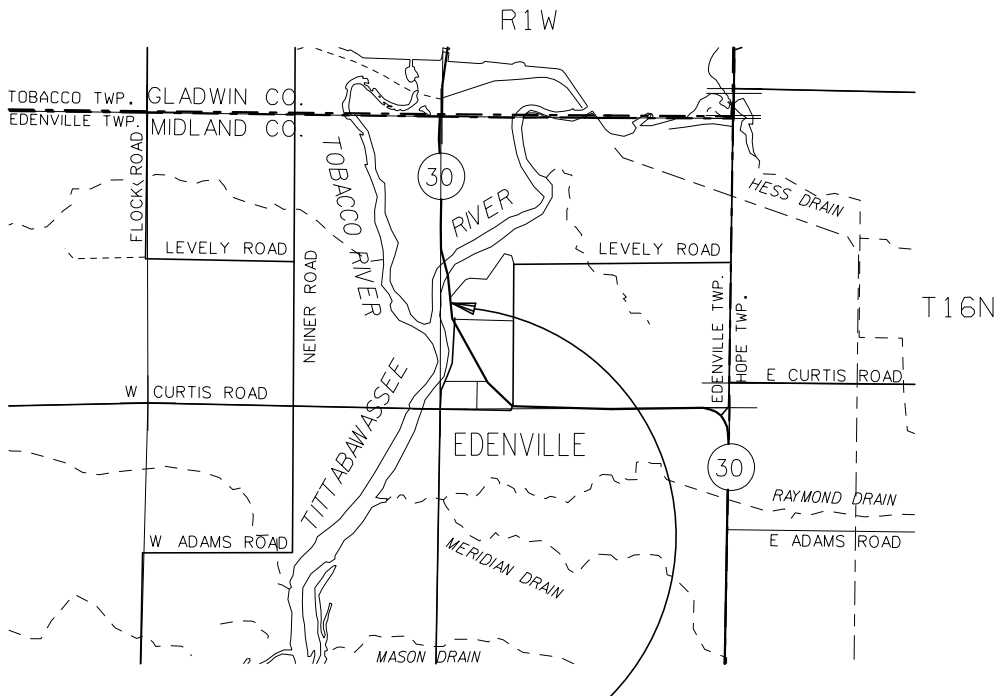


# MICHIGAN DEPARTMENT OF TRANSPORTATION

## ROUTE: M-30 EDENVILLE TOWNSHIP MIDLAND COUNTY

SECTION	CONTROL SEC	JOB NO.	FEDERAL	
			PROJECT	ITEM
	56032	16-5603		

ROAD	YEAR	TRAFFIC DATA			SPEED DATA		LIMITS OF TRAFFIC DATA
		ADT	DHV	COMM	DESIGN	POSTED	
M-30	2016	8400	969	2%	50	45	FIKE RD TO CEDAR ST



PROJECT LOCATION:  
M-30 APPROXIMATE STATION 548+00  
PR 3560069  
PR MP 9.28  
CS 56032  
CS MP 9.14



COUNTY KEY

THE IMPROVEMENTS COVERED BY THESE PLANS SHALL BE DONE IN ACCORDANCE WITH THE MICHIGAN DEPARTMENT OF TRANSPORTATION 2012 STANDARD SPECIFICATIONS FOR CONSTRUCTION. PHYSICAL ROAD NUMBER (PR#) & MILEPOST (MP) DATA ARE FROM MICHIGAN GEOGRAPHIC FRAMEWORK VERSION # 15.

MILES: 0.01

CONTRACT FOR:  
REMOVAL OF SEPARATED STORM DRAIN CULVERT, CONSTRUCTION OF CULVERT EXTENSION AND HEADWALL, DRAINAGE STRUCTURE ADJUSTMENT, AND PLACEMENT OF RIPRAP AND SLOPE RESTORATION.



KIRK T. STEUDLE, P.E. - DIRECTOR

DATE: 5/16/16  
DESIGN UNIT: MYERS  
TSC: MT PLEASANT

DRAWING	SHEET
	1

# LOG OF PROJECT

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J.N. 16-5603

## **PROGRESS SCHEDULE**

Work may begin immediately after receiving approval from MDOT. Work must be completed by September 16, 2016. Work shall be completed within 18 consecutive calendar days. Notice must be provided to Jason Potts at 989-737-0211 three (3) calendar days prior to beginning any work.

## **JOB LOCATION**

The project begins on the west side of M-30 approximately 150 feet north of Moore Rd (across M-30 from the Marathon gas station in Edenville) and continues northerly approximately 30 feet, and westerly approximately 150 feet to the Tittabawassee River, Edenville Township, Midland County.

Project Location, approximate M-30 Station 548+00

C.S. = 56032/ C.S. Mile Point 9.14

P.R. 3560069 / P.R. Mile Point 9.28

## **DESCRIPTION OF WORK**

The work shall consist of repair of the eroded slope and culvert that empties into the Tittabawassee River. Items of work include removal of separated CMP culvert ending and removal of last section of RCP culvert (4 feet), construction of new 24 inch diameter RCP culvert extension, construction of a new headwall with baffles (constructed per Standard Plan R-85 series), placement of riprap with a check dam at the entrance to the river, and placement of embankment to restore the eroded slope. Work also includes a drainage structure cover adjustment to the storm drain inlet on the west side of M-30 to raise structure cover approximately 8 inches to be level with the ditch.

Turbidity curtain, riprap, check dam, silt fence, inlet protection, and slope restoration shall be used for soil erosion and sedimentation control.

Contractor will be responsible for maintaining the culvert flow during construction through use of by-pass pumping. This outlet drains a substantial portion of Edenville and it is expected that there will be a steady flow of water through the culvert at all times.

The culvert is located on a 30' by 150' easement. Contractor must take care to disturb as little of the property as possible. Do not disturb any of the utilities on the easement. Tree and stump removal on the easement may be required, including trees with trunks up to 3' in diameter. Prior approval for tree removals must be granted from MDOT. The cost of any necessary tree and stump removals shall be included in the lump sum price of the bid.

Contractor may elect to contact the property owners on either side of the easement to arrange for use of their respective properties during construction to access the site and/or stage equipment. Restoration of the private property shall be worked out directly with each property owner and the cost of restoration shall be included in the lump sum bid. The property owner on the south side (vacant lot) is Mr. Dan Mchenry, 989-430-4670. The property owner on the north side is Mr. Danny Dionne, 989-330-3532 and Mrs. Dawn Dionne 989-965-0940.

A DEQ permit was obtained to construct this project and is included in this proposal. The contractor must have a copy of the permit on the construction site at all times.

# LOG OF PROJECT

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J.N. 16-5603

## **ESTIMATED QUANTITIES**

The quantities included in the summations below are approximate and for reference only. Contractor will be responsible for verifying quantities before bidding by site inspection and plan review. If any major discrepancies are noted, contractor must contact Krista Phillips at (989) 245-2173.

This project is a Maintenance funded project, which means that there will be absolutely no overpayment or extras. All material, labor and mobilization shall be included in the bid.

MDOT will have the low bid reviewed and approved for funding. MDOT reserves the right to reject any bid that appears to be unqualified. Before award, MDOT may request a site and plan review meeting with the low bid contractor.

## **Items of Work (for information only)**

Culv, Rem, 24 inch to 48 inch (10 feet of CMP & last 4 feet section of RCP)	1 Ea
Culv, Cl A, Conc, 24 inch (include cost to maintain flow w/bypass pumping)	24 Ft
Conc, Grade S2	2 Cyd
Reinforcement Steel, Culv and Headwall	65 Lb
Riprap, Plain (no crushed concrete)	120 Ton
Embankment, CIP	45 Cyd
Slope Restoration, Type D	2000 Syd
Dr Structure Cover, Adj, Case 2	1 Ea
Dr Structure, Adj, Add Depth	1 Ft
Tree, Rem, 37 inch or larger	3 Ea
Tree, Rem, 19 inch to 36 inch	2 Ea
Tree, Rem, 6 inch to 18 inch	5 Ea
Erosion Control, Silt Fence	60 Ft
Erosion Control, Turbidity Curtain, Shallow	30 Ft
Erosion Control, Check Dam, Stone	20 Ft
Erosion Control, Inlet Protection, Fabric Drop	1 Ea

## **Items for Maintaining Construction Zone Traffic**

Minor Traffic Devices	1 LS
Plastic Drum, High Intensity, Furn	10 Ea
Plastic Drum, High Intensity, Oper	10 Ea
Sign, Type B, Temp, Prismatic, Furn	120 Sft
Sign, Type B, Temp, Prismatic, Oper	120 Sft
Lighted Arrow, Type C, Furn	1 Ea
Lighted Arrow, Type C, Oper	1 Ea

# **LOG OF PROJECT**

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## **MAINTAINING TRAFFIC**

### **Traffic Restrictions**

Maintaining traffic will be accomplished with shoulder closures utilizing Maintaining Traffic Typical M0020a and M0110a. If necessary, use a single lane closure with traffic regulators according to Maintaining Traffic Typical M0140a. Additionally, traffic shall be maintained according to Sections 104.07, 104.11, and 812 of the 2012 Standard Specifications for Construction, including any Supplemental Specifications, and as specified herein.

The Contractor shall not create any unsafe conditions within the Construction Influence Area (CIA) that form a hazard for motorists. The CIA shall extend as far as the required advanced construction signing, detour signing, or any other signs pertaining to this location. Extra caution should be used when delineating the work zone overnight to protect the roadway users.

Maintain a minimum of two lanes of traffic at all times on M-30, unless traffic regulator operations are in use.

No work shall be performed or lane closures allowed during the Memorial Day, Independence Day, or Labor Day holiday periods. Memorial and Labor Day holiday periods shall be defined as beginning on Thursday at noon until Tuesday at normal starting time. The Independence Day holiday period shall be defined as beginning on Thursday, June 30, 2016 at noon until Wednesday, July 6, 2016 at normal starting time.

The storage restrictions in section 812.03.G.5 of the 2012 Standard Specifications for Construction will be strictly adhered to. The Contractor shall not park any vehicle or store any material on public recreational property.

Daily maintenance of traffic control items will not be paid for separately, but will be included in the lump sum price for the project.

Any construction equipment parked at the site overnight shall be located at least 30' from the edge of the shoulder.

## **GENERAL PLAN NOTES**

### **SPECIFICATIONS FOR CONSTRUCTION**

The improvements covered by these plans shall be done in accordance with the MDOT 2012 Standard Specifications for Construction.

### **MISS DIG/UNDERGROUND UTILITY NOTIFICATION**

For the protection of underground utilities and in conformance with Public Act 174 of 2013, the Contractor shall contact MISS DIG System, Inc. by phone at 811 or 800-482-7171 or via the web at either [elocate.missdig.org](http://elocate.missdig.org) for single address or [rte.missdig.org](http://rte.missdig.org), a minimum of 3 business days prior to excavating, excluding weekends and holidays.

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## STATIONING

Stationing on this project was taken from Right-of-Way plans. The stationing is not necessarily accurate.

## EXISTING WATER MAINS AND SEWERS

The Contractor shall be responsible for any damage to properly identified existing water mains and/or existing sewers during the construction of this project.

## SOIL EROSION MEASURES

Appropriate soil erosion and sedimentation control measures shall be in place prior to earth-disturbing activities. Place turf establishment items as soon as possible on potential erodible slopes as directed by the Engineer. Critical ditch grades shall be protected with either sod or seed/mulch or mulch blanket as directed by the Engineer.

## SEED MIXTURE

The symbol for the permanent turf seed mixture on this project is symbol THV.

## EXISTING SIGN RELOCATION

Any permanent signs requiring relocation due to Contractor operations shall be salvaged and reset by the Contractor at locations designated by the Engineer. Signs and posts damaged during the removal and storage operations shall be replaced with new signs and posts. The cost of this work shall be borne by the Contractor.

## RECREATIONAL PROPERTIES

The Contractor shall not park any vehicles or store any equipment on public recreational property. Access to the recreational properties must also be maintained at all times. Noncompliance, even without the knowledge and approval of MDOT personnel, can result in penalties up to and including termination of the construction contractor and loss of federal funding for the project. Should there be any questions regarding this requirement, contact the MDOT Environmental Section at (517) 373-8350.

## NOTES APPLYING TO STANDARD PLANS

Where the following items are called for on the plans, they are to be constructed according to the Standard Plan or Special Detail given below opposite each item unless otherwise indicated.

Drainage Structures.....	*R-1-G
Cover G.....	R-12-E
Bedding and Filling Around Pipe Culverts.....	R-82-D
Outlet Headwalls.....	R-85-D
Soil Erosion & Sedimentation Control Measures.....	R-96-E
Seeding and Tree Planting .....	R-100-H
Ground Driven Sign Supports for Temporary Signs .....	*WZD-100-A
Temporary Traffic Control Devices.....	*WZD-125-E

*\*indicates Special Detail*

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## **PUBLIC UTILITIES**

### **Utility Owner**

### **Type of Utility**

CenturyLink  
100 Second Street, P.O. Box 389  
Pinconning, Michigan 48650-0389  
Ph: 989-879-8710(W)  
Attn: Glen Rogers

Telecom

Charter Communications  
7372 Davison Rd  
Davison, Michigan 48423  
Ph: 810-658-5140(W)  
Attn: David Kelly

Cable

Consumers Energy  
2400 Weiss Street  
Saginaw, Michigan 48602  
Ph: 989-791-5353(W)  
Attn: Greg Squanda

Electric

Consumers Energy  
1945 West Parnall Road, P12-208A  
Jackson, Michigan 49201  
Ph: 517-788-0817(W)  
Attn: Pete Mulhearn

Electric

Consumers Energy  
2400 Weiss Street  
Saginaw, Michigan 48602  
Ph: 989-791-5885(W)  
Attn: Kevin Couturier

Gas

Consumers Energy  
1945 West Parnall Road, P23-228  
Jackson, Michigan 49201  
Ph: 517-788-0998(W)  
Attn: Timothy Coppernoll

Gas

Midland County Drain Commissioner  
220 West Ellsworth Street, Room 229-30  
Midland, Michigan 48640  
Ph: 989-832-6772(W)  
Attn: Doug Enos

County Drain

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## Utility Owner

Midland County Educational Service Agency  
3917 Jefferson Avenue  
Midland, Michigan 48640  
Ph: 989-249-8752(W)  
Attn: Jim Mallory

## Type of Utility

Telecom

Midland County Water District No. 1  
P.O. Box 320  
Sanford, Michigan 48657  
Ph: 989-687-2709(W)  
Attn: Ron Rose

Water

TDS Telecom (Wolverine Telephone)  
104 N. Cedar St., P.O. Box 78  
Sanford, Michigan 48657  
Ph: 989-687-2111(W)  
Attn: Ron Cay

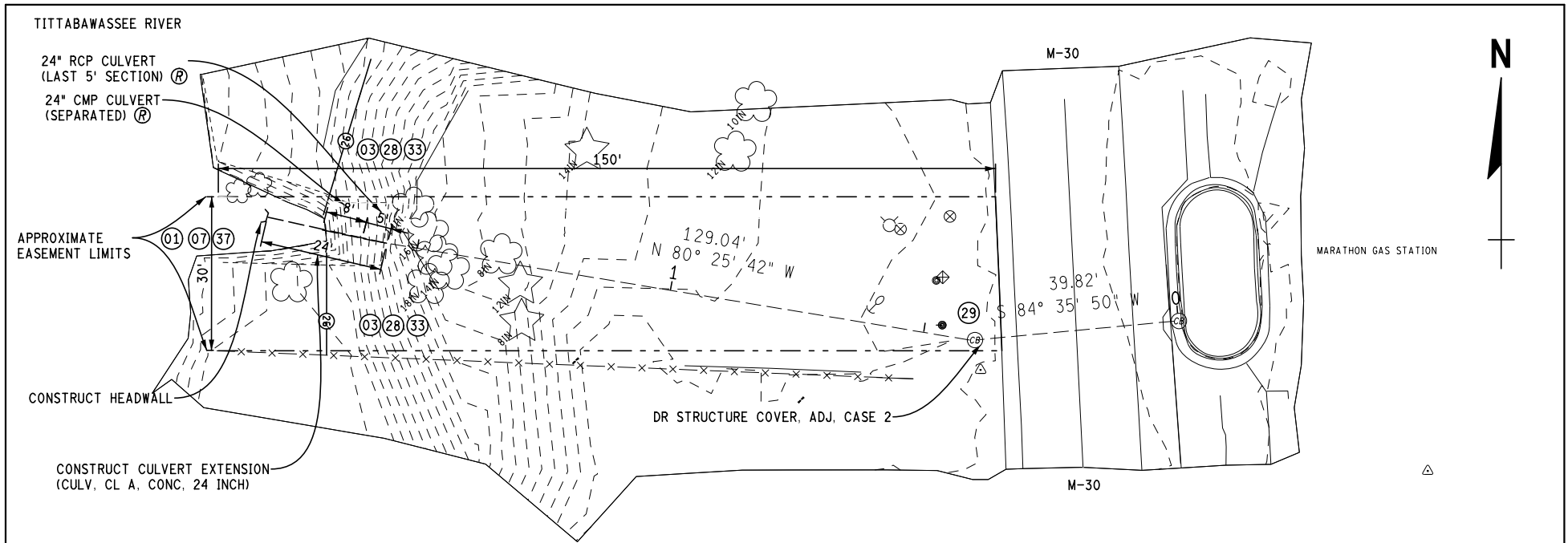
Telecom

US Signal Company  
201 Ionia Avenue, SW  
Grand Rapids, Michigan 49503

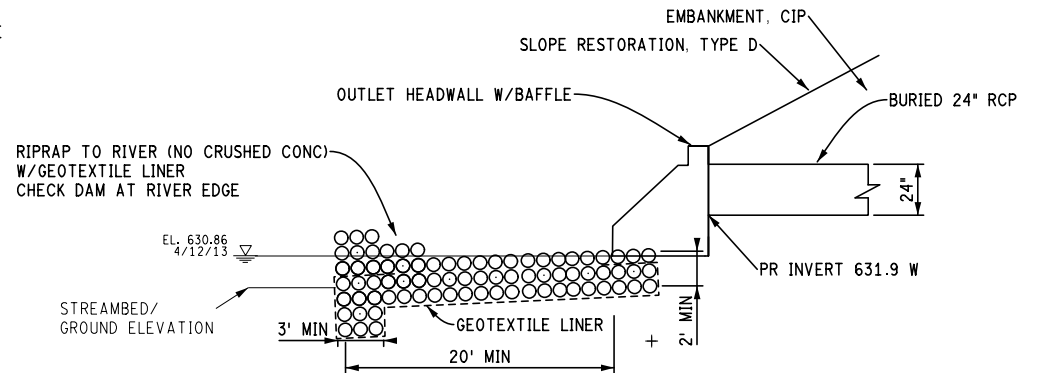
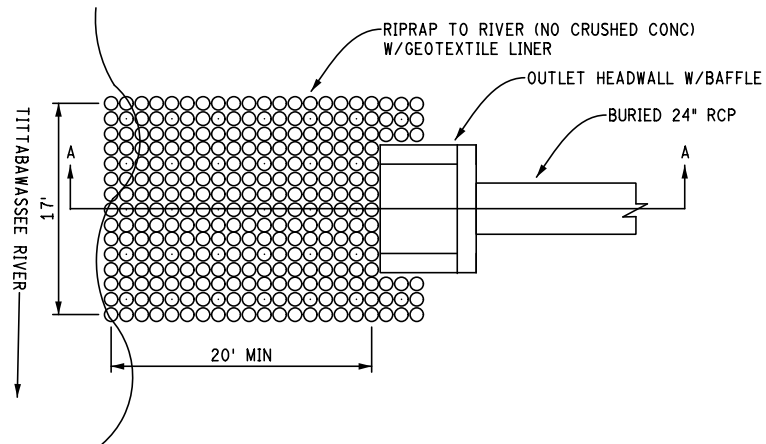
Telecom

ACD Telecom, Inc.  
1800 N. Grand River Ave  
Lansing, Michigan 48906  
Ph: 517-999-3213(W)  
Attn: Phil Brown

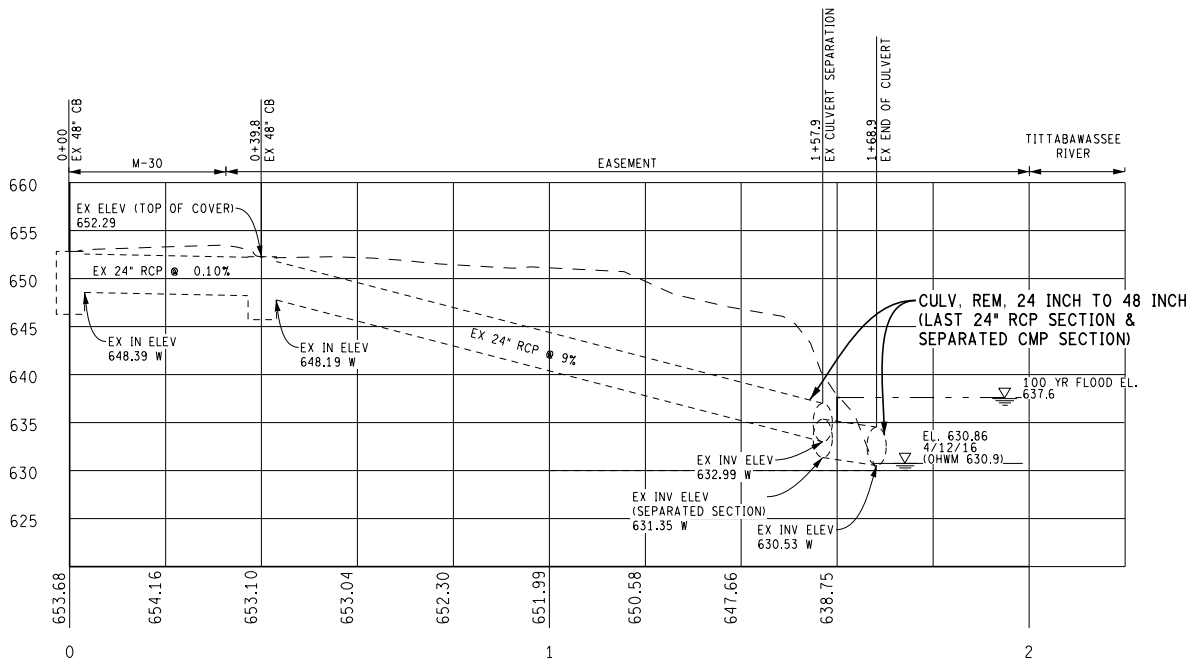
Cable



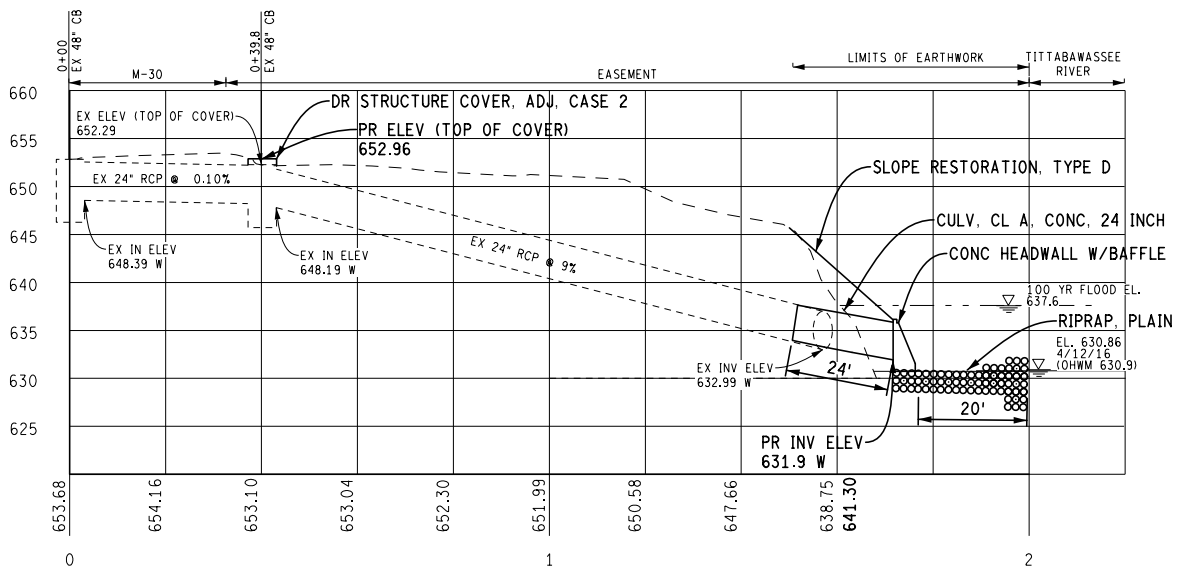
PLAN VIEW DETAILS







EXISTING CROSS SECTION  
LOOKING SOUTH



PROPOSED CROSS SECTION  
LOOKING SOUTH

--- EX GROUND PROFILE OVER STORM SEWER ALIGNMENT

--- EX GROUND PROFILE OVER STORM SEWER ALIGNMENT  
— PR GROUND PROFILE OVER STORM SEWER



**MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY  
WATER RESOURCES DIVISION  
PERMIT**

**ISSUED TO:**

**Brent Brooks, MDOT  
5859 Sherman Road  
Saginaw, Michigan 48604**

<b>Permit No.</b>	<b>WRP002407 v1.0</b>
<b>Submission No.</b>	<b>2F5-YV9K-3PSQ</b>
<b>Issued</b>	<b>5/4/2016</b>
<b>Expires</b>	<b>5/4/2021</b>

