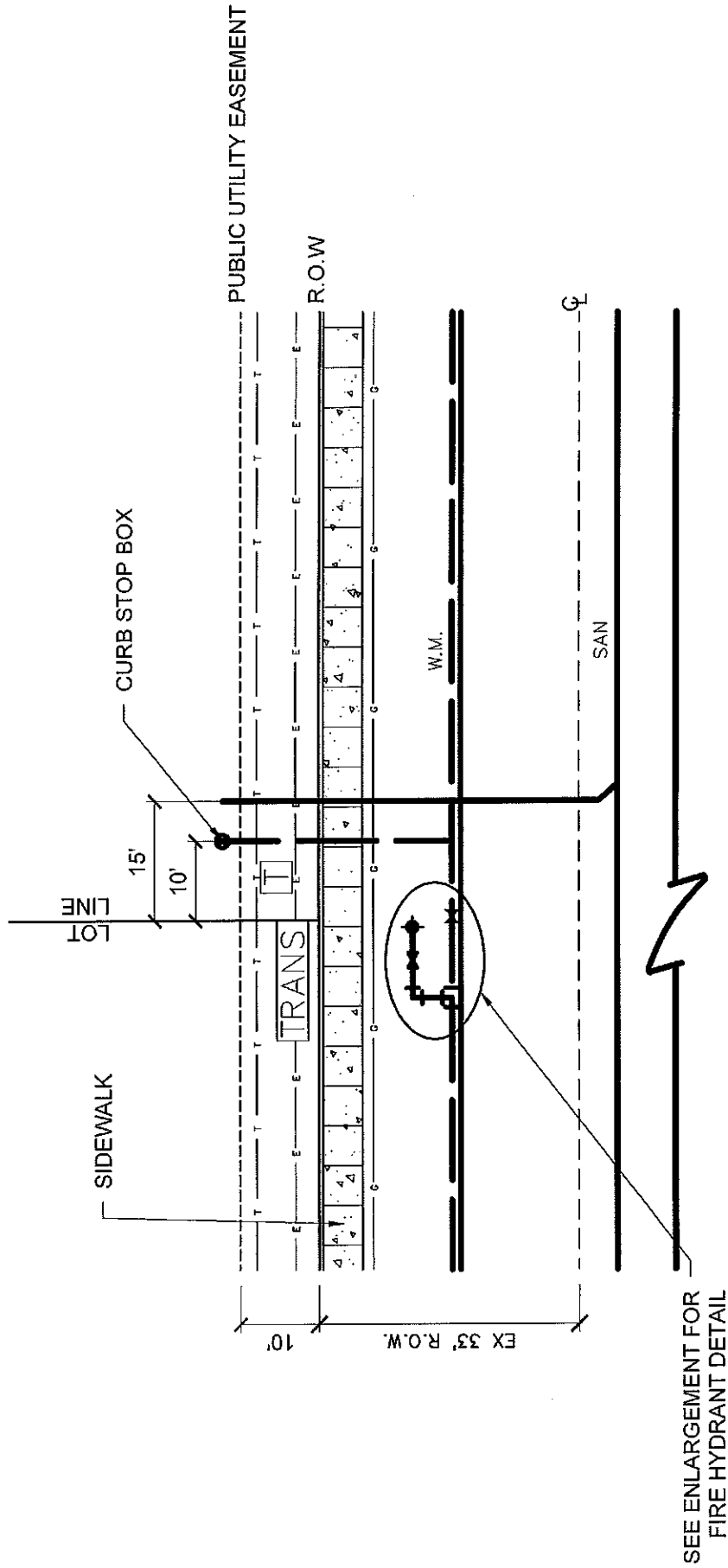
1. SAMPLE POINT TO BE USED FOR FUTURE SERVICE LEAD.
2. NO TAP SHALL BE MADE CLOSER THAN 18" TO ANY COUPLING OR JOINT IN THE PIPE.