This permit is being issued by the Michigan Department of Environmental Quality (MDEQ) under the provisions of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA), and specifically:

- |                                                                                           |                                                                                |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> <b>Part 301, Inland Lakes and Streams</b>             | <input type="checkbox"/> <b>Part 315, Dam Safety</b>                           |
| <input type="checkbox"/> <b>Part 325, Great Lakes Submerged Lands</b>                     | <input type="checkbox"/> <b>Part 323, Shorelands Protection and Management</b> |
| <input type="checkbox"/> <b>Part 303, Wetlands Protection</b>                             | <input type="checkbox"/> <b>Part 353, Sand Dunes Protection and Management</b> |
| <input checked="" type="checkbox"/> <b>Part 31, Floodplain/Water Resources Protection</b> |                                                                                |

Permission is hereby granted, based on permittee assurance of adherence to State of Michigan requirements and permit conditions, to:

**56 M-30, storm outlet to Tittabawassee River  
Michigan 48620  
Midland County**

**Storm outlet maintenance.**

**All according to permit conditions and information submitted. Contact this office 5 days before work begins at [silaqyi@michigan.gov](mailto:silaqyi@michigan.gov) or 989-370-1569.**

**Authority granted by this permit is subject to the following limitations:**

- A. Initiation of any work on the permitted project confirms the permittee's acceptance and agreement to comply with all terms and conditions of this permit.
- B. The permittee, in exercising the authority granted by this permit, shall not cause unlawful pollution as defined by Part 31, Water Resources Protection, of the NREPA.
- C. This permit shall be kept at the site of the work and available for inspection at all times during the duration of the project or until its date of expiration.
- D. All work shall be completed in accordance with the approved plans and specifications submitted with the application and/or plans and specifications attached to this permit.
- E. No attempt shall be made by the permittee to forbid the full and free use by the public of public waters at or adjacent to the structure or work approved.
- F. It is made a requirement of this permit that the permittee give notice to public utilities in accordance with Act 53 of the Public Act of 1974 and comply with each of the requirements of that Act.
- G. This permit does not convey property rights in either real estate or material, nor does it authorize any injury to private property or invasion of public or private rights, nor does it waive the necessity of seeking federal assent, all local permits, or complying with other state statutes.
- H. This permit does not prejudice or limit the right of a riparian owner or other person to institute proceedings in any circuit court of this state when necessary to protect his rights.
- I. Permittee shall notify the MDEQ within one week after the completion of the activity authorized by this permit.
- J. This permit shall not be assigned or transferred without the written approval of the MDEQ.
- K. Failure to comply with conditions of this permit may subject the permittee to revocation of permit and criminal and/or civil action as cited by the specific state act, federal act, and/or rule under which this permit is granted.

- L. All dredged or excavated materials shall be disposed of in an upland site (outside of floodplains, unless exempt under Part 31, and wetland).
- M. In issuing this permit, the MDEQ has relied on the information and data that the permittee has provided in connection with the submitted application for permit. If, subsequent to the issuance of a permit, such information and data prove to be false, incomplete, or inaccurate, the MDEQ may modify, revoke, or suspend the permit, in whole or in part, in accordance with the new information.
- N. The permittee shall indemnify and hold harmless the State of Michigan and its departments, agencies, officials, employees, agents, and representatives for any and all claims or causes of action arising from acts or omissions of the permittee, or employees, agents, or representative of the permittee, undertaken in connection with this permit. The permittee's obligation to indemnify the State of Michigan applies only if the State (1) provides the permittee or its designated representative written notice of the claim or cause of action within 30 days after it is received by the State and (2) consents to the permittee's participation in the proceeding on the claim or cause of action. It does not apply to contested case proceedings under the Administrative Procedures Act challenging the permit. This permit shall not be construed as an indemnity by the State of Michigan for the benefit of the permittee or any other person.
- O. Noncompliance with these terms and conditions and/or the initiation of other regulated activities not specifically authorized shall be cause for the modification, suspension, or revocation of this permit, in whole or in part. Further, the MDEQ may initiate criminal and/or civil proceedings as may be deemed necessary to correct project deficiencies, protect natural resource values, and secure compliance with statutes.
- P. If any change or deviation from the permitted activity becomes necessary, the permittee shall request, in writing, a revision of the permitted activity from the MDEQ. Such revision request shall include complete documentation supporting the modification and revised plans detailing the proposed modification. Proposed modifications must be approved, in writing, by the MDEQ prior to being implemented.
- Q. This permit may be transferred to another person upon written approval of the MDEQ. The permittee must submit a written request to the MDEQ to transfer the permit to the new owner. The new owner must also submit a written request to the MDEQ to accept transfer. The new owner must agree, in writing, to accept all conditions of the permit. A single letter signed by both parties which includes all the above information may be provided to the MDEQ. The MDEQ will review the request and if approved, will provide written notification to the new owner.
- R. Prior to initiating permitted construction, the permittee is required to provide a copy of the permit to the contractor(s) for review. The property owner, contractor(s), and any agent involved in exercising the permit are held responsible to ensure that the project is constructed in accordance with all drawings and specifications. The contractor is required to provide a copy of the permit to all subcontractors doing work authorized by the permit.
- S. Construction must be undertaken and completed during the dry period of the wetland. If the area does not dry out, construction shall be done on equipment mats to prevent compaction of the soil.
- T. Authority granted by this permit does not waive permit requirements under Part 91, Soil Erosion and Sedimentation Control, of the NREPA, or the need to acquire applicable permits from the County Enforcing Agent.
- U. Authority granted by this permit does not waive permit requirements under the authority of Part 305, Natural Rivers, of the NREPA. A Natural Rivers Zoning Permit may be required for construction, land alteration, streambank stabilization, or vegetation removal along or near a natural river.
- V. The permittee is cautioned that grade changes resulting in increased runoff onto adjacent property is subject to civil damage litigation.
- W. Unless specifically stated in this permit, construction pads, haul roads, temporary structures, or other structural appurtenances to be placed in a wetland or on bottomland of the waterbody are not authorized and shall not be constructed unless authorized by a separate permit or permit revision granted in accordance with the applicable law.
- X. For projects with potential impacts to fish spawning or migration, no work shall occur within fish spawning or migration timelines (i.e., windows) unless otherwise approved in writing by the MDNR, Fisheries Division.
- Y. Work to be done under authority of this permit is further subject to the following special instructions and specifications:

1. Areas to be protected by riprap shall be cleared of brush and debris. All grades shall be shaped and compacted to the required cross section. Geotextile liner shall be placed on the prepared grades. The riprap installation shall not damage the geotextile liner.
2. All fill shall consist of clean inert material.
3. Any alterations to the existing road grade elevations other than that shown on the plans will require prior approval from the Water Resources Division.

4. All work shall be completed in accordance with plans prepared and the last submission to this office. Said plans are kept on file at the MDEQ's Water Resources Division, Gaylord Field Office.
5. Authority granted by this permit does not waive compliance requirements under Part 91, Soil Erosion and Sedimentation Control, of the NREPA. Any discharge of sediment into waters of the state and/or off the road right-of-way is a violation of this permit, Part 91, and Part 31, Water Resources Protection, of the NREPA. A violation of these parts subjects the permittee to potential fines and penalties.
6. This permit does not authorize or sanction work that has been completed in violation of applicable federal, state, or local statutes.
7. The permittee is responsible for acquiring all necessary easements or rights-of-way before commencing any work authorized by this permit. All construction operations relating to or part of this project shall be confined to the existing right-of-way limits or other acquired easements.
8. Temporary soil erosion and sedimentation control measures shall be installed before or upon commencement of the earth change and shall be maintained daily. Temporary soil erosion and sedimentation control measures shall be maintained until permanent soil erosion and sedimentation control measures are in place and the area is stabilized. Permanent soil erosion and sedimentation control measures for all slopes, channels, ditches, or any disturbed area shall be installed within five (5) calendar days after final grading or the final earth change has been completed.
9. All raw areas in uplands resulting from the permitted construction activity shall be effectively stabilized with sod and/or seed and mulch (or other technology specified by this permit or project plans) in a sufficient quantity and manner to prevent erosion and any potential siltation to surface waters or wetlands. Temporary stabilization measures shall be installed before or upon commencement of the permitted activity, and shall be maintained until permanent measures are in place. Permanent measures shall be in place within five (5) days of achieving final grade.
10. All raw earth within 100 feet of a lake, stream, or wetland that is not brought to final stabilization by the end of the active growing season shall be temporarily stabilized with mulch blankets in accordance with the following dates: September 20th for the Upper Peninsula, October 1st for the Lower Peninsula north of US-10, and October 10th for the Lower Peninsula south of US-10.
11. This permit shall be kept posted at the work site, in a prominent location at all times for the duration of the project, or until permit expiration.
12. This permit is being issued for the maximum time allowed and no extensions of this permit will be granted. Initiation of the construction work authorized by this permit indicates the permittee's acceptance of this condition. The permit, when signed by the MDEQ, will be for a five-year period beginning at the date of issuance. If the project is not completed by the expiration date, a new permit must be sought.
13. All slurry resulting from any dewatering operation shall be discharged through a filter bag or pumped to a sump located away from wetlands and surface waters and allowed to filter through natural upland vegetation, gravel filters, or other engineered devices for a sufficient

distance and/or period of time necessary to remove sediment or suspended particles. The discharge of slurry water resulting from the hydrodemolition of concrete is not allowed to enter a lake, stream, or wetland.

14. All dredge/excavated spoils including organic and inorganic soils, vegetation, and other material removed shall be placed on upland (non-wetland, non-floodplain or non-bottomland), prepared for stabilization, revegetated and reseeded with native Michigan species appropriate to the site, and mulched in such a manner so as to prevent and ensure against erosion of any material into any waterbody, wetland, or floodplain.
15. During removal or repair of the existing structure, every precaution shall be taken to prevent debris from entering any watercourse. Any debris reaching the watercourse during the removal and/or reconstruction of the structure shall be immediately retrieved from the water. All material shall be disposed of in an acceptable manner consistent with local, state, and federal regulations.
16. Prior to the removal of the existing structures located in the water or wetland; cofferdams of interlocking steel sheet piling or other acceptable barriers approved in advance by the Engineer shall be installed to isolate all construction activities from the water. The cofferdam shall be maintained in good working order throughout the duration of the project. Upon project completion, the accumulated materials inside the cofferdam shall be removed and disposed of at an upland site.
17. All cofferdam and temporary steel sheet pile shall then be removed in its entirety, unless specifically shown to be left in place on the plans. Cofferdam and sheet pile that are to remain shall be cut off at the elevation shown on the plan. Cofferdam and sheet pile left above the stream bottom must be approved by the DEQ. Areas where the sheet piling is cut off shall be covered with riprap as shown in the plans or backfilled with other acceptable material approved in advance by the Engineer and the DEQ. Projects where the cofferdam is cut off less than 1 foot below the stream bottom must be submitted for individual review before any revision to current permit conditions will be allowed.
18. The existing structure, temporary structure, or permitted structure, shall be kept open to pass the stream flow at all times.
19. The placement of the new culvert and the initial placement of fill in the stream shall be done immediately after removal of the existing culvert. The placement shall be conducted in such a manner that all flow is immediately passed through the new culverts, allowing the major placement of fill to be done in the dry or in still water where erosion and sedimentation will be minimized. The fill material used in this initial placement shall be washed gravel, coarse aggregate, or rock and shall be placed at both ends of the culvert to a level above normal water level before backfill material is placed.
20. Road fill side slopes shall not be steeper than 1-on-2 (1 vertical to 2 horizontal) except where headwalls of reinforced concrete, mortar masonry, dry masonry, or other acceptable methods are used.
21. Road fill side slopes terminating in the stream and any raw streambanks resulting from the construction shall be stabilized with temporary measures in accordance with appropriate Best Management Practices based on site conditions, and if necessary, may be riprapped extending above the ordinary high water mark, before or upon commencement of the permitted

activity. Temporary stabilization measures shall be maintained until permanent measures are in place.

22. All other road fill slopes, ditches, and other raw areas draining directly to the stream may be protected with riprap, sod and/or seed and mulch as may be necessary to provide effective erosion protection. The placement of riprap shall be limited to the minimum necessary to ensure proper stabilization of the side slopes and fill in the immediate vicinity of the structure.
23. If the project, or any portion of the project, is stopped and lies incomplete for any length of time other than that encountered in a normal work week, every precaution shall be taken to protect the incomplete work from erosion, including the placement of temporary gravel bag riprap, temporary seed and mulch, or other acceptable temporary protection.
24. No work shall be done in the stream during periods of above-normal flows except as necessary to prevent erosion.

By:



Jeff Silagy  
Water Resources Division  
989-370-1569

cc: Agent  
MDOT Local Agency Programs  
MDEQ Soil Erosion

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
SLOPE RESTORATION, NON-FREEWAY

C&amp;T:DMG

1 of 3

C&amp;T:APPR:TWK:DBP:04-25-12

**a. Description.** This work consists of preparing all lawns and slopes on non-freeway projects designated for slope restoration on the plans or as directed by the Engineer and applying topsoil, fertilizer, seed, mulch with mulch anchor, mulch blanket, high velocity mulch blanket and permanent turf reinforcement mat to those areas. Turf establishment must be in accordance with section 816 of the Standard Specifications for Construction and Standard Plan R-100 Series, except as modified herein or otherwise directed by the Engineer.

**b. Materials.** The materials and application rates specified in sections 816 and 917 of the Standard Specifications for Construction apply unless modified by this special provision or otherwise directed by the Engineer. The following materials must be used on this project:

1. Seeding mixture as called for on the plans
2. Fertilizer, Chemical Nutrient, Class A
3. Topsoil Surface, Furnished or Salvaged, 4 inch. Remove any stones greater than 1/2 inch in diameter or other debris from all topsoil.
4. Mulch and Mulch Anchoring, Mulch Blanket and High Velocity Mulch Blanket
5. Permanent Turf Reinforcement Mat (TRM) must be 100 percent synthetic and consist of 100 percent ultraviolet (UV) stabilized polyolefin fibers sewn between two layers of black UV stabilized polypropylene netting with polyolefin thread. The TRM must meet the following "minimum average roll value" requirements:

<b>Property</b>	<b>Test Method</b>	<b>Requirement</b>
Mass/Unit Area	ASTM D 6566	10 oz/syd
Ultraviolet Stability @ 1000 hrs	ASTM D 4355	80 percent
Tensile Strength (MD)	ASTM D 6818	165 lbs/ft

Acceptance. Supply a Test Data Certification for the permanent TRM from one of the following manufacturers:

Recyclex - American Excelsior Co., Arlington, TX (800) 777-7645  
P300 - North American Green, Poseyville, IN (800) 772-2040  
Landlok 450 - Propex, Inc., Chattanooga, TN (800) 621-1273  
PP5-10 - Western Excelsior, Mancos, CO (800) 833-8573

**c. Construction.** Construction methods must be in accordance with subsection 816.03 of the Standard Specifications for Construction. Begin this work as soon as possible after final grading of the areas designated for slope restoration but no later than the maximum time frames stated in

subsection 208.03 of the Standard Specifications for Construction. It may be necessary, as directed by the Engineer, to place materials by hand.

Shape, compact and assure all areas to be seeded are weed free prior to placing topsoil. Place topsoil to the minimum depth indicated above, to meet proposed finished grade. If the area being restored requires more than the minimum depth of topsoil to meet finished grade, this additional depth must be filled using topsoil or, at the Contractor's option, embankment. Furnishing and placing this additional material is included in this item of work.

Topsoil must be weed and weed seed free and friable prior to placing seed. Remove any stones greater than 1/2 inch in diameter or other debris. Apply seed mixture and fertilizer to prepared soil surface. Incorporate seed into top 1/2 inch of topsoil

Apply mulch at a rate of 2 tons per acre. Place Mulch Anchoring over the mulch at a rate specified in subsection 816.03.F of the Standard Specifications for Construction. Mulch Blanket and High Velocity Mulch Blanket must be placed in accordance with subsection 816.03.H of the Standard Specifications for Construction and as shown on Standard Plan R-100 Series.

Areas constructed with the TRM must be installed on prepared (seeded) grades as shown on the plans in strict accordance with the manufacturer's published installation guidelines. The top edge of the TRM must be anchored in a minimum 6 inch deep trench. Operation of equipment on the slope will not be allowed after placement of the TRM. No credit for splices, overlaps, tucks or wasted material will be made.

If an area washes out after this work has been properly completed and approved by the Engineer, make the required corrections to prevent future washouts and replace the topsoil, fertilizer, seed and mulch. This replacement will be paid for as additional work using the applicable contract items.

If an area washes out for reasons attributable to the Contractor's activity or failure to take proper precautions, replacement will be at the Contractor's expense.

The Engineer will inspect the seeded turf to ensure the end product is well established, weed free, in a vigorous growing condition, and contains the species called for in the seeding mixture.

If the seeded turf is not well established at the end of the first growing season, the Contractor is responsible to re-seed until the turf is well established and approved by the Engineer.

If weeds are determined by the Engineer to cover more than 10 percent of the total area of slope restoration, the Contractor must provide weed control in accordance with subsection 816.03.J of the Standard Specifications for Construction. Weed control will be at the Contractor's expense with no additional charges to the project.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following pay item:

Pay Item	Pay Unit
Slope Restoration, Type _____	Square Yard

1. Place **Slope Restoration, Type A** in all areas not described in the other types of slope restoration and will be measured by area in square yards in place. **Slope Restoration, Type A**



includes all labor, equipment and materials required to install Topsoil Surface, Furnished or Salvaged; Fertilizer, Chemical Nutrient, Class A; Seeding Mixture; and Mulch and Mulch Anchoring which will not be paid for separately but is included in the contract unit price for **Slope Restoration, Type A**.

2. Place **Slope Restoration, Type B** parallel (6 feet minimum) to the edge of the roadway, in areas that have a 1 on 3 slope and in any ditch with a grade less than 1.5 percent, or as directed by the Engineer. **Slope Restoration, Type B** will be measured by area in square yards in place. **Slope Restoration, Type B** includes all labor, equipment and materials required to install Topsoil Surface, Furnished or Salvaged; Fertilizer, Chemical Nutrient, Class A; Seeding Mixture; and Mulch Blanket which will not be paid for separately but is included in the contract unit price for **Slope Restoration, Type B**.

3. Place **Slope Restoration, Type C** in areas that have a 1 on 2 slope, any ditch with a grade of 1.5 percent to 3 percent or as directed by the Engineer. **Slope Restoration, Type C** will be measured by area in square yards in place. **Slope Restoration, Type C** includes all labor, equipment and materials required to install Topsoil, Furnished or Salvaged; Fertilizer, Chemical Nutrient, Class A; Seeding Mixture; and High Velocity Mulch Blanket which will not be paid for separately but is included in the contract unit price for **Slope Restoration, Type C**.

4. Place **Slope Restoration, Type D** in areas that have a slope steeper than 1 on 2, any ditch with a grade steeper than 3 percent or as directed by the Engineer. **Slope Restoration, Type D** will be measured by area in square yards in place. **Slope Restoration, Type D** includes all labor, equipment and materials required to install Topsoil, Furnished or Salvaged; Fertilizer, Chemical Nutrient, Class A; Seeding Mixture; and TRM which will not be paid for separately but is included in the contract unit price for **Slope Restoration, Type D**.

# MINIMUM MERGING TAPER LENGTH "L" (FEET)

OFFSET	POSTED SPEED LIMIT, MPH (PRIOR TO WORK AREA)									
FEET	25	30	35	40	45	50	55	60	65	70
1	10	15	20	27	45	50	55	60	65	70
2	21	30	41	53	90	100	110	120	130	140
3	31	45	61	80	135	150	165	180	195	210
4	42	60	82	107	180	200	220	240	260	280
5	52	75	102	133	225	250	275	300	325	350
6	63	90	123	160	270	300	330	360	390	420
7	73	105	143	187	315	350	385	420	455	490
8	83	120	163	213	360	400	440	480	520	560
9	94	135	184	240	405	450	495	540	585	630
10	104	150	204	267	450	500	550	600	650	700
11	115	165	225	293	495	550	605	660	715	770
12	125	180	245	320	540	600	660	720	780	840
13	135	195	266	347	585	650	715	780	845	910
14	146	210	286	374	630	700	770	840	910	980
15	157	225	307	400	675	750	825	900	975	1050

TAPER LENGTH "L" IN FEET

THE FORMULAS FOR THE MINIMUM LENGTH OF A MERGING TAPER IN DERIVING THE "L" VALUES SHOWN IN THE ABOVE TABLES ARE AS FOLLOWS:

"L" =  $\frac{W \times S^2}{60}$  WHERE POSTED SPEED PRIOR TO THE WORK AREA IS 40 MPH OR LESS

"L" = S x W WHERE POSTED SPEED PRIOR TO THE WORK AREA IS 45 MPH OR GREATER

L = MINIMUM LENGTH OF MERGING TAPER

S = POSTED SPEED LIMIT IN MPH  
PRIOR TO WORK AREA

W = WIDTH OF OFFSET

## TYPES OF TAPERS

### UPSTREAM TAPERS

MERGING TAPER

SHIFTING TAPER

SHOULDER TAPER

TWO-WAY TRAFFIC TAPER

### DOWNSTREAM TAPERS

(USE IS OPTIONAL)

## TAPER LENGTH

L - MINIMUM

1/2 L - MINIMUM

1/3 L - MINIMUM

100' - MAXIMUM

100' - MINIMUM

(PER LANE)



TRAFFIC AND SAFETY  
MAINTAINING TRAFFIC  
TYPICAL

TABLES FOR "L", "D" AND "B" VALUES

DRAWN BY: CON:AE:djf

JUNE 2006

CHECKED BY: BMM

PLAN DATE:

M0020a

SHEET  
1 OF 2

FILE: K:/DGN/TSR/STDS/ENGLISH/MNTTRF/M0020a.dgn

REV. 08/21/2006

DISTANCE BETWEEN TRAFFIC CONTROL DEVICES "D"  
AND LENGTH OF LONGITUDINAL BUFFER SPACE ON  
"WHERE WORKERS PRESENT" SEQUENCES

"D" DISTANCES	POSTED SPEED LIMIT, MPH (PRIOR TO WORK AREA)									
	25	30	35	40	45	50	55	60	65	70
D (FEET)	250	300	350	400	450	500	550	600	650	700

GUIDELINES FOR LENGTH OF  
LONGITUDINAL BUFFER SPACE "B"

SPEED* MPH	LENGTH FEET
20	33
25	50
30	83
35	132
40	181
45	230
50	279
55	329
60	411
65	476
70	542

\* POSTED SPEED, OFF PEAK 85TH PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED

1 BASED UPON AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) BRAKING DISTANCE PORTION OF STOPPING SIGHT DISTANCE FOR WET AND LEVEL PAVEMENTS (A POLICY ON GEOMETRIC DESIGN OF HIGHWAY AND STREETS), AASHTO. THIS AASHTO DOCUMENT ALSO RECOMMENDS ADJUSTMENTS FOR THE EFFECT OF GRADE ON STOPPING AND VARIATION FOR TRUCKS.



TABLES FOR "L", "D" AND "B" VALUES

DRAWN BY: CON:AE:djf

JUNE 2006

M0020a

SHEET  
2 OF 2



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PLAN DATE:

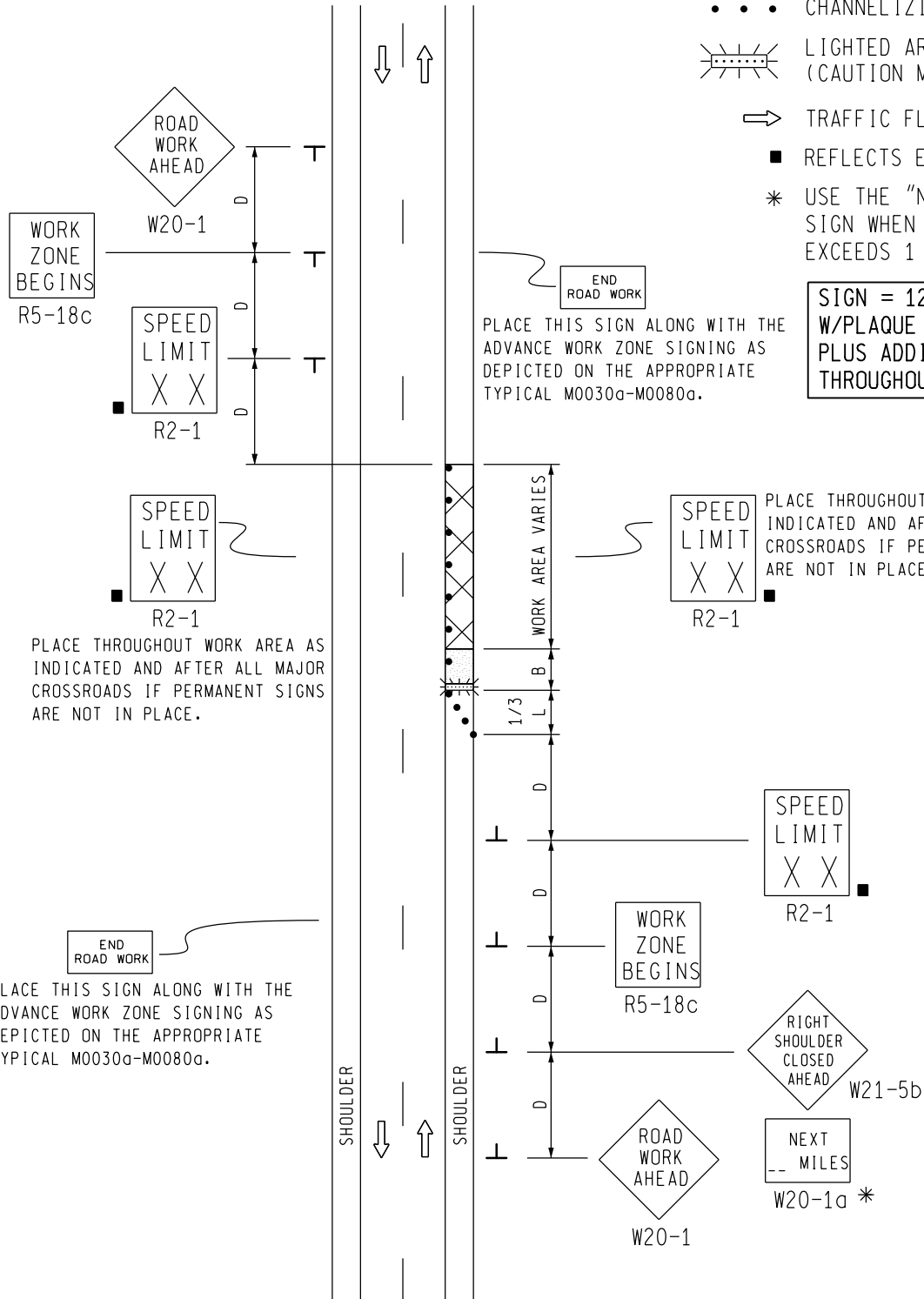
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REV. 08/21/2006

# KEY

- • • CHANNELIZING DEVICES
-  LIGHTED ARROW PANEL (CAUTION MODE)
-  TRAFFIC FLOW
- REFLECTS EXISTING SPEED LIMIT
- \* USE THE "NEXT \_ \_ MILES" SIGN WHEN SHOULDER CLOSURE EXCEEDS 1 MILE IN LENGTH

SIGN = 120 ft±2 - TYPE B  
W/PLAQUE = 132 ft±2 - TYPE B  
PLUS ADDITIONAL R2-1's  
THROUGHOUT WORK AREA



**MDOT**  
Michigan Department of Transportation  
TRAFFIC AND SAFETY  
MAINTAINING TRAFFIC  
TYPICAL

TYPICAL TEMPORARY TRAFFIC CONTROL  
FOR A SHOULDER CLOSURE ON A TWO  
LANE TWO-WAY ROADWAY  
NO SPEED REDUCTION

DRAWN BY: CON:AE:djf  
CHECKED BY: BMM:CRB

OCTOBER 2011  
PLAN DATE:

M0110a

SHEET  
1 OF 2

NOT TO SCALE

FILE: PW RD/TS/Typicals/Signs/MT NON Fwy/M0110a.dgn REV. 10/04/2011


## NOTES

1. D = DISTANCE BETWEEN TRAFFIC CONTROL DEVICES  
 $\frac{1}{3} L$  = MINIMUM LENGTH OF TAPER  
 B = LENGTH OF LONGITUDINAL BUFFER  
 SEE **M0020a** FOR "D," "L," AND "B" VALUES
2. ALL NON-APPLICABLE SIGNING WITHIN THE CIA SHALL BE MODIFIED TO FIT CONDITIONS, COVERED OR REMOVED.
3. DISTANCES BETWEEN SIGNS, THE VALUES FOR WHICH ARE SHOWN IN TABLE D, ARE APPROXIMATE AND MAY NEED ADJUSTING AS DIRECTED BY THE ENGINEER.
- 3A. THE "WORK ZONE BEGINS" (R5-18c) SIGN SHALL BE USED ONLY IN THE INITIAL SIGNING SEQUENCE IN THE WORK ZONE. SUBSEQUENT SEQUENCES IN THE SAME WORK ZONE SHALL OMIT THIS SIGN AND THE QUANTITIES SHALL BE ADJUSTED APPROPRIATELY.
- 4E. THE MAXIMUM RECOMMENDED DISTANCE(S) BETWEEN CHANNELIZING DEVICES SHOULD BE EQUAL IN FEET TO THE POSTED SPEED IN MILES PER HOUR ON TAPER(S) AND TWICE THE POSTED SPEED IN THE PARALLEL AREA(S).
5. FOR OVERNIGHT CLOSURES, TYPE III BARRICADES SHALL BE LIGHTED.
6. WHEN CALLED FOR IN THE FHWA ACCEPTANCE LETTER FOR THE SIGN SYSTEM SELECTED, THE TYPE A WARNING FLASHER, SHOWN ON THE WARNING SIGNS, SHALL BE POSITIONED ON THE SIDE OF THE SIGN NEAREST THE ROADWAY.
7. ALL TEMPORARY SIGNS, TYPE III BARRICADES, THEIR SUPPORT SYSTEMS AND LIGHTING REQUIREMENTS SHALL MEET NCHRP 350 CRASHWORTHLY REQUIREMENTS STIPULATED IN THE CURRENT EDITION OF THE MICHIGAN MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, THE CURRENT EDITION OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION, THE STANDARD PLANS AND APPLICABLE SPECIAL PROVISIONS. ONLY DESIGNS AND MATERIALS APPROVED BY MDOT WILL BE ALLOWED.
8. WHEN BUFFER AREAS ARE ESTABLISHED, THERE SHALL BE NO EQUIPMENT OR MATERIALS STORED OR WORK CONDUCTED IN THE BUFFER AREA.
- 29A. THE TYPE OF REFLECTIVE SHEETING USED FOR THE W20-1a PLAQUE SHALL BE THE SAME AS THE TYPE USED FOR THE PARENT SIGN.

## SIGN SIZES

DIAMOND WARNING	- 48" x 48"
W20-1a PLAQUE	- 48" x 36"
R2-1 REGULATORY	- 48" x 60"
R5-18c REGULATORY	- 48" x 48"

NOT TO SCALE

 Michigan Department of Transportation <b>TRAFFIC AND SAFETY</b> <b>MAINTAINING TRAFFIC</b> <b>TYPICAL</b>		<b>TYPICAL TEMPORARY TRAFFIC CONTROL</b> <b>FOR A SHOULDER CLOSURE ON A TWO</b> <b>LANE TWO-WAY ROADWAY</b> <b>NO SPEED REDUCTION</b>	
DRAWN BY: CON:AE:djf	OCTOBER 2011	<div style="font-size: 1.2em; font-weight: bold;">M0110a</div>	SHEET 2 OF 2
CHECKED BY: BMM:CRB	PLAN DATE:		
FILE: PW RD/TS/Typicals/Signs/MT NON FWY/M0110a.dgn REV. 10/04/2011			

## SIGN MATERIAL SELECTION TABLE

SIGN SIZE	SIGN MATERIAL TYPE		
	TYPE I	TYPE II	TYPE III
≤ 36" X 36"		X	X
>36" X 36" ≤ 96" TO WIDE		X	
> 96" WIDE TO 144" WIDE	X	X	
> 144" WIDE	X		

TYPE I            ALUMINUM EXTRUSION  
 TYPE II          PLYWOOD  
 TYPE III        ALUMINUM SHEET

ROUNDING OF CORNERS IS NOT REQUIRED FOR TYPE I OR II SIGNS.  
 VERTICAL JOINTS ARE NOT PERMITTED.  
 HORIZONTAL JOINTS THROUGH SIGN LEGEND OR SYMBOLS ARE NOT PERMITTED.

## POST SIZE REQUIREMENTS TABLE

SIGN AREA (ft <sup>2</sup> )	POST TYPE		
	U-CHANNEL STEEL	SQUARE TUBULAR STEEL	WOOD
≤ 9	1 - 3 lb/ft*	1 - 2" 12 or 14 GA*	N/A
9 ≤ 20	2 - 3 lb/ft	2 - 2" 12 or 14 GA	1 - 4" X 6"*
> 20 ≤ 30	N/A	N/A	2 - 4" X 6"
> 30 ≤ 60	N/A	N/A	2 - 6" X 8"
> 60 ≤ 84	N/A	N/A	3 - 6" X 8"

\*SIGNS 4 FEET AND GREATER IN WIDTH REQUIRE 2 POSTS.  
 SIGNS GREATER THAN 8 FEET IN WIDTH REQUIRE 2 OR 3 WOOD  
 POSTS DEPENDING ON AREA OF SIGN.  
 A MAXIMUM OF 2 POSTS WITHIN A 7' PATH IS PERMITTED.

NOT TO SCALE

File:PW/Doc/RD/T&S/Typ/Dev/Sign MainTraf D/WZD-100-A Rev. 8/21/06 ECH



PREPARED BY  
 TRAFFIC AND SAFETY  
 SUPPORT AREA

DRAWN BY: CON/ECH

CHECKED BY: AUG

\_\_\_\_\_  
ENGINEER OF DELIVERY

\_\_\_\_\_  
ENGINEER OF DEVELOPMENT

PENDING

\_\_\_\_\_  
FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
 BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

### GROUND DRIVEN SIGN SUPPORTS FOR TEMP SIGNS

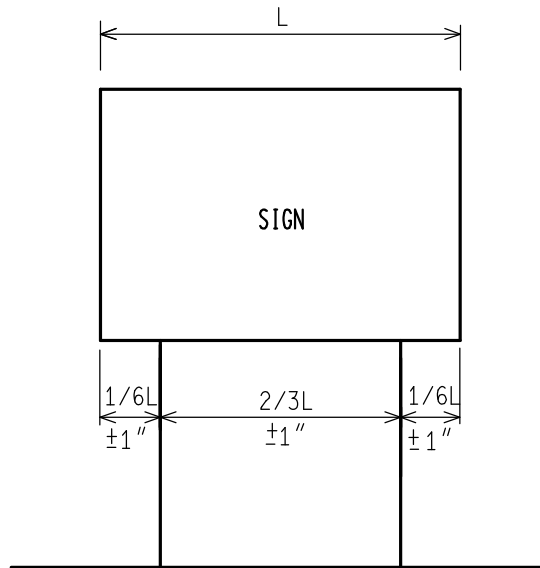
8/2006  
 PLAN DATE

WZD-100-A

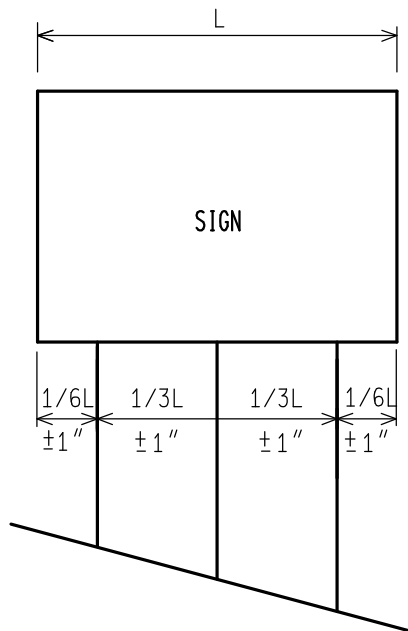
SHEET  
 1 of 11

NOTE: THE ORIGINAL SIGNED COPY IS KEPT ON FILE AT THE MICHIGAN DEPARTMENT OF TRANSPORTATION.

## 2 POST SIGN SUPPORT SPACING



## 3 POST SIGN SUPPORT SPACING



\* FOR ALL 11' AND 12' LONG SIGNS ON 3 WOOD SUPPORTS, SPREAD POSTS SO AS TO HAVE A 8' MIN. TO 9' MAX. DISTANCE BETWEEN OUTSIDE POSTS.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

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FHWA APPROVAL DATE

8/2006

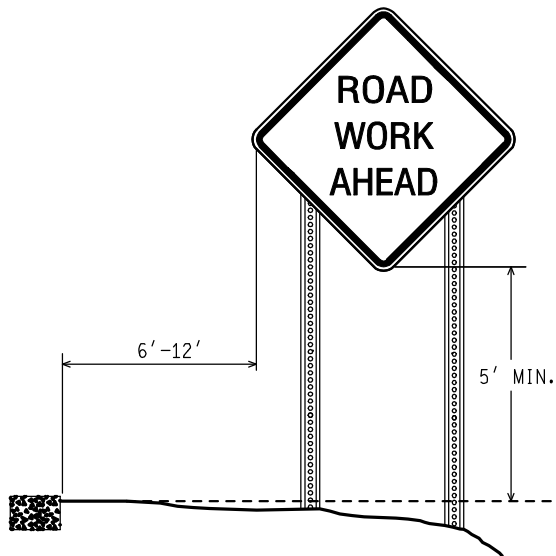
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WZD-100-A

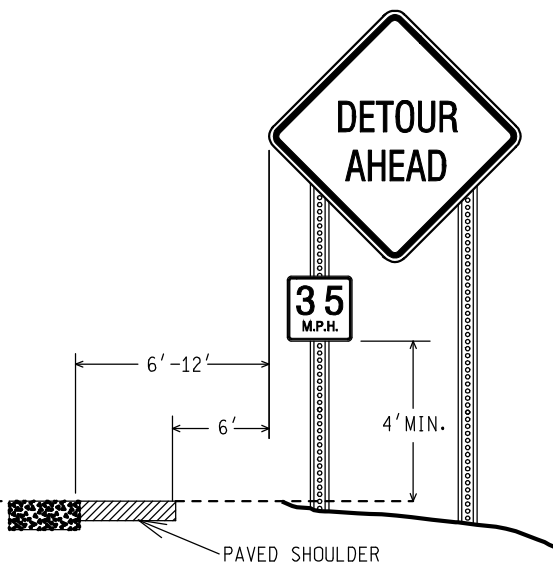
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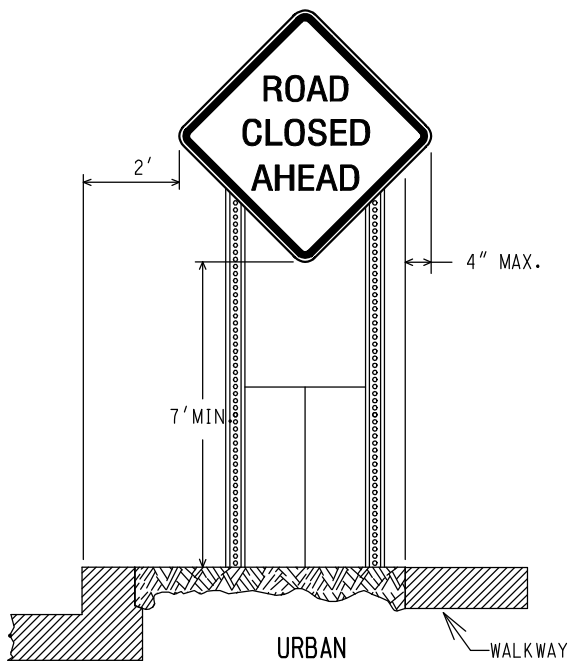
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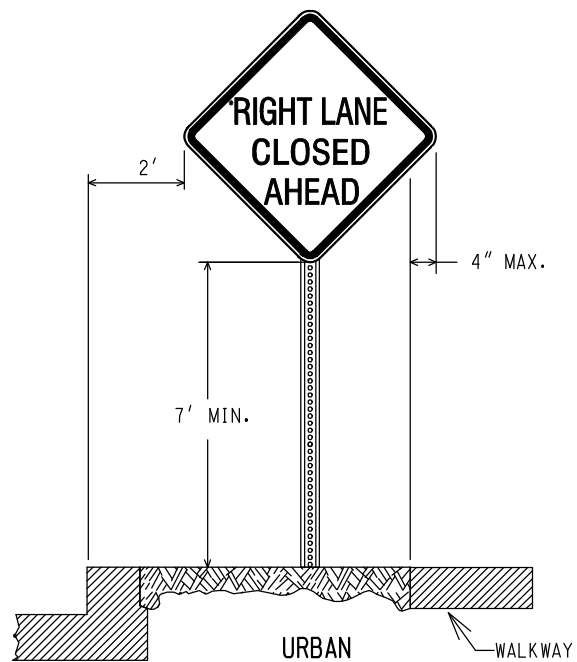
RURAL



RURAL WITH ADVISORY  
SPEED PLATE



(CURBED AREAS OR WHERE  
WALKWAYS ARE PRESENT)



(CURBED AREAS OR WHERE  
WALKWAYS ARE PRESENT)

## BOTTOM HEIGHT AND OFFSET

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

PENDING  
FHWA APPROVAL DATE

8/2006

PLAN DATE

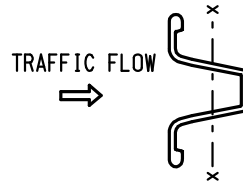
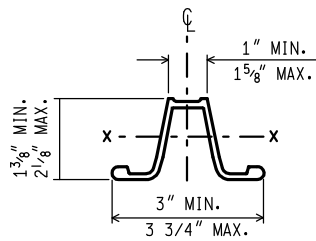
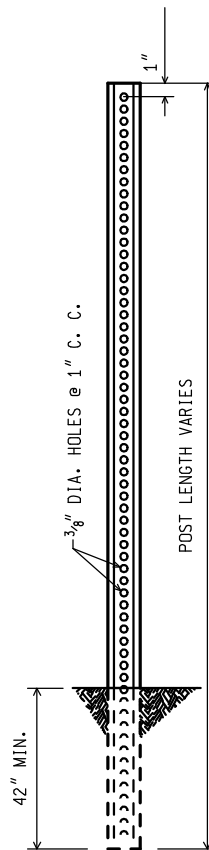
WZD-100-A

SHEET  
3 of 11

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WEIGHT = 3 lbs/ft  
 SECT. MOD. X.-X. = 0.31 CUBIC INCHES MIN.