COPPER SERVICE LEAD CONNECTION/SAMPLE POINT



HDPE TO DUCTILE IRON MECHANICAL JOINT ADAPTER DETAIL

NOT TO SCALE

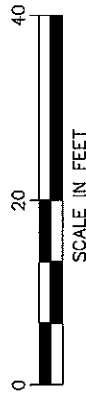


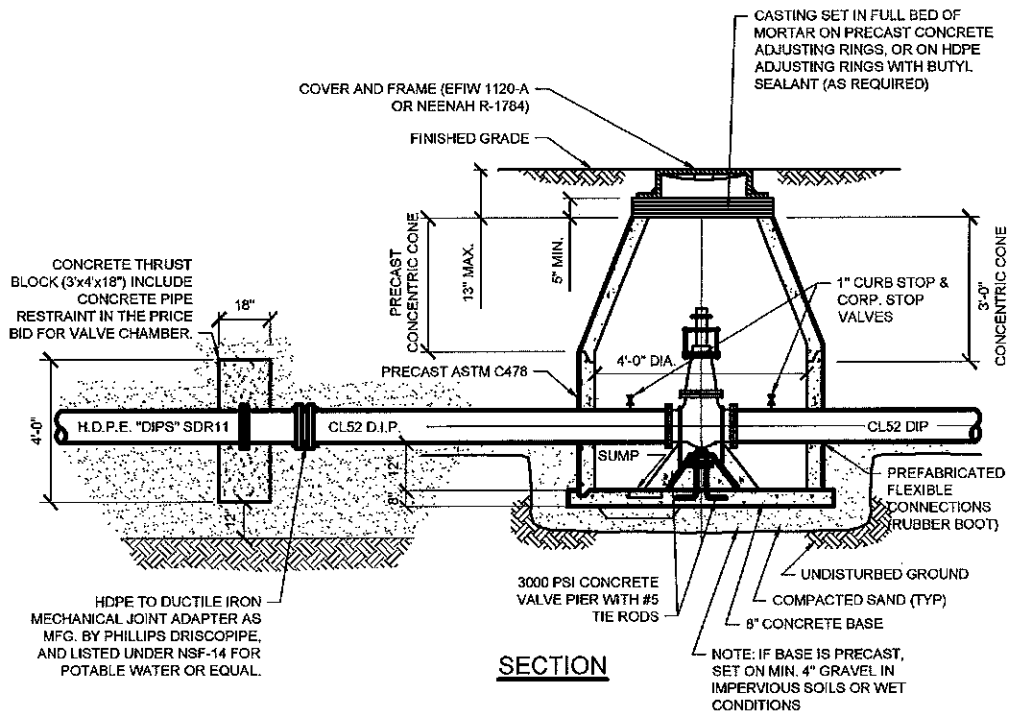
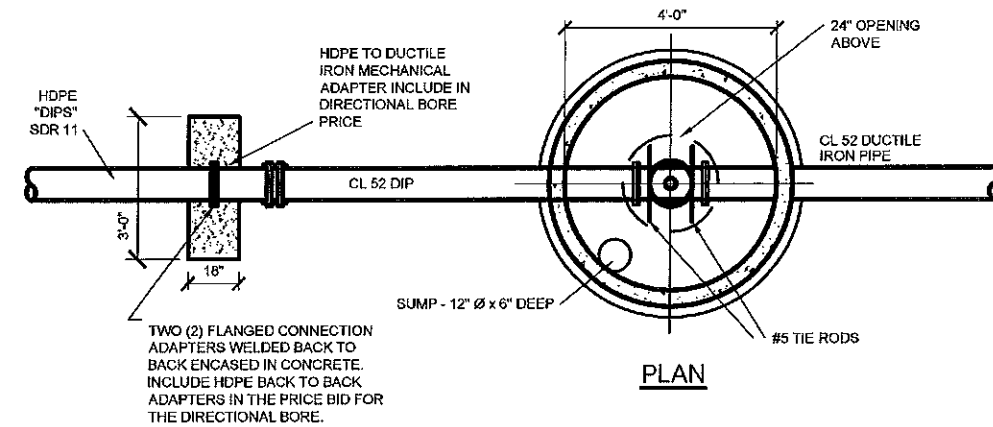
UNDERGROUND UTILITIES

DRAWING TO SCALE

LEGEND

- E — Electrical
- T — Telephone
- G — Gas
- ☐ Telephone Pedestal
- ☐ TRANS Transformer





HDPE TO DIP CONNECTION

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)	
	3' - 19'	Over 19'
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 ½ inch at inside face and wipe joints. Plaster coat complete interior of structure with ½ 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: ½ 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, ½ 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.

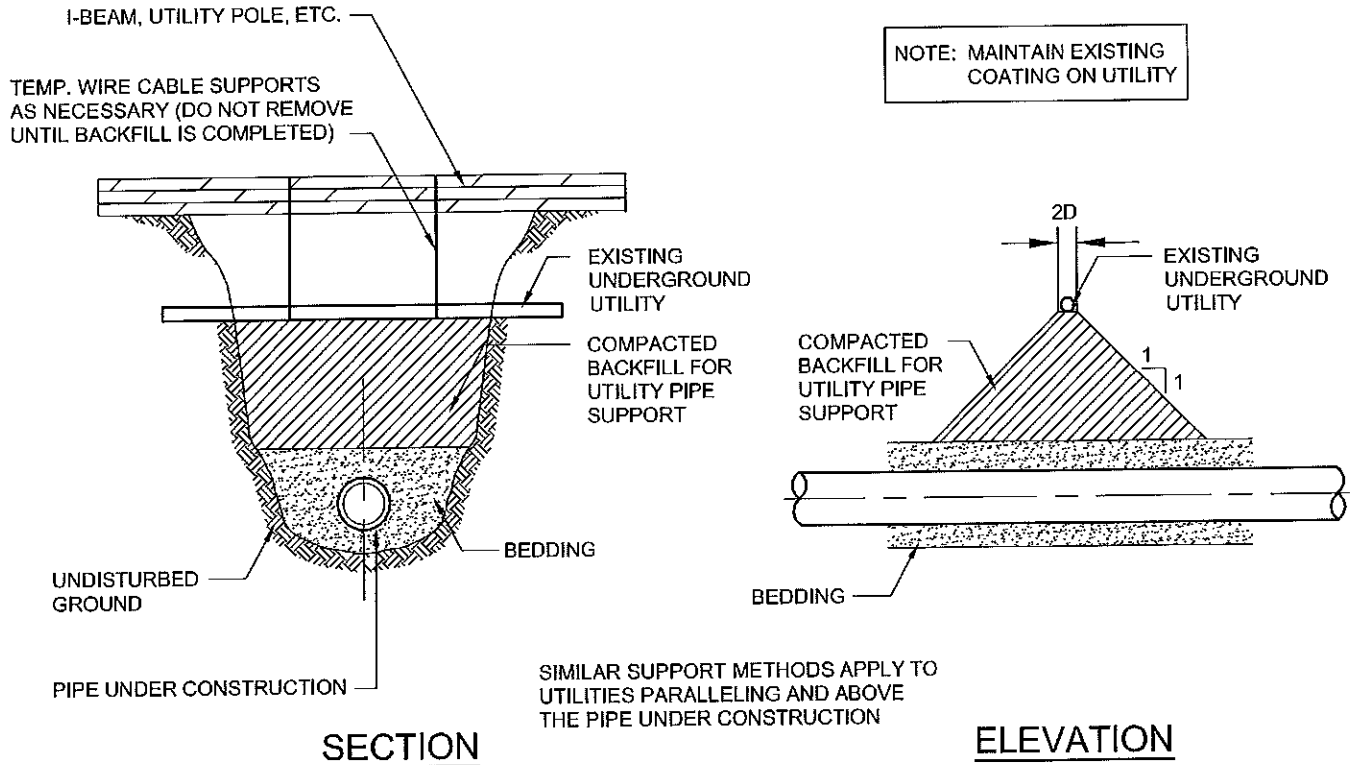
3.04 ADJUST AND CLEAN:

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

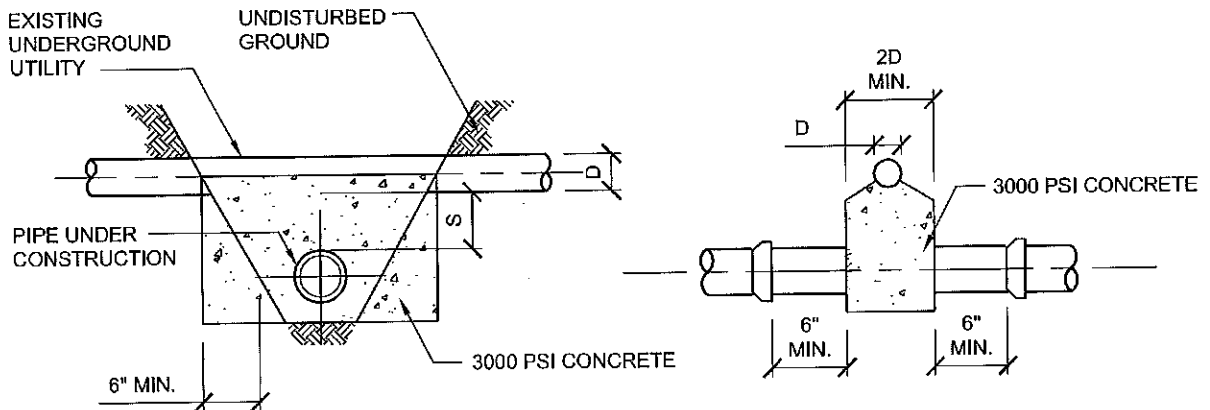
3.05 SCHEDULES:

- 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



SPECIAL SUPPORTS FOR UNDERGROUND UTILITIES



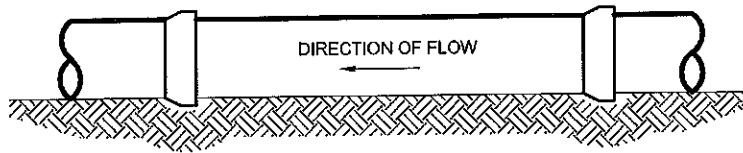
NOTES:

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.

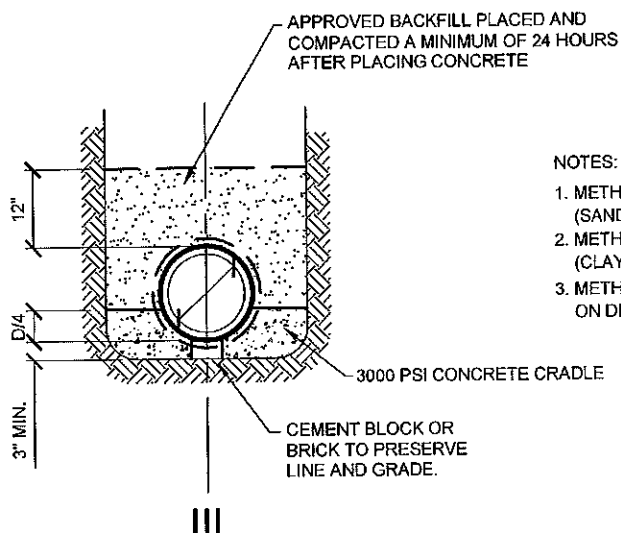
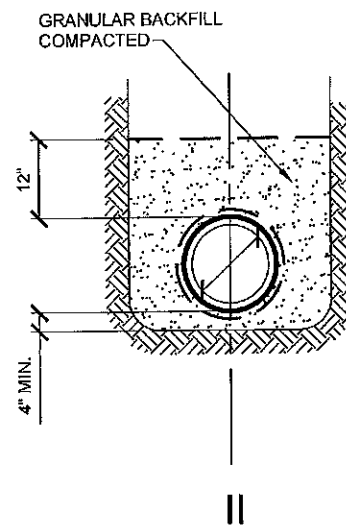
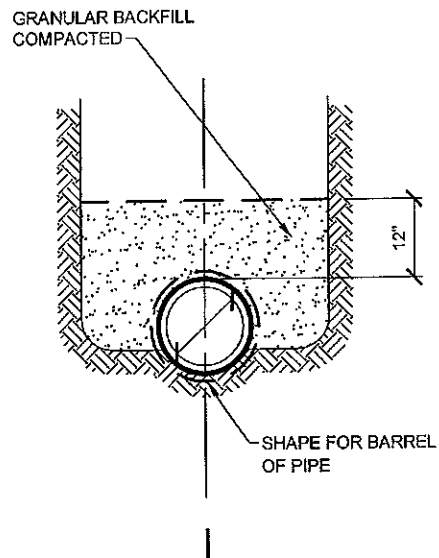
SECTION