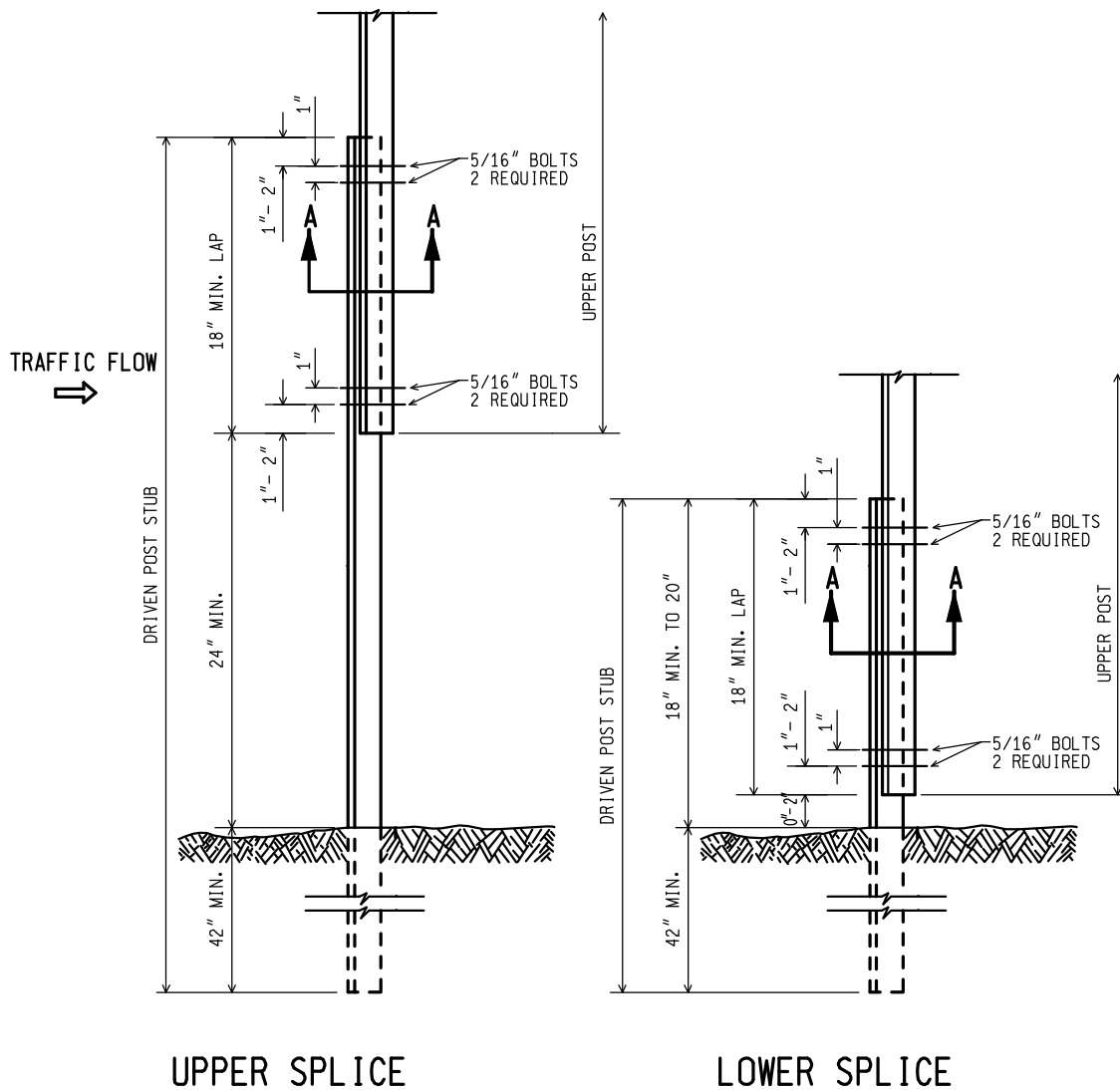
### 3 lb. U - CHANNEL STEEL POST (NO SPLICE)

MOUNT SIGN ON OPEN FACE OF  
 U - CHANNEL STEEL POST

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	PENDING	8/2006	WZD-100-A	SHEET 4 of 11
	FHWA APPROVAL DATE			
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### 3 lb. U - CHANNEL STEEL POST (WITH SPLICE)

MOUNT SIGN ON OPEN FACE OF  
UPPER U - CHANNEL STEEL POST

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

PENDING  
FHWA APPROVAL DATE

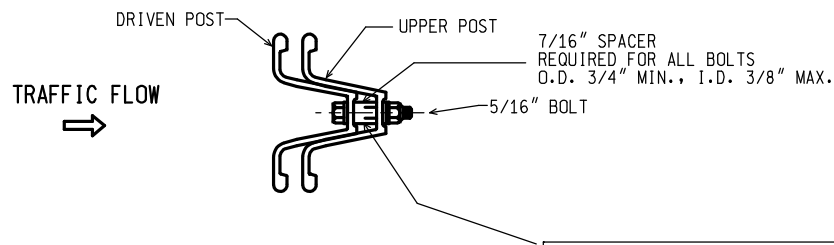
8/2006

PLAN DATE

WZD-100-A

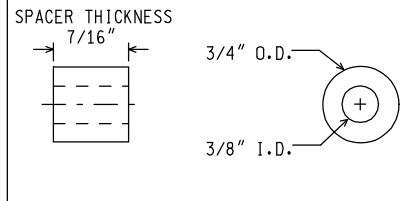
SHEET  
5 of 11

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**SECTION A-A**

**SPACER DETAIL**



**NOTES:**

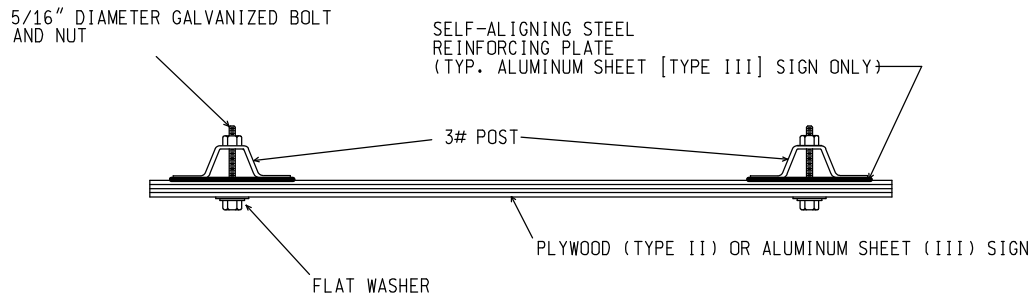
1. THE SPACER THICKNESS SHALL BE 1/16" LESS THAN THE GAP BETWEEN THE POST WHEN POSITIONED IN THE UNBOLTED CONFIGURATION.
2. THE EXTERIOR BOLT (CLOSEST TO LAP), SPACER, WASHER, AND NUT SHALL BE INSTALLED IN A PREPUNCHED HOLE 1" to 2" FROM THE END OF THE LAP.
3. THE INTERIOR BOLT (FARTHEST FROM LAP), SPACER, WASHER, AND NUT SHALL BE INSTALLED IN THE NEXT PREPUNCHED HOLE.
4. THE DRIVEN POST SHALL ALWAYS BE MOUNTED IN FRONT OF THE UPPER POST WITH RESPECT TO THE ADJACENT ONCOMING TRAFFIC, REGARDLESS OF THE DIRECTION THE SIGN IS FACING.
5. THE SPLICE LAP SHALL BE FASTENED BY FOUR-5/16" DIA. GALVANIZED A449 BOLTS (SAE J429 GRADE 5) OR GALVANIZED A325 BOLTS.

**3 lb. U - CHANNEL STEEL POST**  
**(WITH SPLICE)**

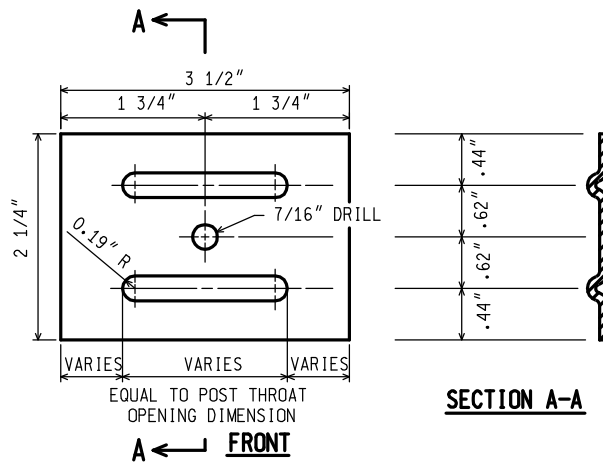
NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	PENDING	8/2006	WZD-100-A	SHEET 6 of 11
	FHWA APPROVAL DATE			
File:PW/Doc/RD/T&S/Typ/Dev/Sign MainTraf D/WZD-100-A Rev. 8/21/06 ECH		PLAN DATE		

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### SIGN TO 3 Ib. POST CONNECTION



#### NOTES: (FOR STEEL SIGN REINF' PLATE)

1. MATERIAL: 12 GAUGE CARBON STEEL.
2. TOLERANCE ON ALL DIMENSIONS  $\pm 0.0625''$
3. FINISH-AFTER STAMPING AND PUNCHING, GALVANIZE ACCORDING TO CURRENT SPECIFICATIONS FOR ZINC (HOT GALVANIZE) COATINGS ON PRODUCTS FABRICATED FROM PLATES OR STRIPS

### STEEL SIGN REINFORCING PLATE REQUIRED FOR TYPE III SIGNS ONLY

### 3 Ib. U - CHANNEL STEEL POST SIGN CONNECTION

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

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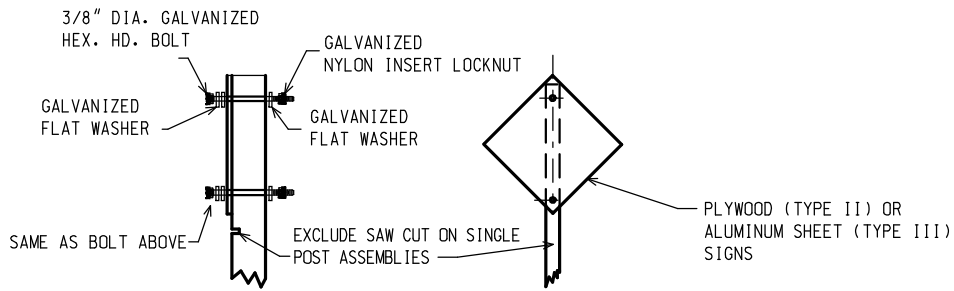
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7 of 11

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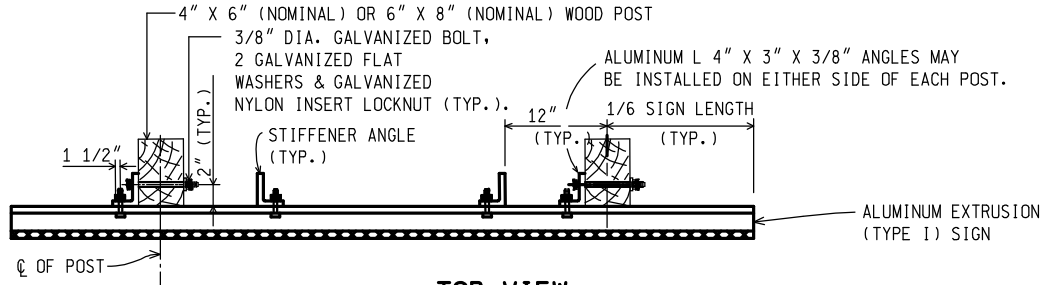
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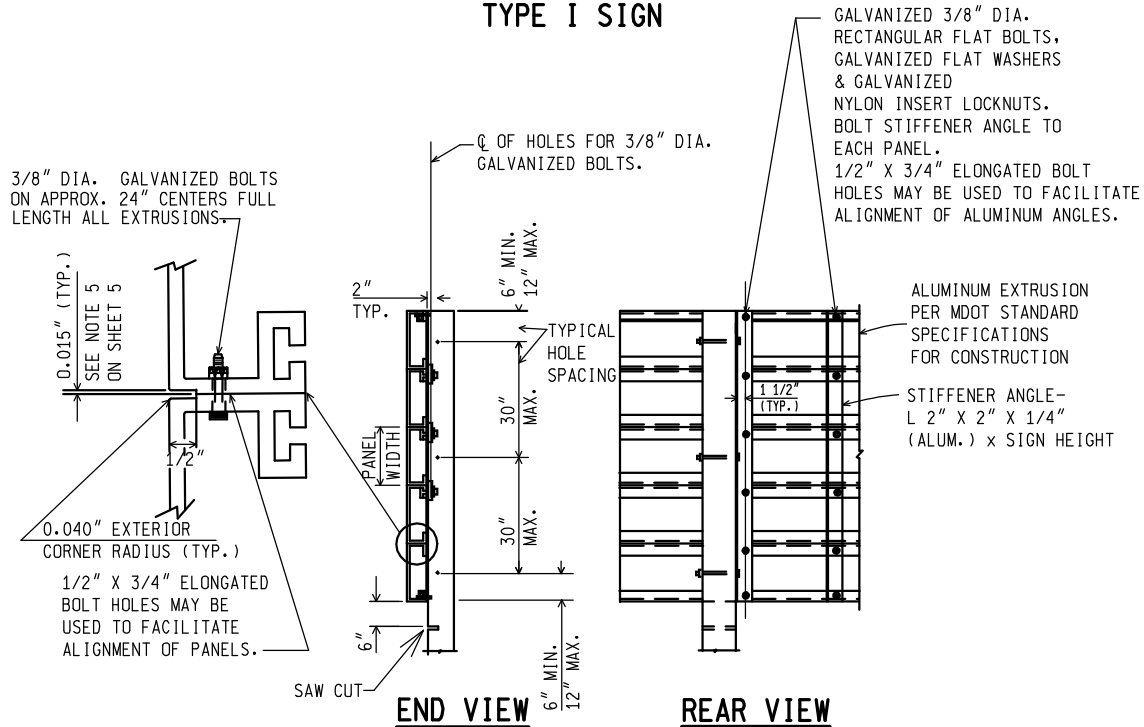


## TYPE II AND TYPE III SIGNS



## TOP VIEW TYPE I SIGN

3/8" DIA. GALVANIZED BOLTS ON APPROX. 24" CENTERS FULL LENGTH ALL EXTRUSIONS.



## TYPE I SIGN - ERECTION DETAILS

## WOOD POST CONNECTIONS

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

PENDING  
FHWA APPROVAL DATE

8/2006

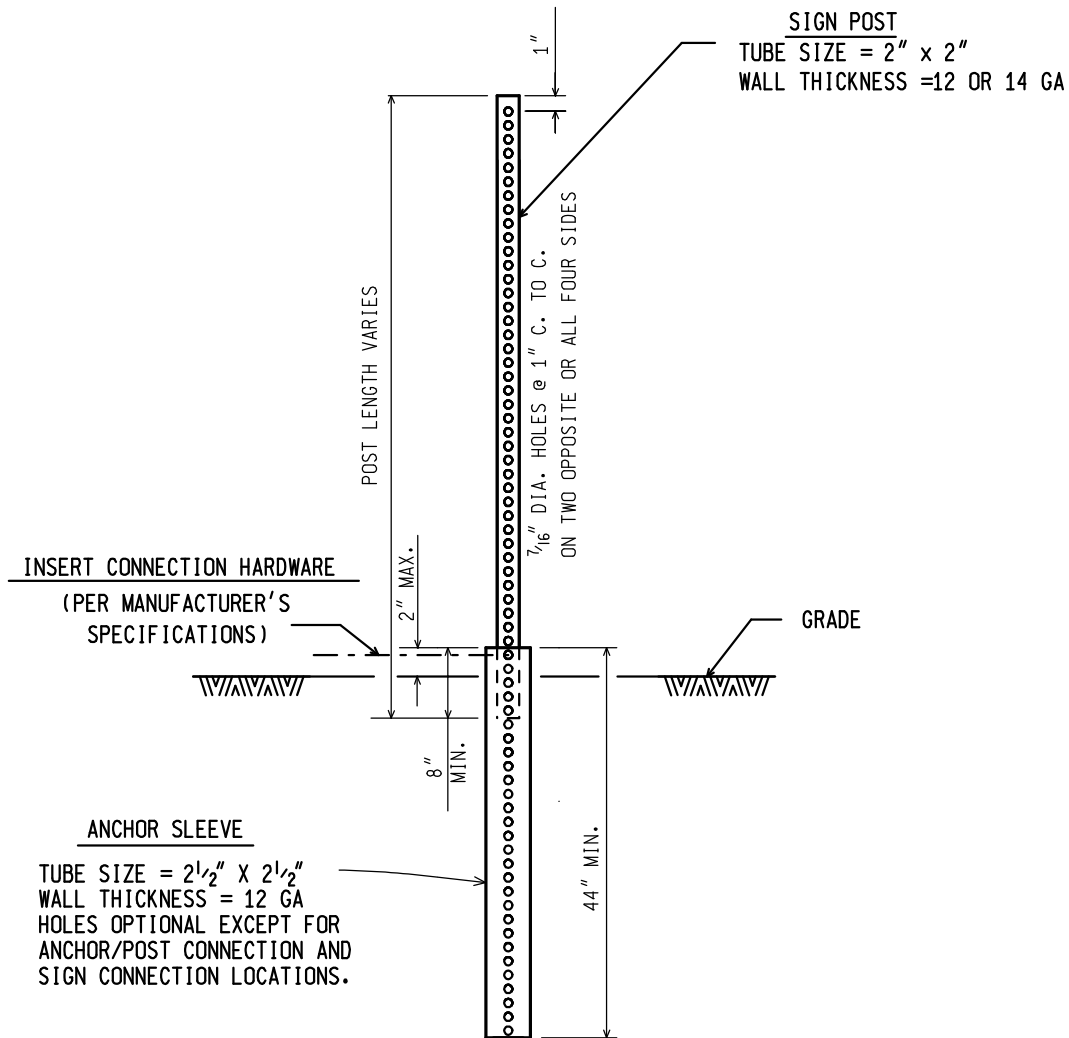
PLAN DATE

WZD-100-A

SHEET  
9 of 11

File:PW/Doc/RD/T&S/Typ/Dev/Sign MainTraf D/WZD-100-A Rev. 8/21/06 ECH

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## SQUARE TUBULAR STEEL POST

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
 BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN

PENDING  
 FHWA APPROVAL DATE

8/2006

PLAN DATE

WZD-100-A

SHEET  
 10 of 11

File:PW/Doc/RD/T&S/Typ/Dev/Sign MainTraf D/WZD-100-A Rev. 8/21/06 ECH

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GENERAL NOTES:

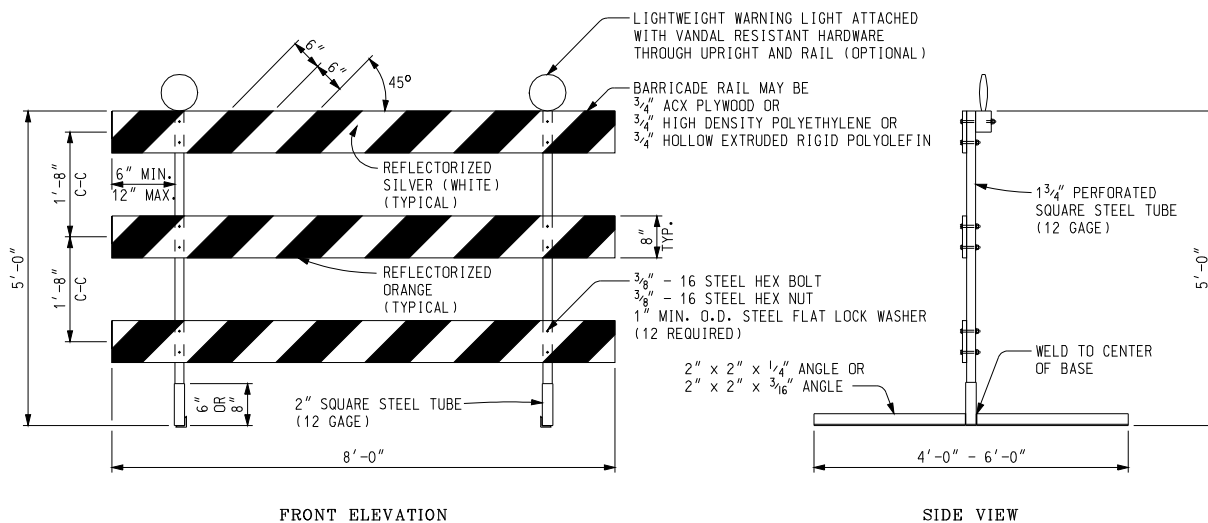
1. A MAXIMUM OF TWO POSTS WITHIN A 7 FOOT PATH IS PERMITTED.
2. ALL SIGN POSTS SHALL COMPLY WITH NCHRP 350.
3. ALL POSTS SHALL BE EMBEDDED A MINIMUM OF 42".
4. BRACING OF POST IS NOT PERMITTED.
5. SIGN SHALL BE LEVEL, AND UPRIGHT FOR THE DURATION OF INSTALLATION.
6. ERECT POSTS SO THE SIGN FACE AND SUPPORTS DO NOT VARY FROM PLUMB BY MORE THAN 3/16" IN 3'. PROVIDE A CENTER-TO-CENTER DISTANCE BETWEEN POSTS WITHIN 2 PERCENT OF PLAN DISTANCE.
7. NO MORE THAN ONE SPLICE PER POST, AS SHOWN, WILL BE PERMITTED.
8. POST TYPES SHALL NOT BE MIXED WITHIN A SIGN SUPPORT INSTALLATION.
9. NO VERTICAL JOINTS ARE PERMITTED IN SIGN. NO HORIZONTAL JOINTS THROUGH SIGN LEGEND OR SYMBOLS ARE PERMITTED IN SIGN
10. REMOVE SIGN POSTS AND/OR POST STUBS IN THEIR ENTIRETY WHEN NO LONGER REQUIRED.
11. ALL LABOR, MATERIALS, AND EQUIPMENT, INCLUDING TEMPORARY SUPPORTS REQUIRED TO INSTALL, MAINTAIN, RELOCATE, COVER, AND/OR REMOVE THE TEMPORARY SIGN, INCLUDING SUPPORTS, ARE CONSIDERED TO BE INCLUDED IN THE COST OF THE TEMPORARY SIGN.
12. SAW CUTS IN WOOD POSTS ARE TO BE PARALLEL TO THE BOTTOM OF THE SIGN.
13. POSTS SHALL NOT EXTEND MORE THAN 4" ABOVE TOP OF SIGN.

NOT TO SCALE

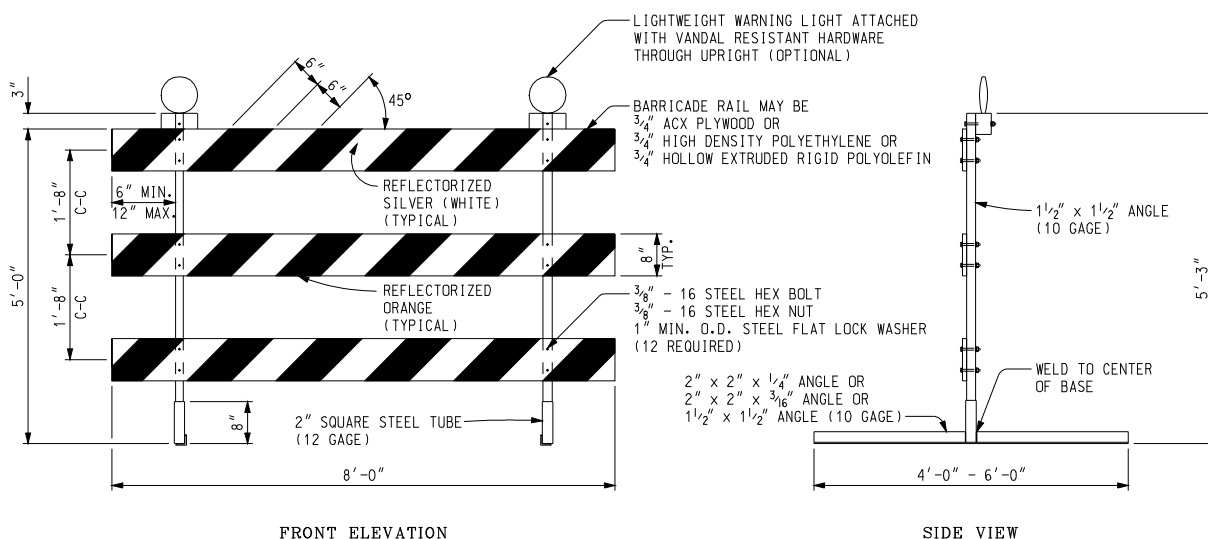
MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN File:PW/Doc/RD/T&S/Typ/Dev/Sign MainTraf D/WZD-100-A Rev. 8/21/06 ECH	PENDING	8/2006	WZD-100-A	SHEET 11 of 11
	FHWA APPROVAL DATE	PLAN DATE		

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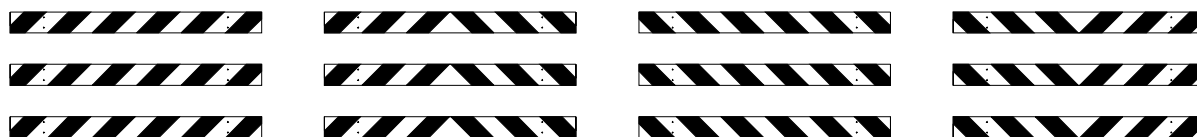




PERFORATED SQUARE STEEL TUBE OPTION



ANGLE IRON OPTION



LEFT DIRECTIONAL

BI-DIRECTIONAL

RIGHT DIRECTIONAL

CLOSURES

BARRICADE RAIL SHEETING OPTIONS  
TYPE III BARRICADES

Other Type III Barricades meeting current NCHRP crash worthy criteria can be found on the FHWA Safety website at  
[http://safety.fhwa.dot.gov/roadway\\_dept/road\\_hardware/wzd.htm](http://safety.fhwa.dot.gov/roadway_dept/road_hardware/wzd.htm)

NOT TO SCALE

File: T&S/Typ/Signs/WorkZones/wzd 125 d

Rev. 09/22/09 PJ



PREPARED BY  
TRAFFIC AND SAFETY

DRAWN BY: ECH

CHECKED BY: MWB

ENGINEER OF DELIVERY

ENGINEER OF DEVELOPMENT

(SPECIAL DETAIL)

FHWA APPROVAL DATE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN FOR

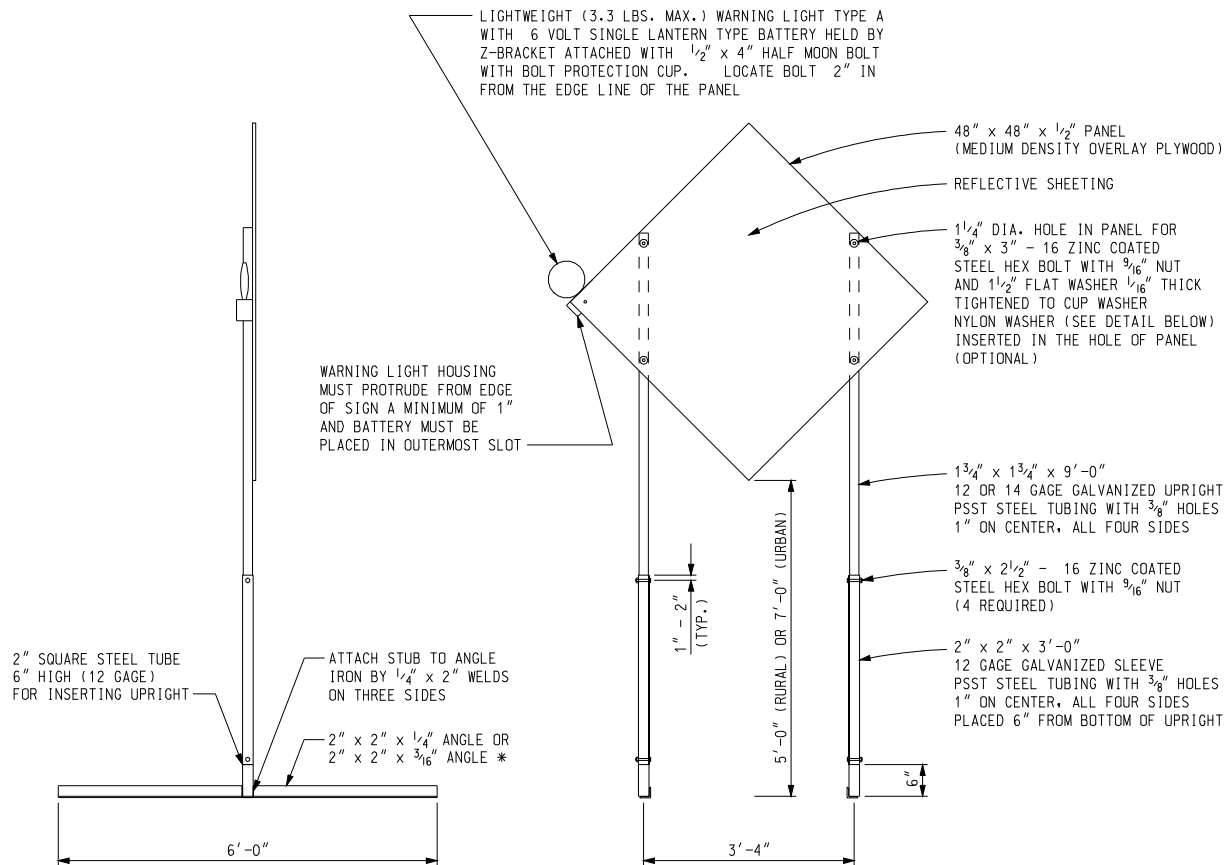
Temporary  
Traffic Control Devices

9/22/09  
PLAN DATE

WZD-125-E

SHEET  
1 of 3

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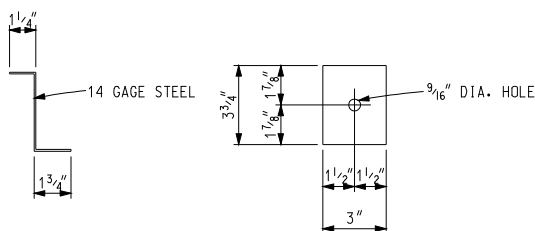
SIDE VIEW

FRONT ELEVATION

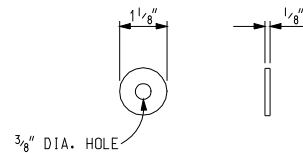
### TEMPORARY SIGN SUPPORT

(WARNING LIGHT PLACED ON SIDE CLOSEST TO TRAFFIC)

\* SIGN STAND IS BALLASTED WITH FOUR OR MORE 35 LB SANDBAGS. A MINIMUM OF ONE ON EACH END.  
UPRIGHTS SHALL NOT EXTEND ABOVE THE SIGN PANEL.



Z-BRACKET DETAIL



OPTIONAL NYLON WASHER

Other temporary sign supports meeting current NCHRP crash worthy criteria can be found on the FHWA Safety website at [http://safety.fhwa.dot.gov/roadway\\_dept/road\\_hardware/wzd.htm](http://safety.fhwa.dot.gov/roadway_dept/road_hardware/wzd.htm)

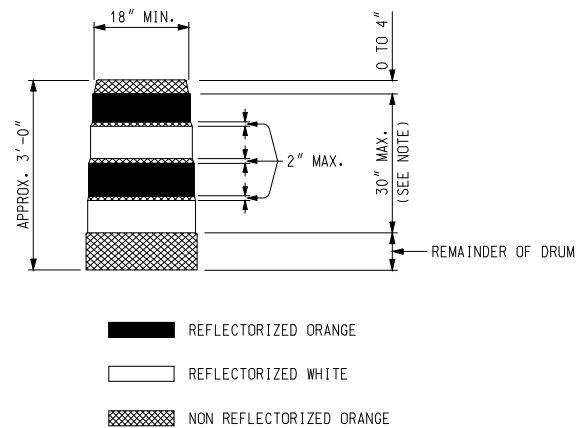
NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	9/22/09	WZD-125-E	SHEET 2 of 3
File: T&S/Typ/Signs/WorkZones/wzd 125 d	Rev. 09/22/09 PJ	PLAN DATE		

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- PLASTIC DRUM
- ▲ ▲ ▲ PROPOSED TYPE III BARRICADE
- △ △ △ EXISTING TYPE III BARRICADE

SYMBOLS TO BE USED ON PLANS



NOTE:  
DRUMS SHALL HAVE AT LEAST 4 HORIZONTAL REFLECTORIZED STRIPES (2 ORANGE AND 2 WHITE) OF 6" UNIFORM WIDTH, ALTERNATING IN COLOR WITH THE TOPMOST REFLECTORIZED STRIPE BEING ORANGE. NON REFLECTORIZED SPACES BETWEEN THE HORIZONTAL REFLECTORIZED ORANGE AND WHITE STRIPES SHALL BE ORANGE IN COLOR AND EQUAL IN WIDTH.

PLASTIC DRUM

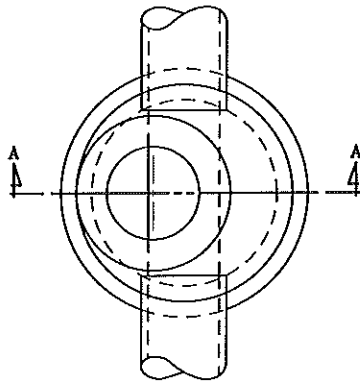
NOTES:

- 2" PERFORATED SQUARE STEEL TUBES MAY BE USED TO FABRICATE THE HORIZONTAL BASE OF THE TYPE III BARRICADE.
- WARNING LIGHTS SHALL BE PLACED ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION AND ALL OTHER PROVISIONS IN THE CONTRACT WHEN THEY ARE USED ON TYPE III BARRICADES.
- SEE ROAD STANDARD PLANS R-113-SERIES FOR TEMPORARY CROSSOVERS FOR DIVIDED ROADWAY, AND R-126-SERIES FOR TYPICAL LOCATION AND SPACING OF PLASTIC DRUMS FOR PLACEMENT OF TEMPORARY CONCRETE BARRIER.
- SIGNS, BARRICADES, AND PLASTIC DRUMS SHALL BE FACED WITH PRESSURE-SENSITIVE REFLECTIVE SHEETING ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS FOR CONSTRUCTION.
- SANDBAGS SHALL BE USED WHEN SUPPLEMENTAL WEIGHTS ARE REQUIRED TO ACHIEVE STABILITY OF THE BARRICADE. THE SANDBAGS SHALL BE PLACED SO THEY WILL NOT COVER OR OBSTRUCT ANY REFLECTIVE PORTION OF THE TRAFFIC CONTROL DEVICE.

NOT TO SCALE

MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAYS DELIVERY STANDARD PLAN	(SPECIAL DETAIL) FHWA APPROVAL DATE	9/22/09	WZD-125-E	SHEET 3 of 3
File: T&S/Typ/Signs/WorkZones/wzd 125 d	Rev. 09/22/09 PJ	PLAN DATE		

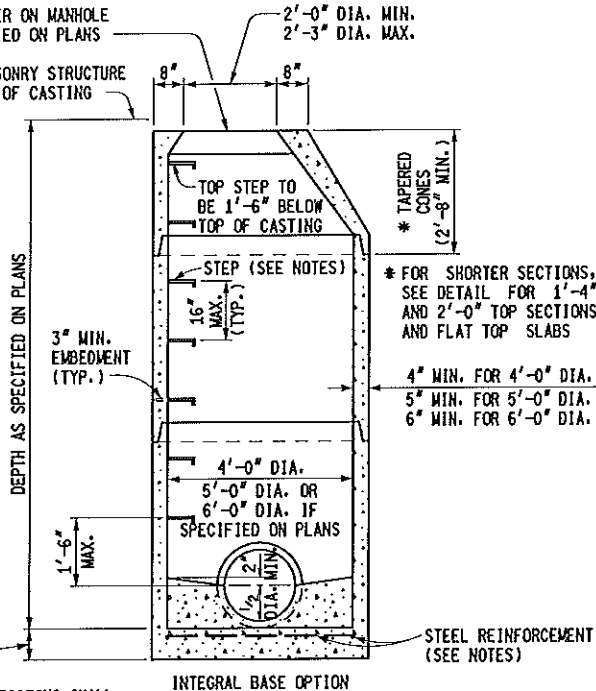
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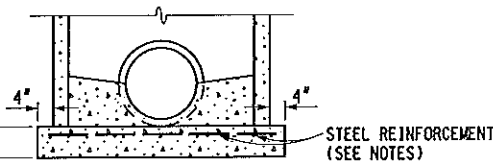
PLAN VIEW

PLACE COVER ON MANHOLE  
AS SPECIFIED ON PLANS

TOP OF MASONRY STRUCTURE  
OR BOTTOM OF CASTING



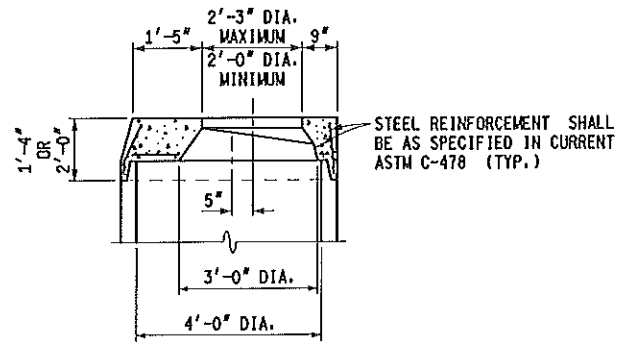
CONCRETE FOOTING SHALL  
BE 8" THICK FOR DEPTHS  
TO 25'-0" AND 1'-0"  
THICK FOR DEPTHS OVER  
25'-0"



CONCRETE FOOTING SHALL  
BE 8" THICK FOR DEPTHS  
TO 25'-0" AND 1'-0"  
THICK FOR DEPTHS OVER  
25'-0"

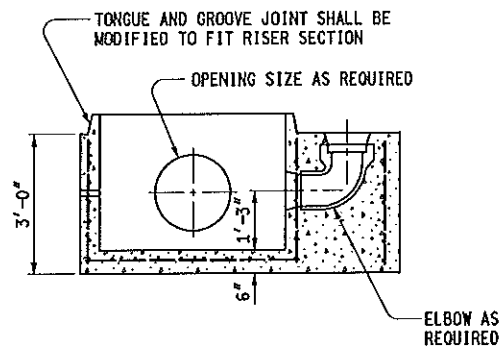
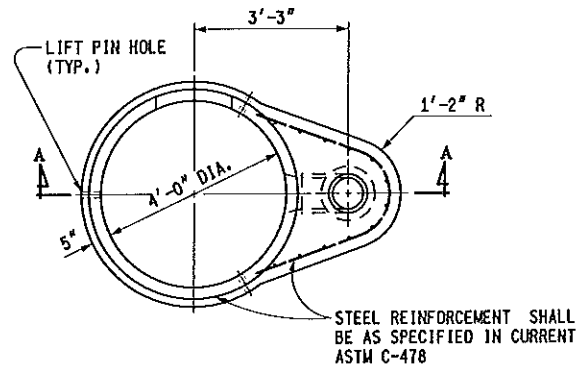
### SECTION A - A TYPICAL MANHOLE

PRECAST REINFORCED CONCRETE SHOWN  
OTHER OPTIONS INCLUDE CONCRETE BLOCK, BRICK, OR CAST-IN-PLACE WALL SECTIONS  
SEE TYPICAL WALL SECTIONS FOR WALL THICKNESS



### DETAIL FOR 1'-4" & 2'-0" TOP SECTIONS

SHAPE MAY VARY FROM DETAIL SHOWN BUT MUST COMPLY  
WITH ASTM C-478 AND JOINTS SHALL BE COMPATIBLE  
WITH THE RISER



### SECTION A - A

### TYPICAL PRECAST REINFORCED BOTTOM SECTION FOR DROP MANHOLE



PREPARED  
BY  
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR  
Kirk T. Staudle

APPROVED BY: \_\_\_\_\_  
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: \_\_\_\_\_  
DIRECTOR, BUREAU OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

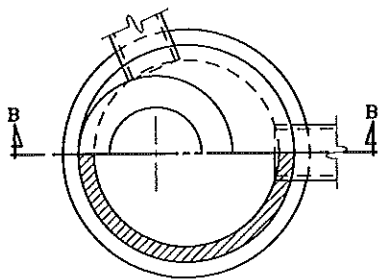
### DRAINAGE STRUCTURES

F.H.W.A. APPROVAL

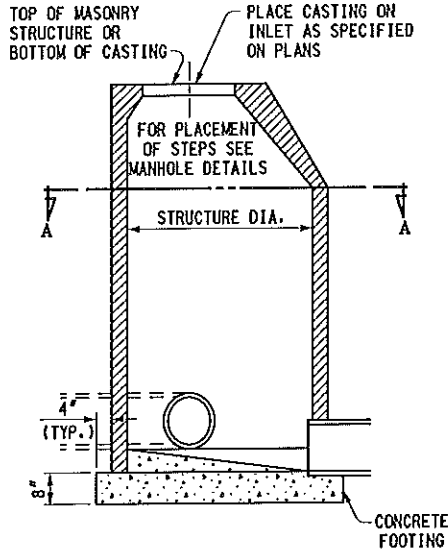
7-28-2015  
PLAN DATE

R-1-G

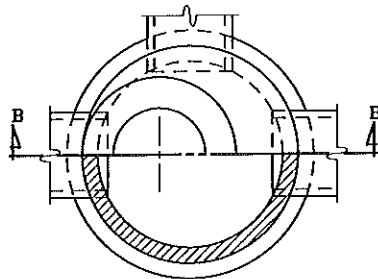
SHEET  
1 OF 9



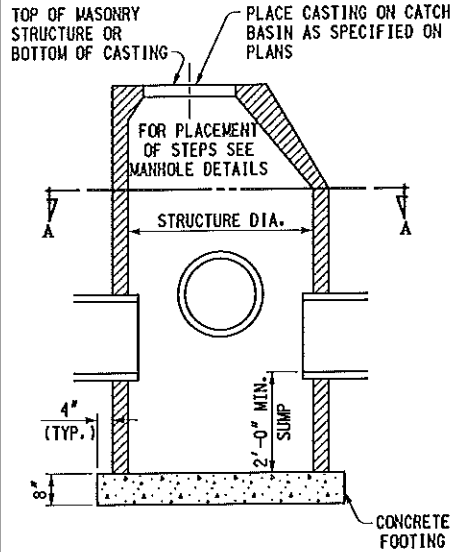
HALF SECTION A - A



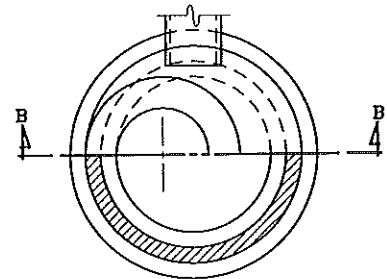
SEE MANHOLE DETAILS FOR SIZE AND BASE OPTIONS  
SECTION B - B  
INLET



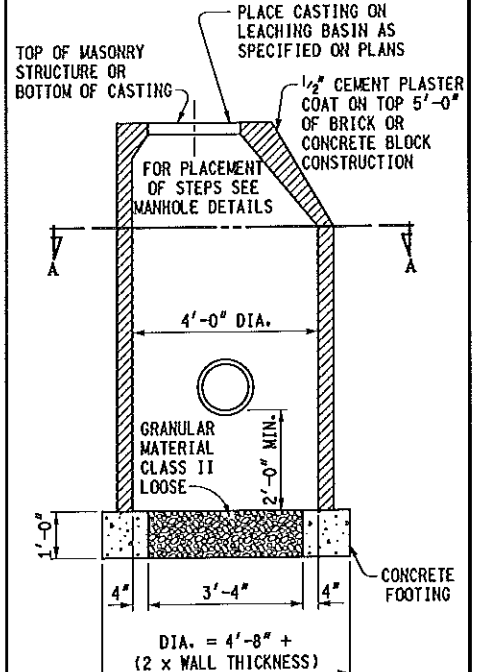
HALF SECTION A - A



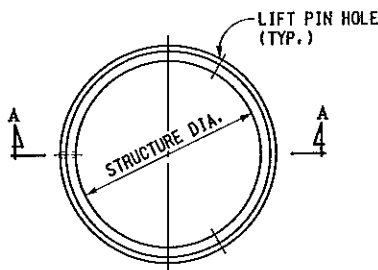
SEE MANHOLE DETAILS FOR SIZE AND BASE OPTIONS  
SECTION B - B  
CATCH BASIN



HALF SECTION A - A

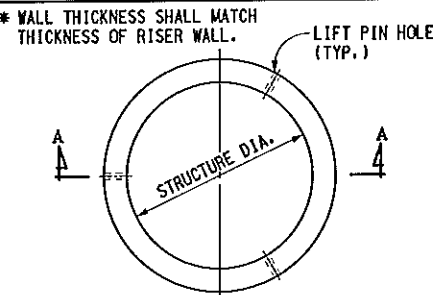


SEE MANHOLE DETAILS FOR BASE OPTIONS  
SECTION B - B  
LEACHING BASIN



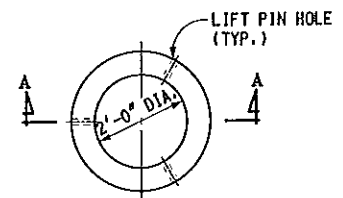
SECTION A - A  
SEE MANHOLE DETAILS FOR SIZE AND BASE OPTIONS

PRECAST SUMP  
FOR PRECAST RISERS



\* WALL THICKNESS SHALL MATCH THICKNESS OF RISER WALL.  
SECTION A - A  
SEE TYPICAL BRICK AND BLOCK SECTION FOR SIZE AND BASE OPTIONS

PRECAST SUMP FOR BRICK  
OR BLOCK CONSTRUCTION



SECTION A - A

PRECAST SUMP FOR  
2'-0" DIA. STRUCTURES

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

## DRAINAGE STRUCTURES

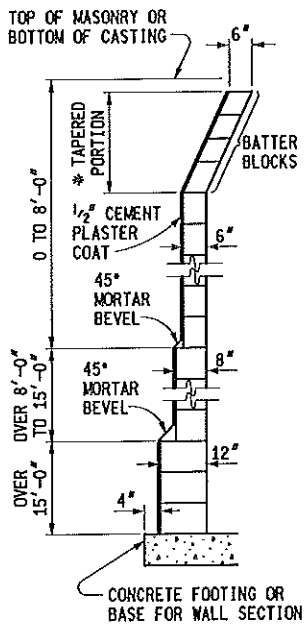
F.H.W.A. APPROVAL

7-28-2015  
PLAN DATE

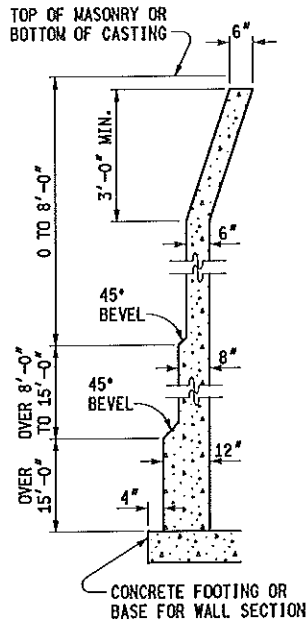
R-1-G

SHEET  
2 OF 9

\* 4 BLOCK MIN. FOR 4'-0" DIA. STRUCTURE  
 6 BLOCK MIN. FOR 5'-0" DIA. STRUCTURE  
 6 BLOCK MIN. FOR 6'-0" DIA. STRUCTURE