ELEVATION

PIPE SADDLES



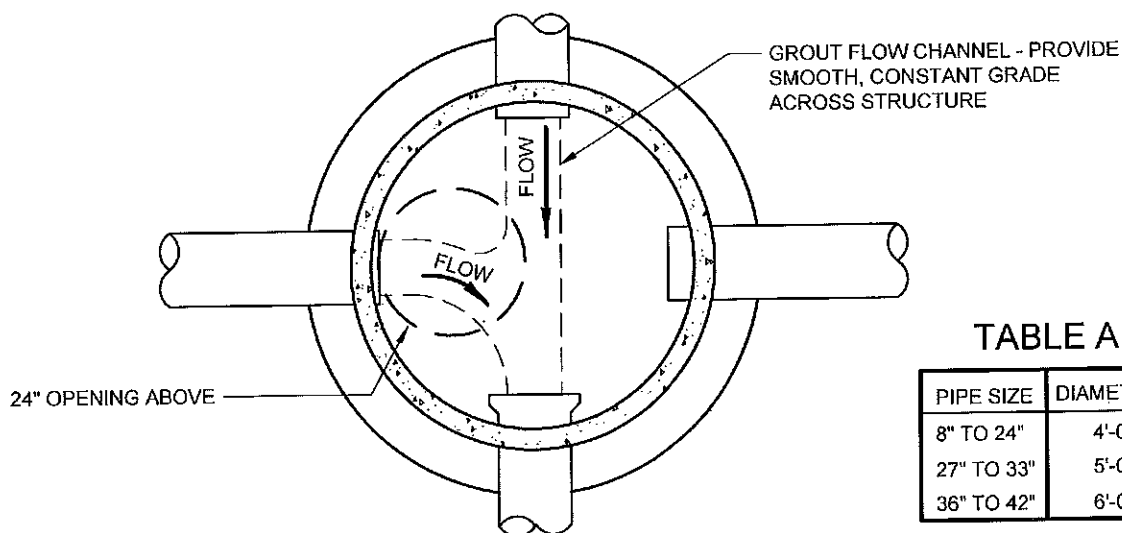
EXCAVATION FOR BELLS



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

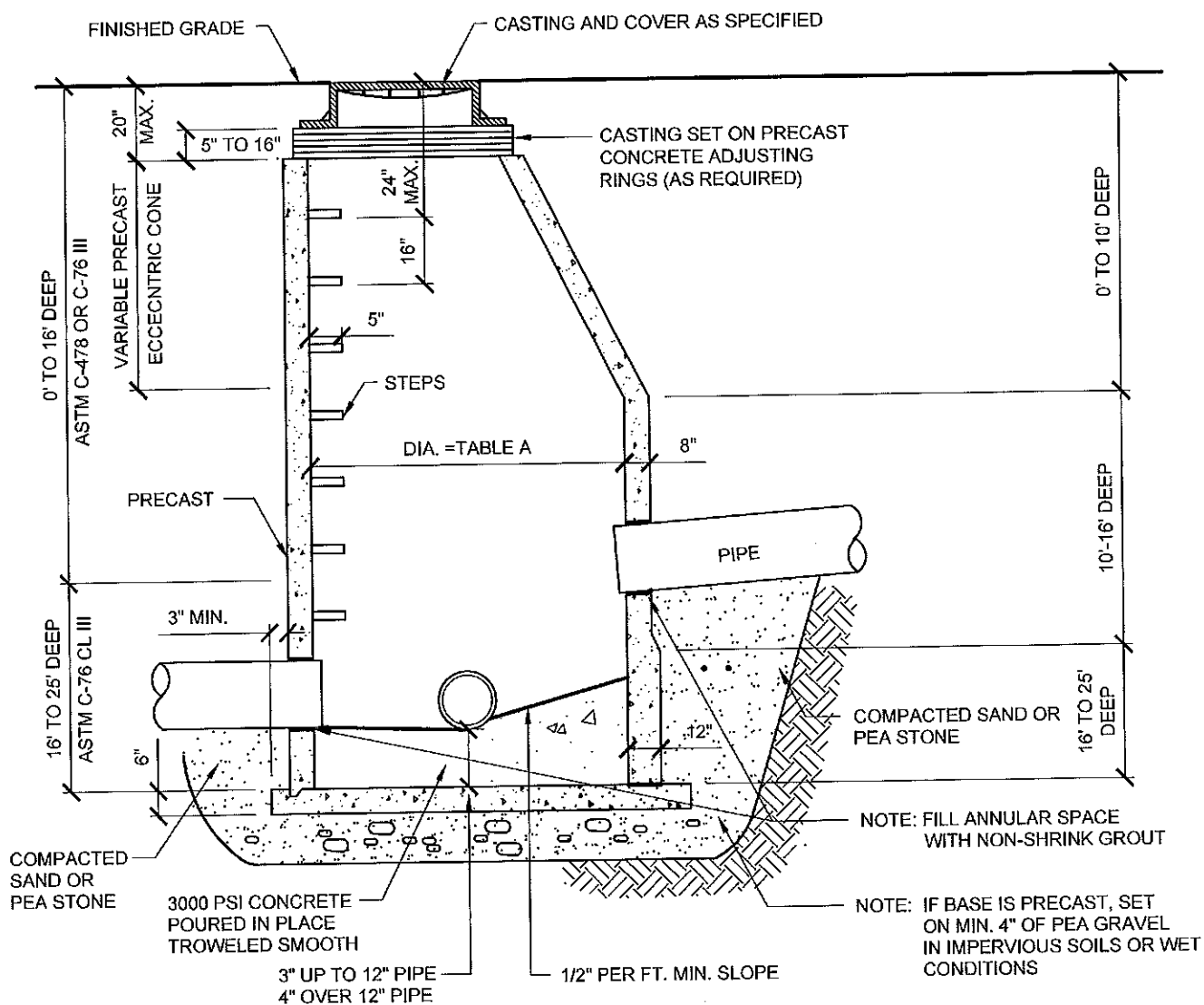
METHODS OF BEDDING PIPE



PLAN

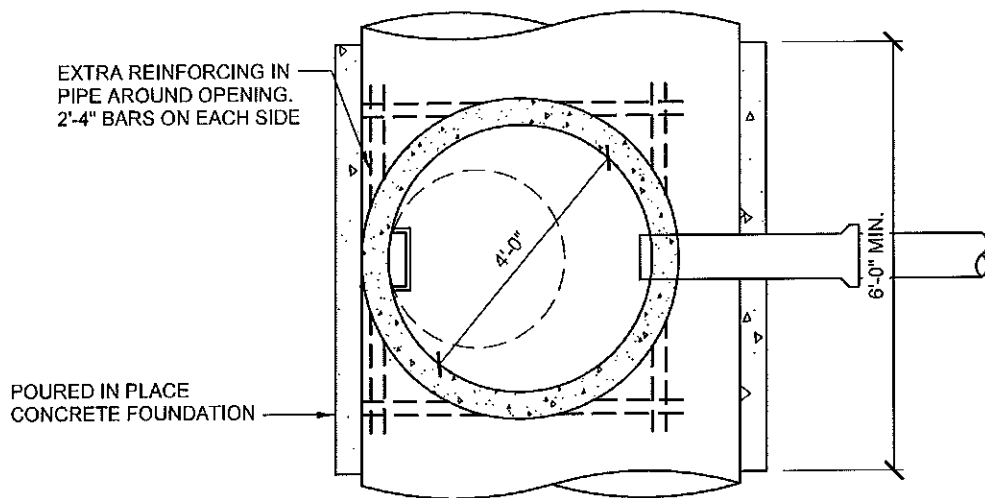