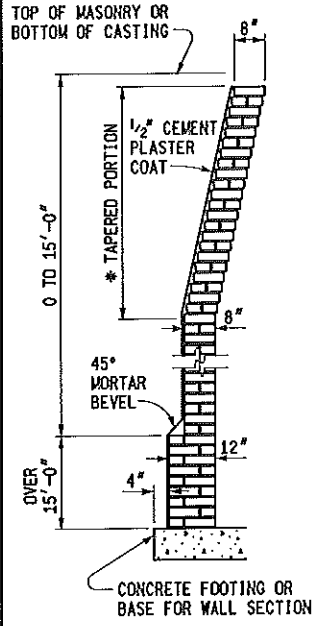


TYPICAL  
 CONCRETE BLOCK  
 WALL SECTION

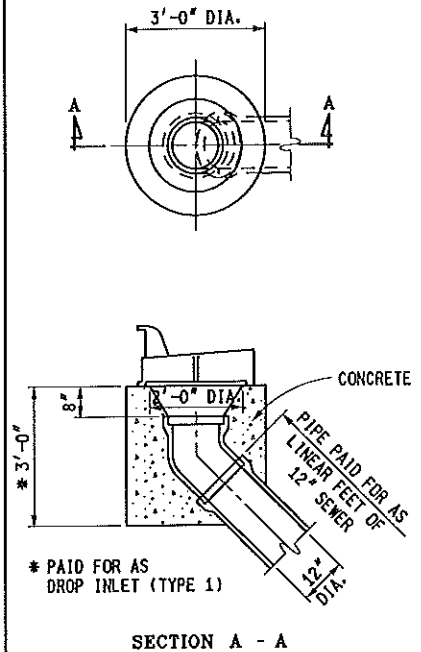


TYPICAL  
 CAST-IN-PLACE  
 CONCRETE  
 WALL SECTION

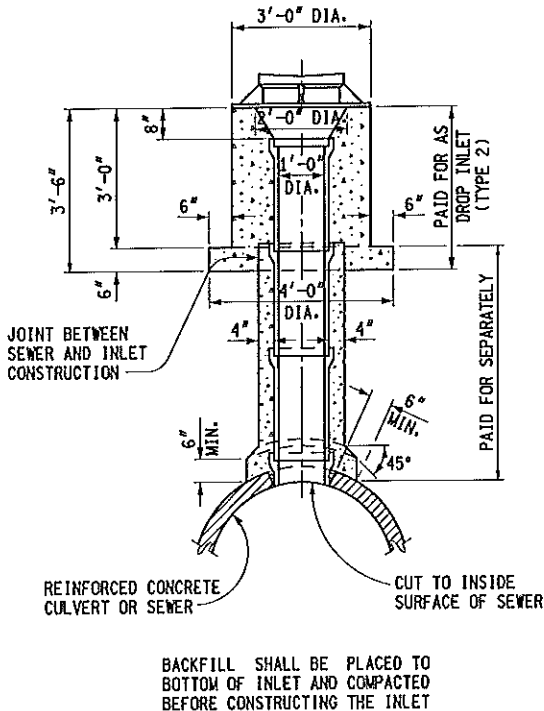
\* 5'-0" MIN. FOR 4'-0" DIA. STRUCTURE  
 6'-0" MIN. FOR 5'-0" DIA. STRUCTURE  
 6'-0" MIN. FOR 6'-0" DIA. STRUCTURE



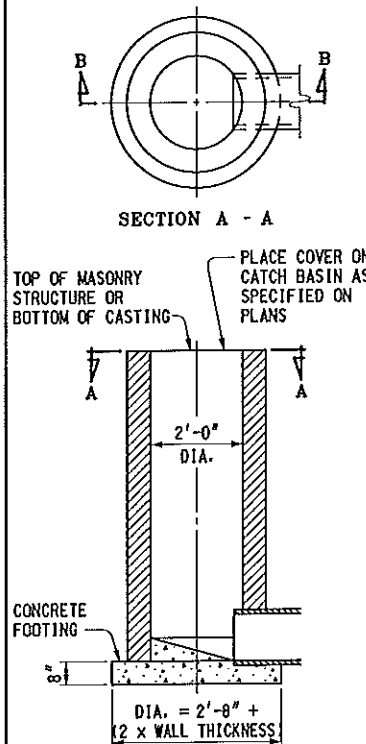
TYPICAL BRICK  
 WALL SECTION



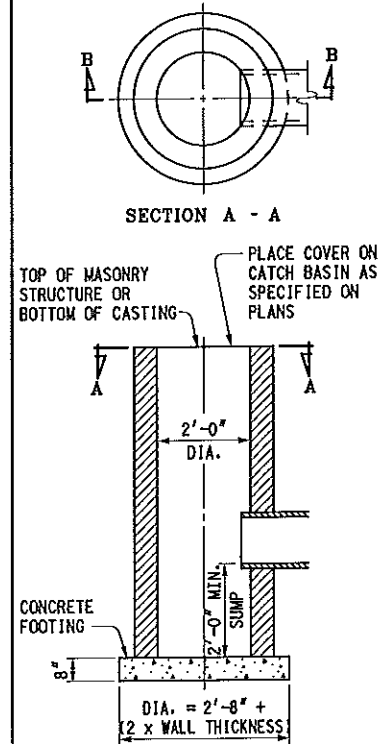
DROP INLET (TYPE 1)



DROP INLET (TYPE 2)



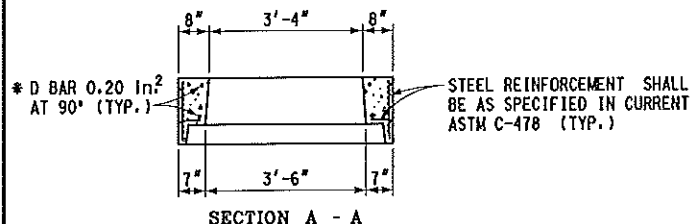
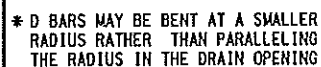
INLET



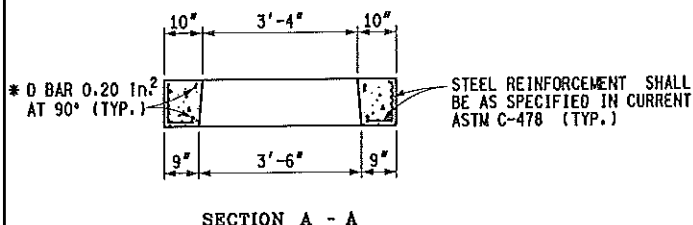
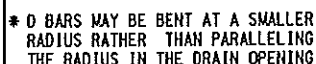
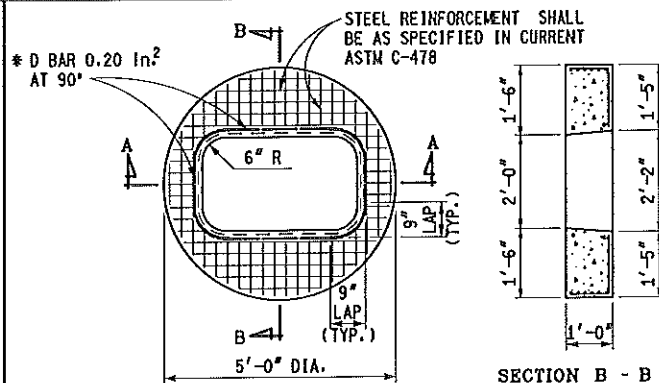
CATCH BASIN

MICHIGAN DEPARTMENT OF TRANSPORTATION  
 BUREAU OF DEVELOPMENT STANDARD PLAN FOR

# DRAINAGE STRUCTURES



PRECAST FLAT SLAB TOP FOR PRECAST  
CONCRETE STRUCTURE, 2' x 4' CASTING



PRECAST FLAT SLAB TOP FOR  
MASONRY STRUCTURE, 2' x 4' CASTING

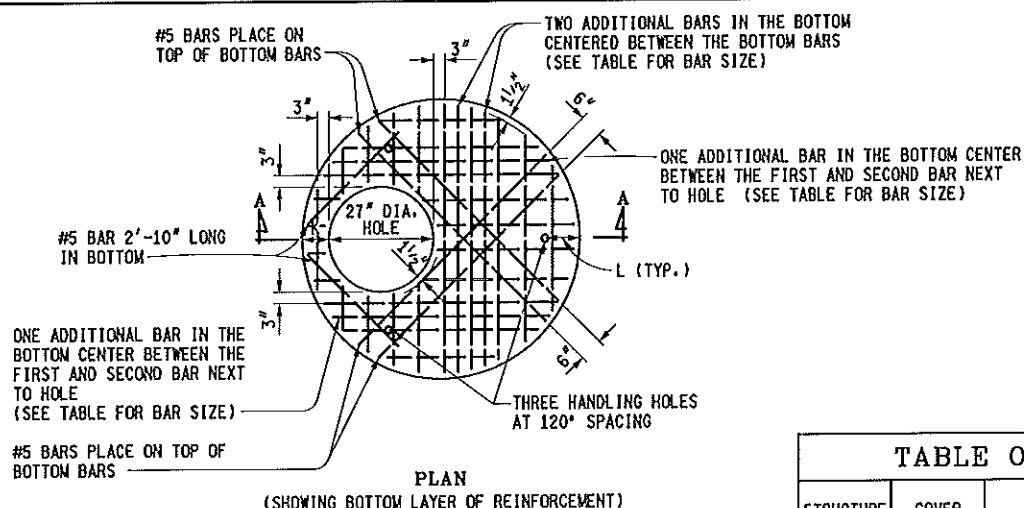


Diagram illustrating the dimensions and components of a drainage structure:

- COVER DIAMETER**: The overall diameter of the cover.
- #4 BARS AT 10" MAXIMUM SPACING EACH WAY (TOP)**: Reinforcement bars in the top slab.
- EXCEPT 4'-0" DIAMETER**: Note for larger diameters.
- 27" DIA. HOLE**: The diameter of the main opening.
- 2" DIA. PLUG (MIN.)**: The minimum diameter of the plug.
- K**: A dimension indicating a small offset or gap.
- DRAINAGE STRUCTURE DIAMETER**: The diameter of the structure below the cover.
- 1 1/2" (TYP.)**: A typical dimension for a small gap or offset.

SECTION A - A  
PRECAST REINFORCED CONCRETE FLAT SLAB TOP

TABLE OF DIMENSIONS					
STRUCTURE DIAMETER	COVER DIAMETER	T	X	L	BAR MAXIMUM SPACING (BOTTOM EACH WAY)
4'-0"	58"	6"	6"	8"	#5 AT 6"
5'-0"	72"	8"	7"	9"	#5 AT 7"
6'-0"	86"	8"	8"	10"	#5 AT 6"
7'-0"	101 1/2"	12"	8 3/4"	11"	#5 AT 5"
8'-0"	114"	12"	9"	11"	#6 AT 6"
9'-0"	128"	12"	10"	12"	#5 AT 6"
10'-0"	140"	12"	10"	13"	#5 AT 6"

\* ONLY BOTTOM LAYERS OF STEEL NECESSARY

MICHIGAN DEPARTMENT OF TRANSPORTATION  
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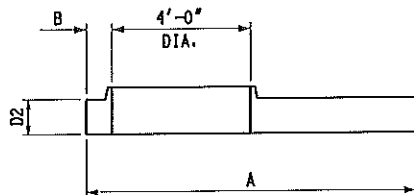
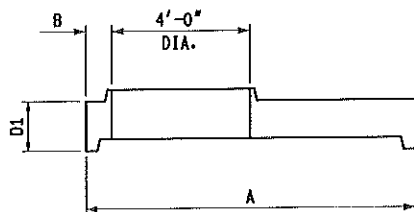
## DRAINAGE STRUCTURES

F.H.W.A. APPROVAL

7-28-2015  
PLAN DATE

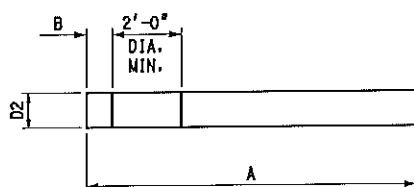
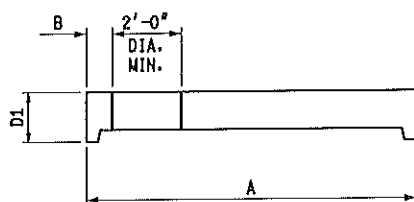
R-1-G

SHEET  
4 OF 9



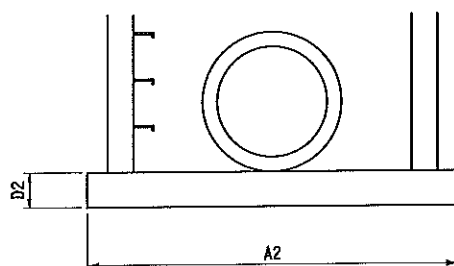
PRECAST REDUCER CAP

REDUCER CAP DIMENSIONS				
STRUCTURE DIAMETER	CAP DIAMETER "A"	B	CAP DEPTH "D1"	CAP DEPTH "D2"
7'-0"	101 1/2"	8 3/4"	1'-5"	12"
8'-0"	114"	9"	1'-5"	12"
9'-0"	128"	10"	1'-5"	12"
10'-0"	140"	10"	1'-6"	12"



PRECAST FLAT SLAB TOP

FLAT SLAB TOP DIMENSIONS				
STRUCTURE DIAMETER	COVER DIAMETER "A"	B	COVER DEPTH "D1"	COVER DEPTH "D2"
7'-0"	101 1/2"	8 3/4"	1'-5"	12"
8'-0"	114"	9"	1'-5"	12"
9'-0"	128"	10"	1'-5"	12"
10'-0"	140"	10"	1'-6"	12"



SEPARATE BASE OPTION

BASE AND RISER DIMENSIONS					
STRUCTURE DIAMETER	BASE DIAMETER "A1"	BASE DIAMETER "A2"	MIN. WALL THICKNESS "T"	BASE DEPTH "D1"	BASE DEPTH "D2"
7'-0"	101 1/2"	108"	7"	8"	12"
8'-0"	114"	128"	8"	8"	12"
9'-0"	128"	140"	9"	8"	12"
10'-0"	140"	154"	10"	8"	12"

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

## DRAINAGE STRUCTURES

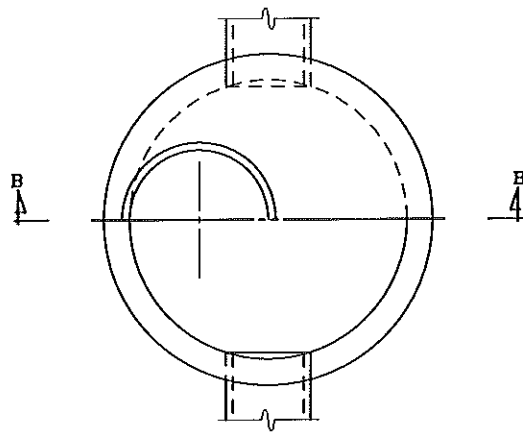
F.H.W.A. APPROVAL

7-28-2015  
PLAN DATE

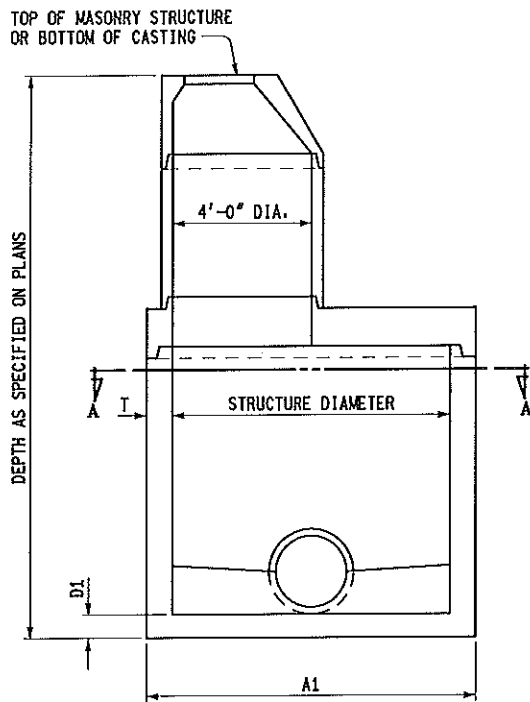
R-1-G

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5 OF 9

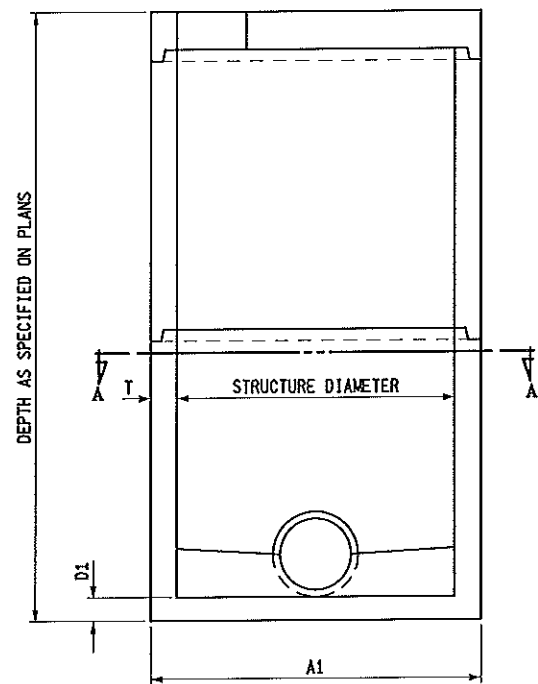




HALF SECTION A - A



SECTION B - B  
SHOWING REDUCER CAP



SECTION B - B  
SHOWING FLAT SLAB TOP

# PRECAST MANHOLE

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

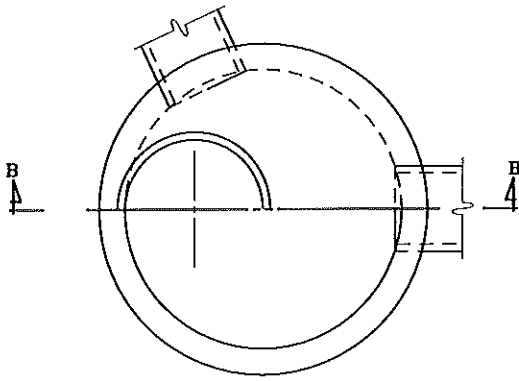
## DRAINAGE STRUCTURES

F.H.W.A. APPROVAL

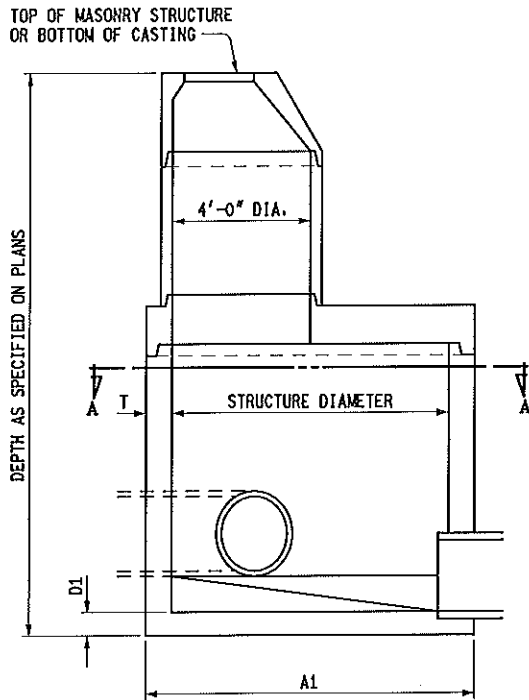
7-28-2015  
PLAN DATE

R-1-G

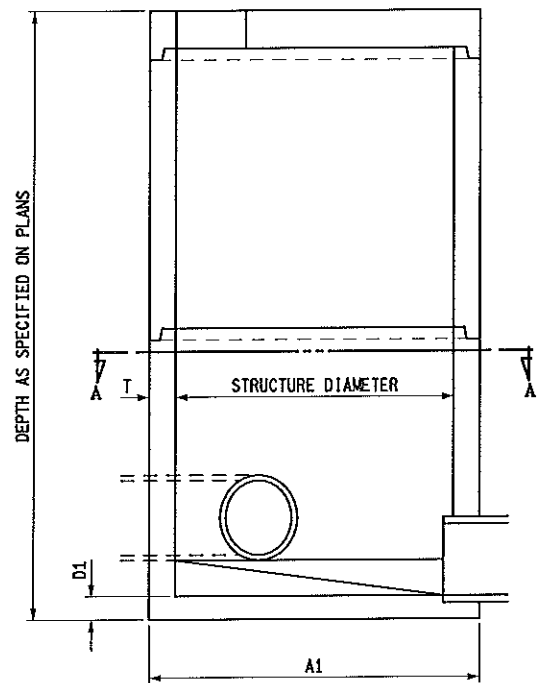
SHEET  
6 OF 9



HALF SECTION A - A



SECTION B - B  
SHOWING REDUCER CAP



SECTION B - B  
SHOWING FLAT SLAB TOP

# PRECAST INLET

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

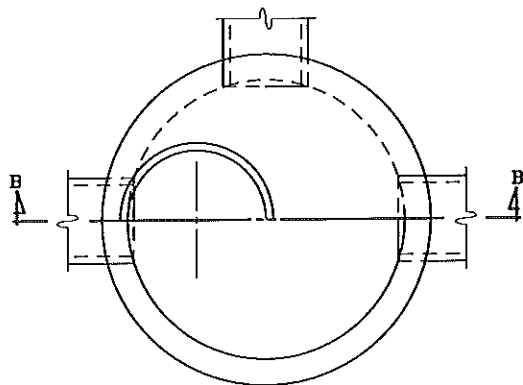
## DRAINAGE STRUCTURES

F.H.W.A. APPROVAL

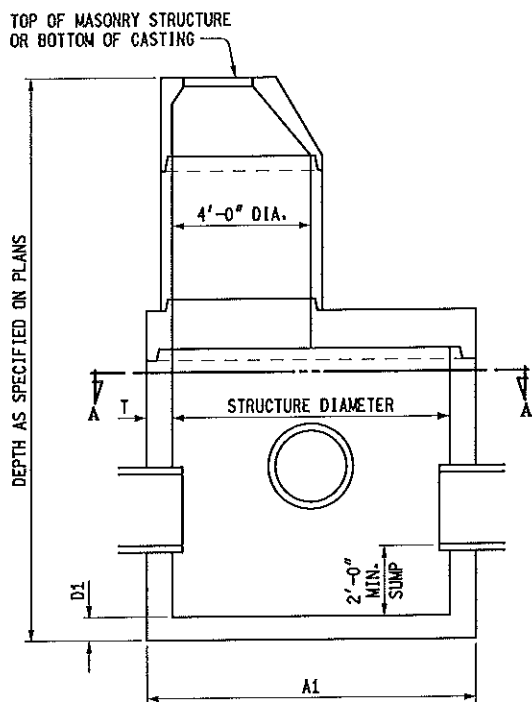
7-28-2015  
PLAN DATE

R-1-G

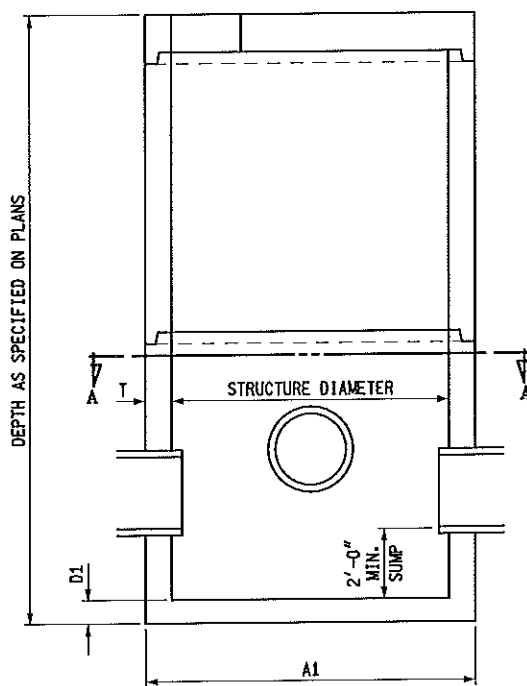
SHEET  
7 OF 9



HALF SECTION A - A



SECTION B - B  
SHOWING REDUCER CAP



SECTION B - B  
SHOWING FLAT SLAB TOP

# PRECAST CATCH BASIN

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

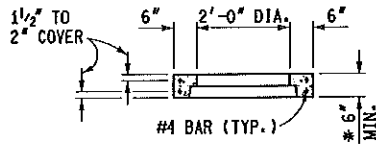
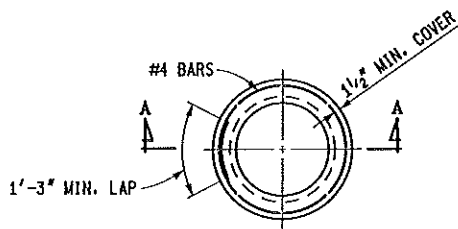
## DRAINAGE STRUCTURES

F.H.W.A. APPROVAL

7-28-2015  
PLAN DATE

R-1-G

SHEET  
8 OF 9



SECTION A - A

- \* WHEN RISER TONGUE LENGTH IS GREATER THAN 3", USE 2 TIMES THE TONGUE LENGTH.

NOTE: PRECAST RISER SHALL FULLY ENGAGE THE TONGUE OF THE RISER PIPE.

### PRECAST RISER RING (FOR 2'-0" DIAMETER STRUCTURE)

#### NOTES:

THE DRAINAGE STRUCTURE COVERS ALLOWED FOR USE ON THESE DRAINAGE STRUCTURES ARE SPECIFIED IN SUBSEQUENT STANDARD PLANS AND ARE INTERCHANGEABLE ON ANY STRUCTURE.

THE TOPS OF MASONRY STRUCTURES SHALL BE SUFFICIENTLY LOW TO PERMIT PROPER ADJUSTMENT OF COVER TO GRADE USING MORTAR OR BRICK AS DIRECTED BY THE ENGINEER.

PREMIUM JOINTS ARE REQUIRED ON ALL SANITARY MANHOLES. SEE ASTM DESIGNATION C-923.

GRANULAR MATERIAL CLASS III SHALL BE USED IN BACKFILLING AROUND ALL STRUCTURES THAT FALL WITHIN THE 1:1 INFLUENCE LINES FROM THE EDGE OF PAVEMENT OR BACK OF CURB.

STEPS FOR DRAINAGE STRUCTURES SHALL BE OF AN APPROVED DESIGN AND MADE FROM CAST IRON, ALUMINUM, OR PLASTIC COATED STEEL. RUNGS SHALL BE A MINIMUM OF 10" IN CLEAR LENGTH, DESIGNED TO PREVENT THE FOOT FROM SLIPPING OFF THE END. THE MINIMUM HORIZONTAL PULL OUT LOAD SHALL BE 400 LBS. THE MINIMUM VERTICAL LOAD SHALL BE 800 LBS.

THE BELL SHALL BE REMOVED FOR THE FIRST LENGTH OF OUTLET PIPE PROJECTING THROUGH THE WALL OF THE MANHOLE.

PRECAST CONCRETE SECTIONS, SUMPS, AND FLAT TOP SLABS SHALL BE BUILT ACCORDING TO CURRENT ASTM C-478 AND ACCORDING TO DETAILS SPECIFIED ON THIS PLAN. PRECAST REINFORCED CONCRETE FLAT TOP SLAB SHALL BE MARKED TO SHOW LOCATION OF REINFORCEMENT. THE WALLS OF THE PRECAST UNITS MAY HAVE A SLIGHT TAPER TO ALLOW FOR FORM REMOVAL. PRECAST CONCRETE 2'-0" DIAMETER DRAINAGE STRUCTURES SHALL HAVE A MINIMUM 3" WALL THICKNESS WITH A 6" MINIMUM BEARING SURFACE ON TOP. SEE PRECAST RISER RING FOR 2'-0" DIAMETER STRUCTURE.

THE INSIDE DIAMETER OF PIPES ENTERING OR LEAVING PRECAST DRAINAGE STRUCTURES SHALL BE LESS THAN THE INSIDE DIAMETER OF THE DRAINAGE STRUCTURE MINUS 2'-0". A PIPE LEAVING A 2'-0" DIAMETER DRAINAGE STRUCTURE IS ALLOWED TO HAVE 1'-0" INSIDE DIAMETER OR LESS.

THE NUMBER OF PIPE OPENINGS IN A RISER SHALL BE DETERMINED BY THE DESIGNER. SPACING BETWEEN OPENINGS SHALL BE 1'-0" MINIMUM. OPENINGS MAY BE CONSTRUCTED BY CASTING OR SCRIBING IN PRECAST STRUCTURES DURING FABRICATION OR BY CORING THE CURED CONCRETE.

PRECAST CONCRETE FOOTINGS OR BASES SHALL BE REINFORCED WITH #4 BARS SPACED AT 1'-0" BOTH WAYS OR WITH TWO LAYERS OF WELDED WIRE FABRIC OF EQUIVALENT CROSS SECTIONAL AREA LAID AT RIGHT ANGLES AND WIRED TOGETHER. REINFORCEMENT SHALL BE PLACED IN TOP OF FOOTING AND SHALL BE MARKED.

PRECAST CONCRETE FOOTINGS SHALL BE SUPPORTED BY A COMPACTED 6" GRANULAR SUBBASE.

THE MINIMUM WALL THICKNESS FOR ALL 2'-0", 4'-0", 5'-0", AND 6'-0" DRAINAGE STRUCTURES USING CONCRETE BLOCK, BRICK, OR CAST-IN-PLACE CONCRETE SHALL BE AS SPECIFIED IN TYPICAL WALL SECTIONS.

THE CONICAL SECTION OF MANHOLES OR CATCH BASINS CONSTRUCTED OF BLOCK OR BRICK SHALL BE SHROUDED WITH GEOTEXTILE FABRIC TO A MINIMUM DEPTH OF 5'-0" OR THROUGH THE FROST ZONE. ENOUGH GEOTEXTILE MATERIAL SHALL BE LEFT ON THE TOP (8" OR MORE) TO ROLL OVER THE TOP OF THE CONE.

PERFORMED HIGH DENSITY POLYSTYRENE FILLER PIECES MAY BE USED TO CHANNEL FLOW IN THE BOTTOM OF MANHOLES PROVIDED THEY HAVE AT LEAST 2" OF CONCRETE COVER. THE USE OF THIS MATERIAL FOR CHANNEL FLOW IS RESTRICTED TO MANHOLES WHERE THE BOTTOM SECTION IS NOT SUBJECT TO FREEZING. THE USE OF THIS MATERIAL MUST BE APPROVED BY THE ENGINEER.

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF DEVELOPMENT STANDARD PLAN FOR

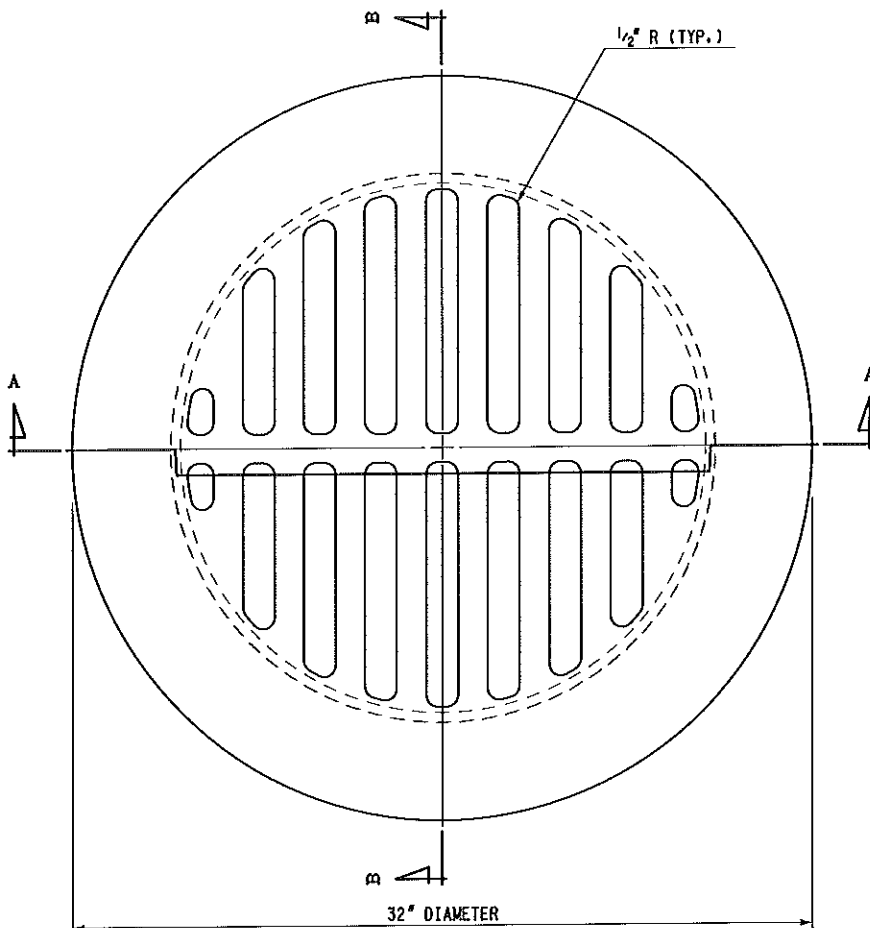
## DRAINAGE STRUCTURES

F.H.W.A. APPROVAL

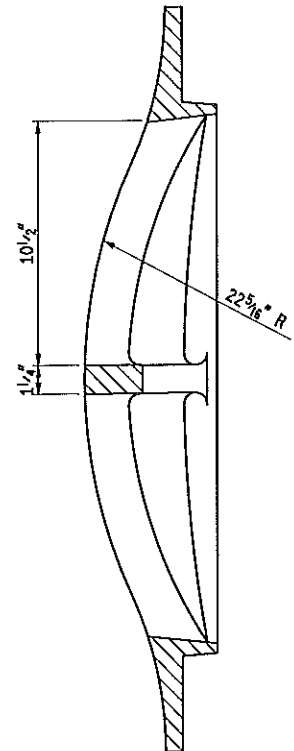
7-28-2015  
PLAN DATE

R-1-G

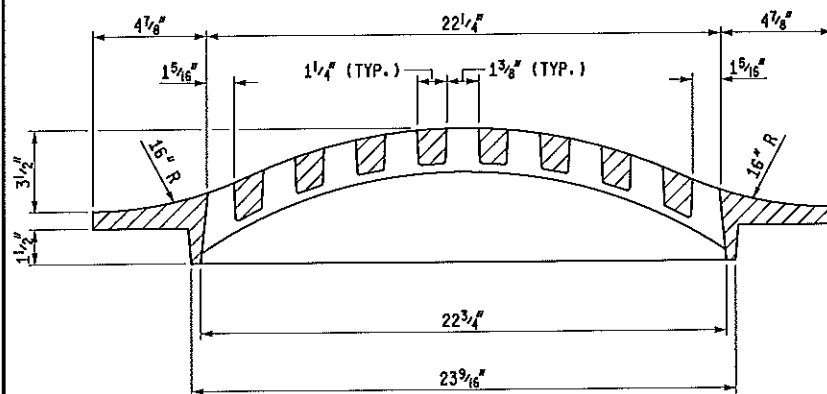
SHEET  
9 OF 9



PLAN VIEW



SECTION B - B



SECTION A - A

NOTES:

THE CASTINGS SHALL MEET THE REQUIREMENTS OF THE CURRENT STANDARD SPECIFICATION FOR GRAY IRON CASTINGS.

ALL CASTINGS SHALL BE CLEANED BY CURRENT APPROVED BLASTING METHODS.

THE CASTINGS SHALL BE FREE OF POURING FAULTS, BLOW HOLES, CRACKS AND OTHER IMPERFECTIONS. THEY SHALL BE SOUND, TRUE TO FORM AND THICKNESS, CLEAN AND NEATLY FINISHED, AND SHALL BE COATED WITH COAL TAR PITCH VARNISH.

THE CASTING SHALL BE SET IN SOFT MORTAR BED TO THE ELEVATION SPECIFIED ON THE PLANS AND IN SUCH A MANNER AS TO PROVIDE A FIRM AND UNIFORM BEARING ON THE MASONRY WALL.

THIS COVER IS DESIGNED TO FIT ON ANY INLET, CATCH BASIN OR ON ANY EXISTING SIMILAR STRUCTURE WHEN SO DESIGNATED ON THE PLANS.



PREPARED  
BY  
DESIGN DIVISION

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR  
Kirk T. Steudle

APPROVED BY:

*Randy V. Puffel*  
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

**COVER G**  
FOR USE IN DITCHES AND AREAS  
SUBJECT TO MINOR TRAFFIC

9-30-2014

F.H.W.A. APPROVAL

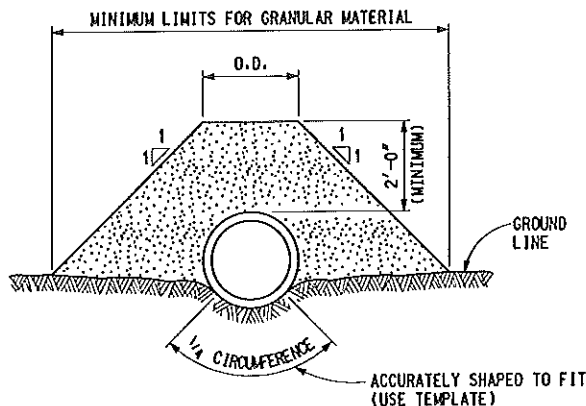
3-13-2014

PLAN DATE

R-12-E

SHEET  
1 OF 1

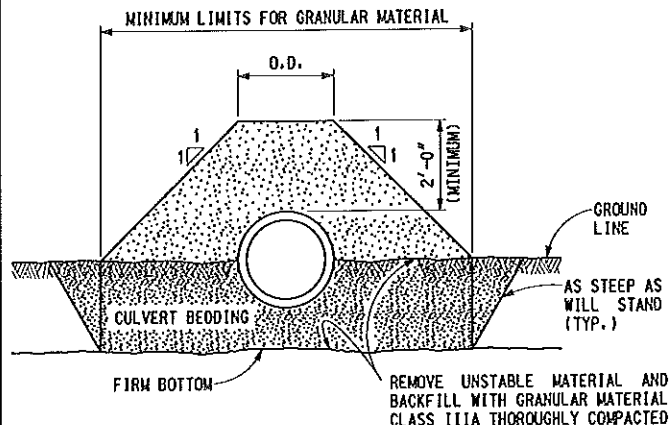
EMBANKMENT BETWEEN GROUND LINE AND 2'-0" MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10" IN THICKNESS.



NOTE:  
TRENCH MAY BE UNDERCUT BELOW CULVERT AND THE UNDERCUT MATERIAL REPLACED WITH GRANULAR MATERIAL.

CROSS-SECTION SHOWING CULVERT  
INSTALLATION IN STABLE SOIL

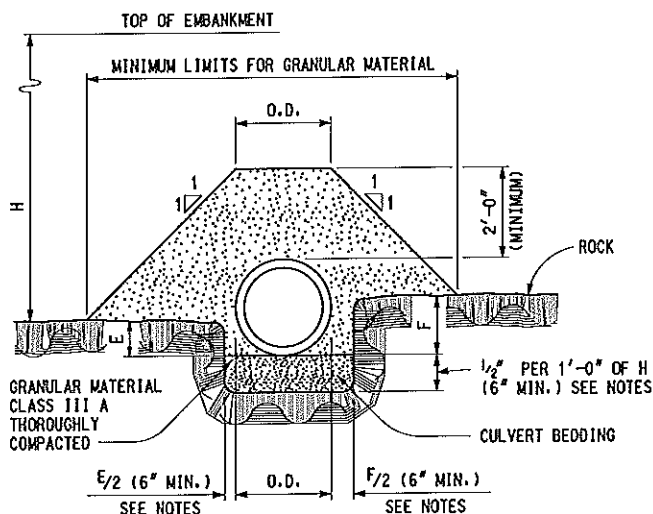
EMBANKMENT BETWEEN GROUND LINE AND 2'-0" MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10" IN THICKNESS.



NOTE:  
PLACE AND COMPACT CULVERT BEDDING TO THE LEVEL OF  $\frac{1}{4}$  THE DIAMETER OF THE PIPE CULVERT AND THEN EXCAVATE AND SHAPE A TRENCH TO FIT THE PIPE. AFTER PLACING CULVERT, CONTINUE FILLING WITH CULVERT BEDDING TO GROUND LINE.

CROSS-SECTION SHOWING CULVERT  
INSTALLATION IN UNSTABLE SOIL

EMBANKMENT BETWEEN GROUND LINE AND 2'-0" MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10" IN THICKNESS.



NOTE:  
PLACE AND COMPACT GRANULAR MATERIAL CLASS IIIA TO THE LEVEL OF  $\frac{1}{4}$  THE DIAMETER OF THE PIPE CULVERT AND THEN EXCAVATE AND SHAPE A TRENCH TO FIT THE PIPE.

CROSS-SECTION SHOWING CULVERT  
INSTALLATION IN ROCK

#### NOTES:

CORRUGATED STEEL PIPE, CORRUGATED POLYETHYLENE, AND ALUMINUM ALLOY PIPE SHALL HAVE A MINIMUM OF 12" OF GRANULAR MATERIAL CLASS IIIA PLACED COMPLETELY AROUND THE PIPE FOR ITS FULL LENGTH EXCEPT FOR BEDDING.

THE ENGINEER SHALL DESIGNATE THE REQUIRED DETAIL BASED ON SOIL CONDITIONS ENCOUNTERED.

UNSTABLE SOIL IS SOIL TOO SOFT OR SPONGY TO PROVIDE A FIRM BED FOR THE PIPE CULVERT.

NO REDUCTION SHALL BE MADE IN THE REGULAR EMBANKMENT QUANTITY FOR THE SPACE OCCUPIED BY THE CULVERT.

PIPE CULVERTS IN CUT SECTIONS SHALL BE PLACED ACCORDING TO THE DETAILS SPECIFIED ON STANDARD PLAN R-83-SERIES.

WHEN AN END SECTION IS USED IN LIEU OF A HEADWALL, A STABLE FOUNDATION SHALL BE PROVIDED FOR THE END SECTION COMPARABLE TO THAT PROVIDED BY THE CULVERT.

WHEN BELL AND SPIGOT PIPE IS USED IN A ROCK TRENCH, A MINIMUM OF 4" OF CULVERT BEDDING WILL BE REQUIRED UNDER THE BELL.



PREPARED BY  
DESIGN  
SUPPORT AREA

DRAWN BY: B.L.T.  
CHECKED BY: W.K.P.

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ENGINEER OF TRAFFIC AND SAFETY

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ENGINEER OF DESIGN SUPPORT AREA

DEPARTMENT DIRECTOR  
Gloria J. Jeff

*Bill. Plouffe*  
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## BEDDING AND FILLING AROUND PIPE CULVERTS

11-14-2003

F.H.W.A. APPROVAL

6-25-2002

PLAN DATE

R-82-D

SHEET  
1 OF 2

EMBANKMENT BETWEEN GROUND LINE AND 2'-0" MINIMUM ABOVE TOP OF PIPE CULVERT SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA COMPACTED TO 95% OF ITS MAXIMUM UNIT WEIGHT. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10" IN THICKNESS.

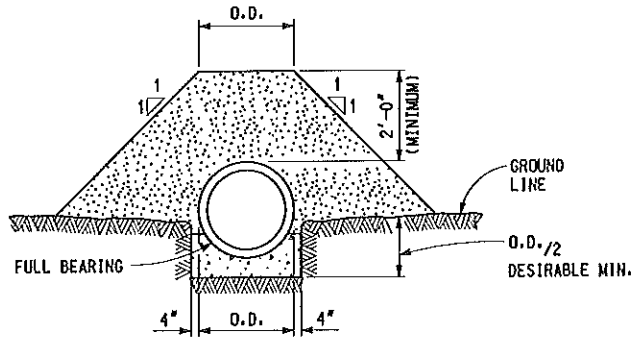


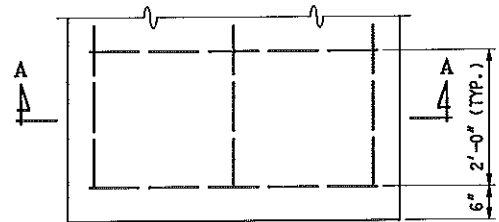
TABLE OF QUANTITIES BASED ON THE OUTSIDE DIAMETER (O.D.) OF PIPE			
INSIDE DIAMETER OF PIPE	OUTSIDE DIAMETER OF PIPE	CYD CONCRETE PER LFT	LBS STEEL PER LFT
18"	1.916'	0.061	9.7
24"	2.500'	0.096	10.3
30"	3.083'	0.140	11.0
36"	3.667'	0.191	11.6
42"	4.250'	0.250	12.3

ALL CONCRETE SHALL BE GRADE M.

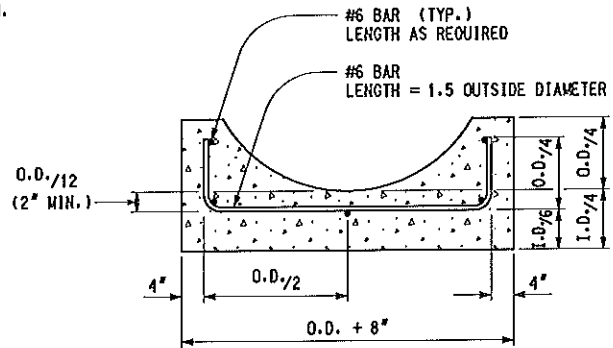
ALL EXCAVATION AND FORMS NECESSARY TO CONSTRUCT THE CONCRETE CRADLE SHALL BE INCLUDED IN THE UNIT PRICE PER CYD FOR CONCRETE.

THE CONCRETE CRADLE SHALL BE CONTINUOUS THROUGH THE ENTIRE LENGTH OF THE PIPE CULVERT.

LAP LONGITUDINAL BARS 2'-0" MINIMUM AT ALL SPLICES.

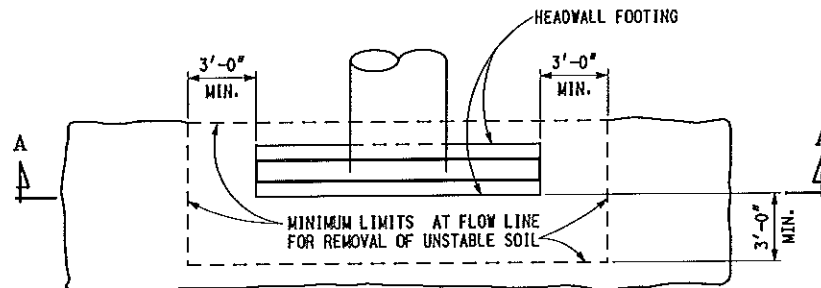


PLAN



SECTION A - A

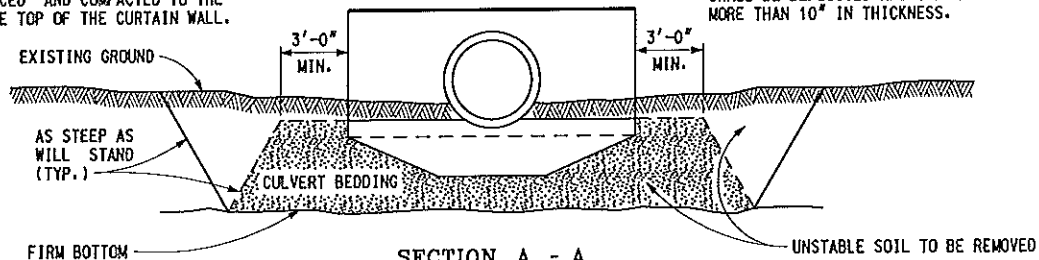
## CULVERT INSTALLATION WITH CONCRETE CRADLE



PLAN

NOTE:  
THE TRENCH FOR THE CURTAIN WALL SHALL BE EXCAVATED AFTER THE GRANULAR MATERIAL CLASS II IS PLACED AND COMPACTED TO THE ELEVATION OF THE TOP OF THE CURTAIN WALL.