TABLE A

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

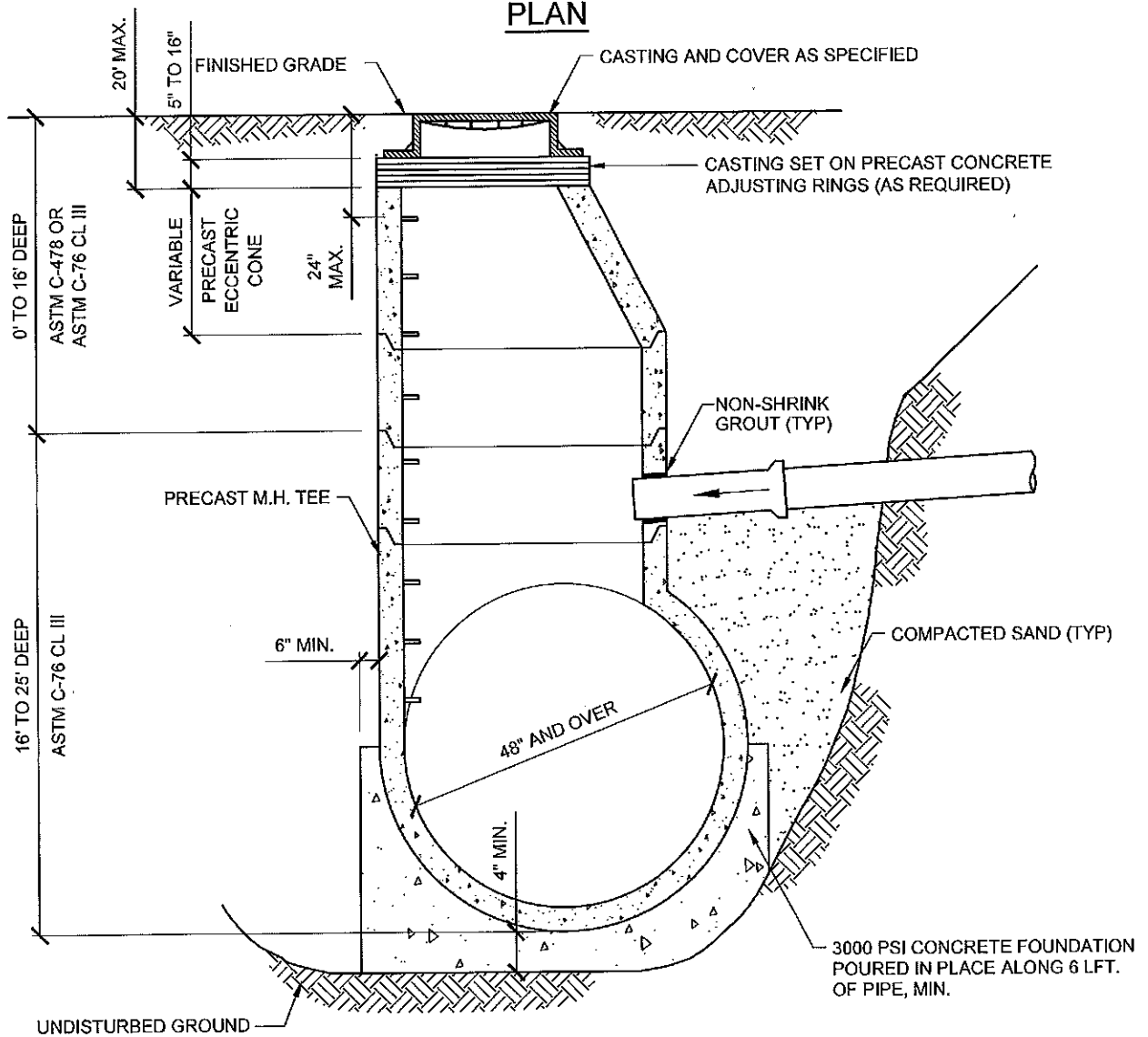


SECTION

STANDARD STORM MANHOLE

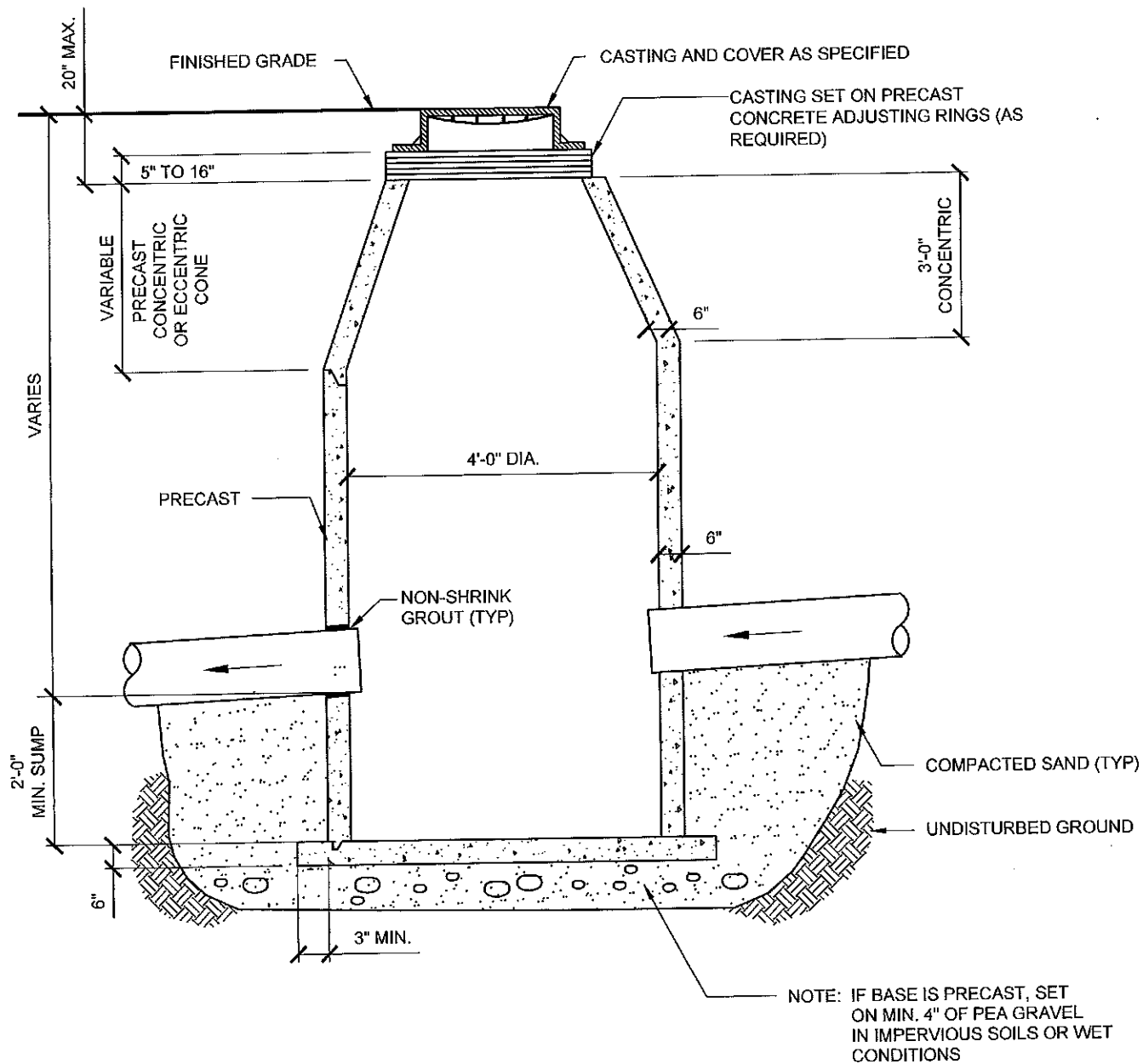


PLAN

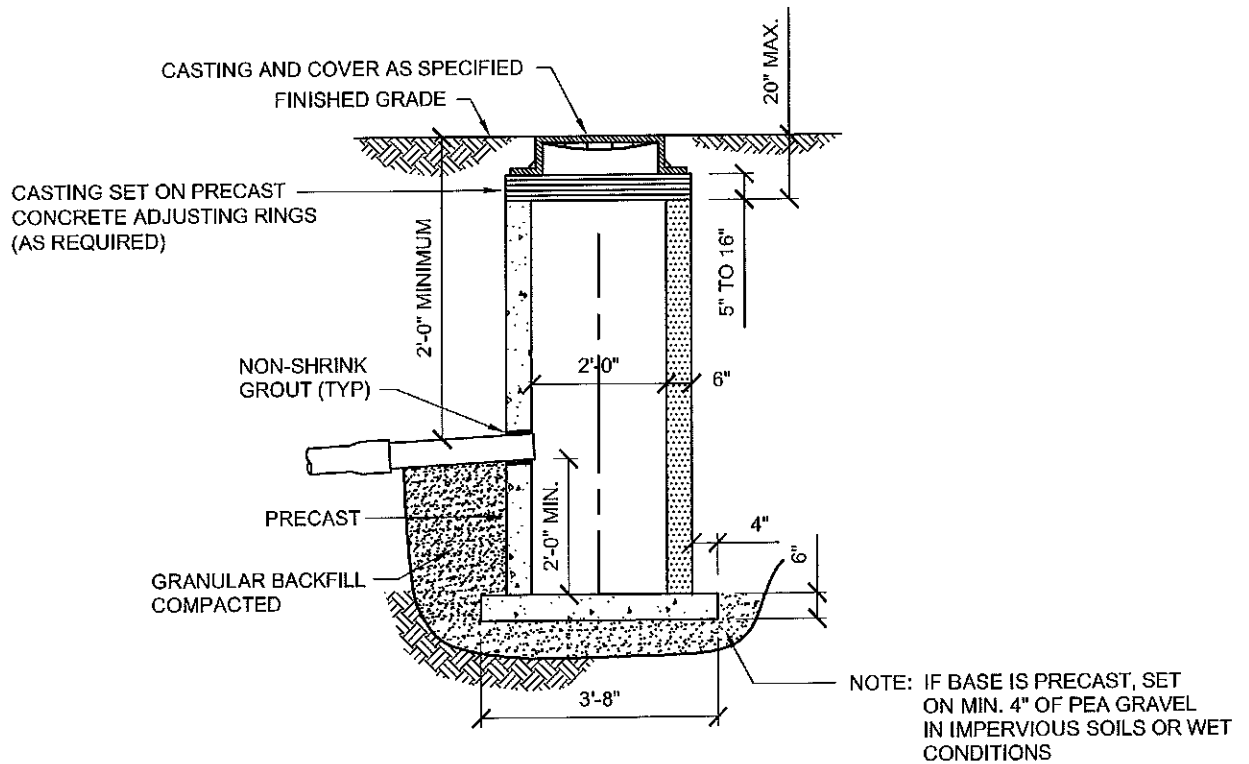


SECTION

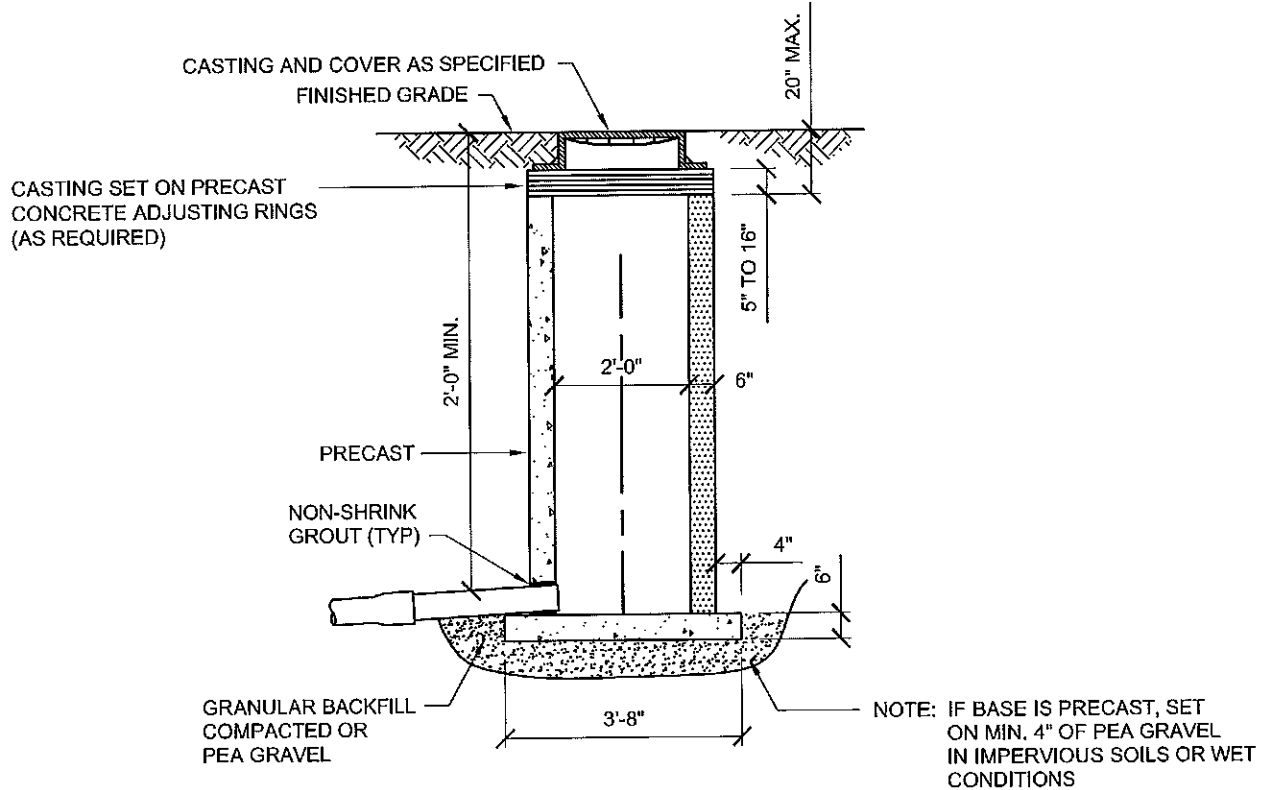
STANDARD STORM TEE MANHOLE



STANDARD CATCH BASIN

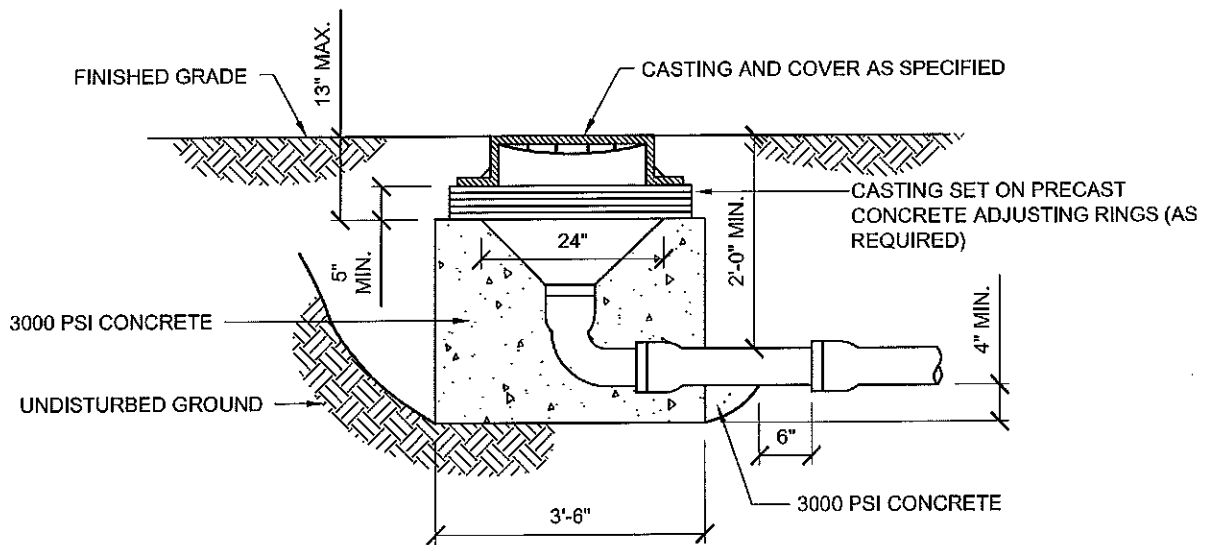


2' DIA. INLET WITH SUMP



2' DIA. INLET

STANDARD INLETS



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 DPW 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 as-built plans to the Township upon completion of project. 2 printed sets to the Township and electronic file in PDF format to the Township Engineer will be required.

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.

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 D2146, 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 "OTTAWA COUNTY SEWER & East Jordan 1045 Z1 frame.
- J. Bituminous Waterproofing: ASTM D449.
- K. Cement Waterproofing: Masonry filler.