BACKFILL SHALL CONSIST OF GRANULAR MATERIAL CLASS IIIA THOROUGHLY COMPACTED. THE MATERIAL SHALL BE DEPOSITED AND COMPACTED IN LAYERS NOT MORE THAN 10" IN THICKNESS.



SECTION A - A

## CULVERT HEADWALL INSTALLATION IN UNSTABLE SOIL

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

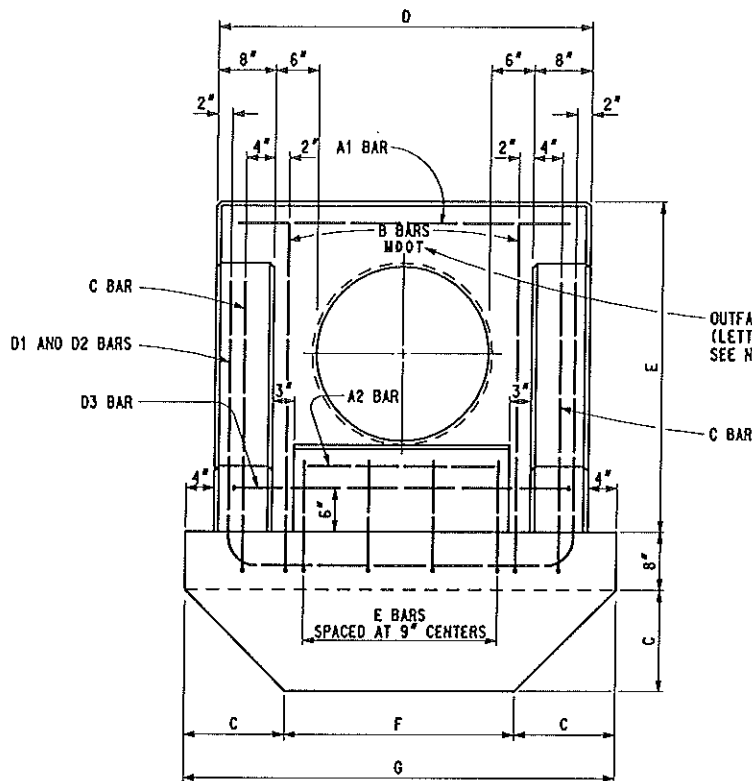
## BEDDING AND FILLING AROUND PIPE CULVERTS

11-14-2003  
F.H.W.A. APPROVAL

6-25-2002  
PLAN DATE

R-82-D

SHEET  
2 OF 2



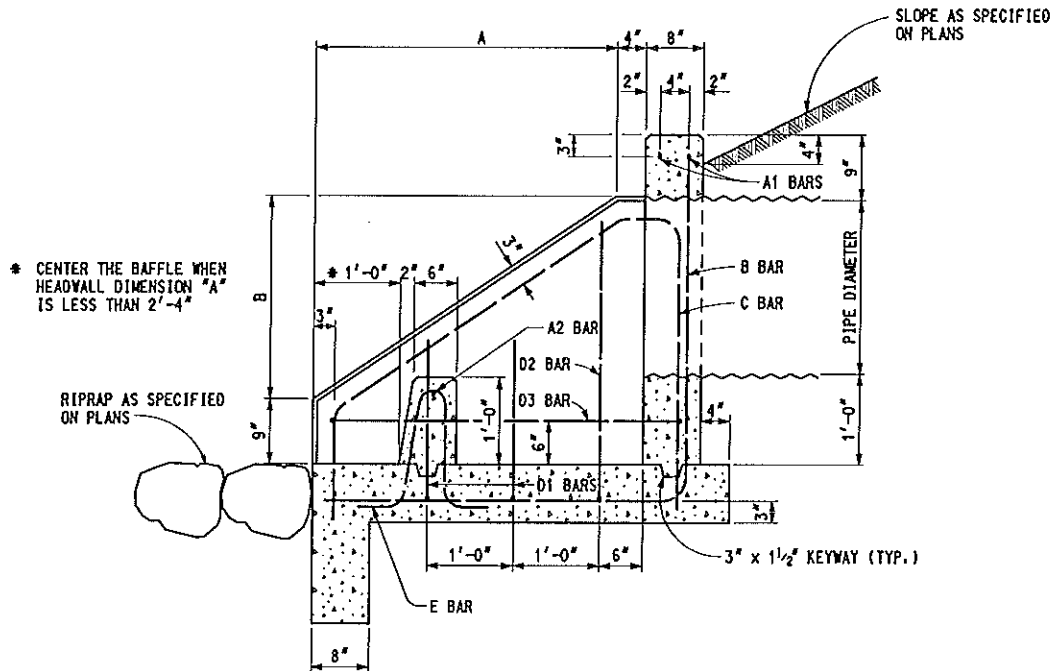
NOTES:

ALL STEEL REINFORCEMENT SHALL BE #4 BARS.

EXPOSED EDGES OF THE HEADWALL SHALL BE CHAMFERED  $\frac{1}{2}$ ".

OUTFALL LABEL TO BE USED ONLY WHERE STORMWATER WILL DISCHARGE DIRECTLY TO THE WATERS OF THE STATE.

OUTFALL LABEL INSCRIBED INTO CONCRETE (LETTERING:  $1\frac{1}{2}$ " HIGH x 1" WIDE x  $\frac{1}{4}$ " DEEP) SEE NOTES



OUTLET HEADWALL  
(SHOWN WITH BAFFLE)



PREPARED BY  
DESIGN  
SUPPORT AREA

DRAWN BY: B.L.T.

CHECKED BY: W.K.P.

DEPARTMENT DIRECTOR  
Gloria J. Jeff

APPROVED BY: *John C. Friend*  
ENGINEER OF DELIVERY

APPROVED BY: *John D. Pomeroy*  
ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## OUTLET HEADWALLS

11-17-2005  
F.H.W.A. APPROVAL

4-21-2005  
PLAN DATE

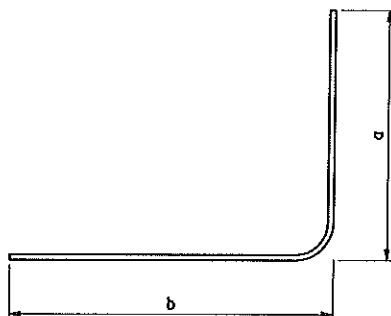
R-85-D

SHEET  
1 OF 2

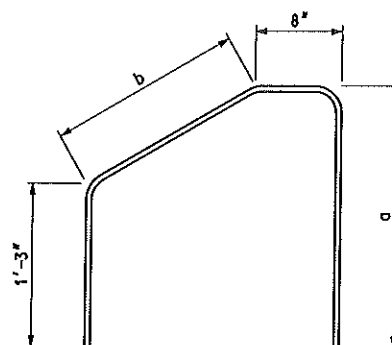




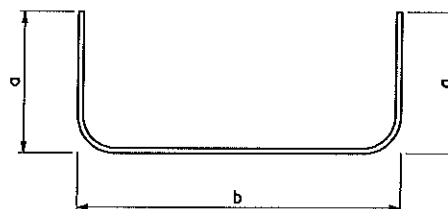
A BAR



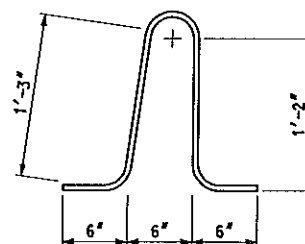
B BAR



C BAR



D BAR



E BAR

PIPE DIAMETER	HEADWALL DIMENSIONS							CONCRETE PER ONE HEADWALL (CYD)
	A	B	C	D	E	F	G	
6"	1'-3"	10"	10"	2'-10"	2'-3"	1'-10"	3'-6"	0.5
8"	1'-6"	1'-0"	10"	3'-0"	2'-5"	2'-0"	3'-8"	0.6
10"	1'-9"	1'-2"	10"	3'-2"	2'-7"	2'-2"	3'-10"	0.7
12"	2'-0"	1'-4"	10"	3'-4"	2'-9"	2'-4"	4'-0"	0.8
15"	2'-4"	1'-7"	11"	3'-7"	3'-0"	2'-5"	4'-3"	0.9
18"	2'-9"	1'-10"	1'-0"	3'-10"	3'-3"	2'-6"	4'-6"	1.0
24"	3'-6"	2'-4"	1'-1"	4'-4"	3'-9"	2'-10"	5'-0"	1.5
30"	4'-3"	2'-10"	1'-4"	4'-10"	4'-3"	2'-10"	5'-6"	1.8
36"	5'-0"	3'-4"	1'-4"	5'-4"	4'-9"	3'-4"	6'-0"	2.2

# STEEL QUANTITIES FOR ONE OUTLET HEADWALL WITH BAFFLE

## STEEL QUANTITIES FOR ONE OUTLET HEADWALL WITHOUT BAFFLE

PIPE DIA.	A1 BAR		B BAR				C BAR				D1 BAR				D2 BAR				D3 BAR				TOTAL WEIGHT OF BARS (LBS)	A2 BAR		E BAR		TOTAL WEIGHT OF BARS (LBS)
	TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.	DIMENSIONS		TOTAL LENGTH	NO.		TOTAL LENGTH	NO.	TOTAL LENGTH	NO.	
			a	b			a	b			a	b			a	b			a	b								
6"	2'-6"	2	1'-11"	2'-6"	4'-5"	2	1'-10"	1'-3"	5'-0"	2	1'-1"	2'-6"	4'-8"	1					1'-7"	2'-6"	5'-8"	1	23	8"	1	3'-8"	2	29
8"	2'-8"	2	2'-2"	2'-8"	4'-10"	2	2'-0"	1'-6"	5'-5"	2	1'-3"	2'-8"	5'-2"	1					1'-10"	2'-8"	6'-4"	1	26	10"	1	3'-8"	2	32
10"	2'-10"	2	2'-5"	2'-10"	5'-3"	2	2'-2"	1'-10"	5'-11"	2	1'-5"	2'-10"	5'-8"	1					2'-1"	2'-10"	7'-0"	1	28	1'-0"	1	3'-8"	2	34
12"	3'-0"	2	2'-8"	3'-0"	5'-8"	2	2'-4"	2'-1"	6'-4"	2	1'-7"	3'-0"	6'-2"	2					2'-4"	3'-0"	7'-8"	1	34	1'-2"	1	3'-8"	2	40
15"	3'-3"	2	3'-0"	3'-3"	6'-3"	2	2'-7"	2'-6"	7'-0"	2	1'-10"	3'-3"	6'-11"	2					2'-8"	3'-3"	8'-7"	1	38	1'-5"	1	3'-8"	3	46
18"	3'-6"	2	3'-5"	3'-6"	6'-11"	2	2'-10"	3'-0"	7'-9"	2	2'-1"	3'-6"	7'-8"	2					3'-1"	3'-6"	9'-8"	1	41	1'-8"	1	3'-8"	3	50
24"	4'-0"	2	4'-2"	4'-0"	8'-2"	2	3'-4"	3'-11"	9'-2"	2	1'-10"	4'-0"	7'-8"	2	3'-3"	4'-0"	10'-6"	1	3'-10"	4'-0"	11'-8"	1	54	2'-2"	1	3'-8"	4	65
30"	4'-6"	2	4'-11"	4'-6"	9'-5"	2	3'-10"	4'-10"	10'-7"	2	2'-4"	4'-6"	9'-2"	2	3'-8"	4'-6"	11'-10"	1	4'-7"	4'-6"	13'-8"	1	62	2'-8"	1	3'-8"	4	74
36"	5'-0"	2	5'-8"	5'-0"	10'-8"	2	4'-4"	5'-9"	12'-0"	2	2'-2"	5'-0"	9'-4"	2	3'-5"	5'-0"	11'-10"	2	5'-4"	5'-0"	15'-8"	1	76	3'-2"	1	3'-8"	5	90

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## OUTLET HEADWALLS

11-17-2005  
F.H.V.A. APPROVAL

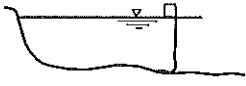


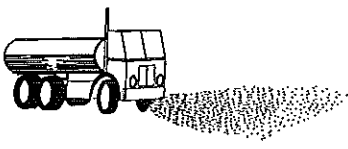


4-21-2005  
PLAN DATE

R-85-D

SHEET  
2 OF 2

**APPLICABLE SOIL EROSION AND SEDIMENTATION CONTROL MEASURES**  
( COMPREHENSIVE DETAILS ARE LOCATED IN SECTION 8 OF )  
( THE SOIL EROSION & SEDIMENTATION CONTROL MANUAL )

- A = SLOPES  
B = STREAMS AND WATERWAYS  
C = SURFACE DRAINAGEWAYS  
D = ENCLOSED DRAINAGE (INLET & OUTFALL CONTROL)  
E = LARGE FLAT SURFACE AREAS  
F = BORROW AND STOCKPILE AREAS  
G = DNRE PERMIT MAY BE REQUIRED

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
1	 TURBIDITY CURTAIN	A Turbidity Curtain is used when slack water area is necessary to isolate construction activities from the watercourse. The still water area contains the sediments within the construction limits.		•					
2	 GRUBBING OMITTED	Retains existing root mat which assists in stabilizing slopes. Assists in the revegetation process by providing sprout growth. Reduces sheet flow velocities preventing rilling and gullying. Discourages off-road vehicle use.	•				•		
3	 PERMANENT/TEMPORARY SEEDING	Inexpensive but effective erosion control measure to stabilize flat areas and mild slopes. Permits runoff to infiltrate soil, reducing runoff volumes. Proper preparation of the seed bed, fertilizing, mulching and watering is critical to its success.	•		•		•	•	
4	 DUST CONTROL	Dust control can be accomplished by watering, and/or applying calcium chloride. The disturbed areas should be kept to a minimum. PERMANENT/TEMPORARY SEEDING (KEY 3) should be applied as soon as possible.	•				•	•	
5	 SODDING	Provides immediate vegetative cover such as at spillways and ditch bottoms. Proper preparation of the topsoil, placement of the sod, and watering is critical to its success.	•				•	•	
6	 VEGETATED BUFFER STRIPS	Reduces sheet flow velocities preventing rilling and gullying. Assists in the collection of sediments by filtering runoff. Assists in the establishment of a permanent vegetative cover.	•				•		



PREPARED  
BY  
DESIGN DIVISION

DRAWN BY: B.L.T.

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DEPARTMENT DIRECTOR  
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ENGINEER OF DELIVERY

APPROVED BY:

ENGINEER OF DEVELOPMENT

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

**SOIL EROSION & SEDIMENTATION  
CONTROL MEASURES**

9-10-2010


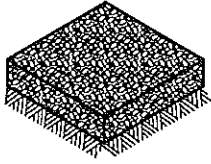


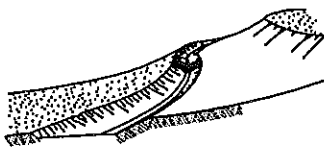
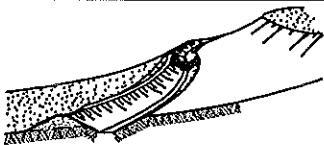

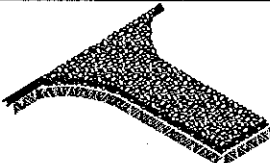
F.H.V.A. APPROVAL

6-3-2010

PLAN DATE

**R-96-E**

SHEET  
1 OF 6

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
7	 <p>RIPRAP</p>	Used where vegetation cannot be established. Very effective in protecting against high velocity flows. Should be placed over a geotextile liner.	•	•	•	•			•
8	 <p>AGGREGATE COVER</p>	Can be used in any area where a stable condition is needed for construction operations, equipment storage or in heavy traffic areas. Reduces potential soil erosion and fugitive dust by stabilizing raw areas.	•				•	•	
9	 <p>BENCHES</p>	Reduces sheet flow velocities preventing rilling and gulying. Assists in the collection and filtering of sediments. Provides access for stabilizing slopes.	•					•	
10	 <p>DIVERSION DIKE</p>	Assists in the diversion of runoff to a stable outlet or sediment control device. Reduces sheet flow velocities preventing rilling and gulying. Collects and diverts runoff to properly stabilized drainage ways. Works well with INTERCEPTING DITCH (KEY 11)	•				•	•	
11	 <p>INTERCEPTING DITCH</p>	Assists in the diversion of runoff to a stable outlet or sediment control device. Reduces sheet flow velocities preventing rilling and gulying. Works well with DIVERSION DIKE (KEY 10)	•				•	•	
12	 <p>INTERCEPTING DITCH AND DIVERSION DIKE</p>	Assists in the diversion of runoff to a stable outlet or sediment control device. Reduces sheet flow velocities preventing rilling and gulying.	•				•	•	
13	 <p>GRAVEL FILTER BERM</p>	Useful in filtering flow prior to its reentry into a lake, stream or wetland. Works well with SEDIMENT TRAP (KEY 20) and TEMPORARY BYPASS CHANNEL (KEY 35). Not to be used in lieu of a CHECK DAM (KEY 37) in a ditch.	•		•			•	
14	 <p>GRAVEL ACCESS APPROACH</p>	Provides a stable access to roadways minimizing fugitive dust and tracking of materials onto public streets and highways.					•	•	

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

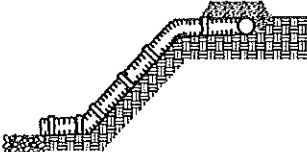

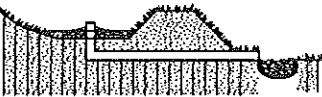
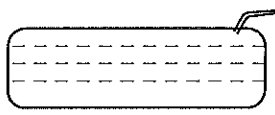
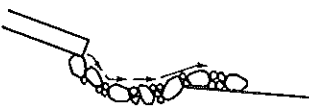

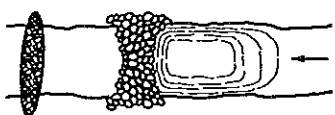
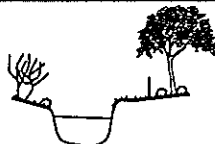
**SOIL EROSION & SEDIMENTATION  
CONTROL MEASURES**

9-10-2010  
F.H.W.A. APPROVAL

6-3-2010  
PLAN DATE

**R-96-E**


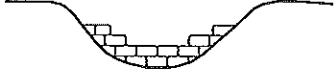
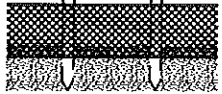


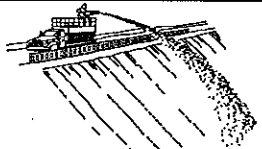
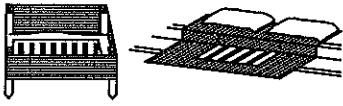
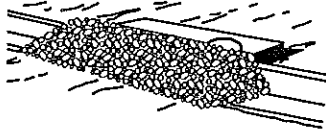
SHEET  
2 OF 6

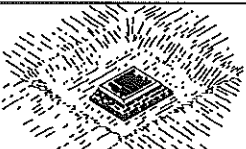

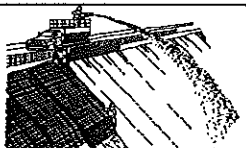
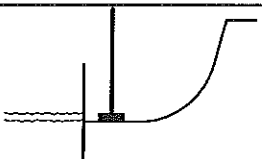

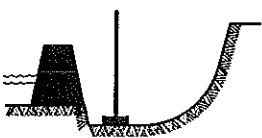

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
15	 <p>SLOPE DRAIN SURFACE</p>	Excellent device for carrying water down slopes without creating an erosive condition. Generally used in conjunction with DIVERSION DIKE (KEY 10), INTERCEPTING DITCH (KEY 11) and INTERCEPTING DITCH AND DIVERSION DIKE (KEY 12) to direct flow to a stable discharge area or SEDIMENT TRAP (KEY 20).	•		•				
16	 <p>TREES, SHRUBS AND PERENNIALS</p>	Trees, shrubs and perennials can provide low maintenance long term erosion protection. These plants may be particularly useful where site aesthetics are important along the roadside slopes.	•				•		
17	 <p>PIPE DROP</p>	Effective way to allow water to drop in elevation very rapidly without causing an erosive condition. Also works as a sediment collector device. May be left in place as a permanent erosion control device.	•		•				
18	 <p>DEWATERING WITH FILTER BAG</p>	It may be necessary to dewater from behind a cofferdam or construction dam to create a dry work site. Discharged water must be pumped to a filter bag. A GRAVEL FILTER BERM (KEY 13) may be placed downslope of the filter bag to provide additional filtration prior to entering any stream or wetland.		•					•
19	 <p>ENERGY DISSIPATORS</p>	A device to prevent the erosive force of water from eroding soils. Used at outlets of culverts, drainage pipes or other conduits to reduce the velocity of the water. Prevents structure scouring and undermining.	•	•	•	•			
20	 <p>SEDIMENT TRAP</p>	Used to intercept concentrated flows and prevent sediments from being transported off site or into a watercourse or wetland. The size of a Sediment Trap is 5 cubic yards or less. Works well when used with CHECK DAM (KEY 37).	•		•	•			
21	 <p>SEDIMENT BASIN</p>	A Sediment Basin is used to trap sediments from an upstream construction site. Requires periodic inspections, repairs, and maintenance. Where practical, sediments should be contained on site. A Sediment Basin should be the last choice of sediment control. The size of a Sediment Basin is greater than 5 cubic yards.		•					•
22	 <p>VEGETATIVE BUFFER AT WATERCOURSE</p>	This practice is used to maintain a vegetative buffer adjacent to a watercourse. When utilized with SILT FENCE (KEY 26) it will, under normal circumstances, prevent sediment from leaving the construction site.	•	•	•		•	•	

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

**SOIL EROSION & SEDIMENTATION  
CONTROL MEASURES**

9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E
		SHEET 3 OF 6

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
23	 <p>STREAM RELOCATION</p>	A detail depicting the proper procedures for stream relocation. Maintains same width, depth, and flow velocity as the natural stream. Revegetate banks with PERMANENT/TEMPORARY SEEDING (KEY 3), MULCHING AND MULCH ANCHORING (KEY 28), MULCH BLANKETS AND HIGH VELOCITY MULCH BLANKETS (KEY 33) and woody plants to shade the stream.		•					•
24	 <p>SAND AND STONE BAGS</p>	Sand and stone bags are a useful tool in the prevention of erosion. Can be used to divert water around a construction site by creating a DIVERSION DIKE (KEY 10). Works well for creating a CONSTRUCTION DAM (KEY 36) and temporary culvert end fill.	•	•	•	•	•	•	•
25	 <p>SAND FENCE AND DUNE STABILIZATION</p>	A Sand Fence traps blowing sand by reducing wind velocities. Can be used to prevent sand from blowing onto roads. Must be maintained until sand source is stabilized.	•				•	•	
26	 <p>SILT FENCE</p>	A permeable barrier erected below disturbed areas to capture sediments from sheet flow. Can be used to divert small volumes of water to stable outlets. Ineffective as a filter and should never be placed across streams or ditches where flow is concentrated.	•				•	•	
27	 <p>PLASTIC SHEETS OR GEOTEXTILE COVER</p>	Plastic Sheets can be used to create a liner in temporary channels. Can also be used to create a temporary cover to prevent erosion of stockpiled materials.	•	•	•			•	
28	 <p>MULCHING AND MULCH ANCHORING</p>	Anchored mulch provides erosion protection against rain and wind. Mulch must be used on seeded areas to promote water retention and growth. Should be inspected after every rainstorm and repaired as necessary until vegetation is well established.	•		•		•	•	
29	 <p>INLET PROTECTION FABRIC DROP</p>	Provides settling and filtering of silt laden water prior to its entry into the drainage system. Can be used in median and side ditches where vegetation will be disturbed. Allows for early use of drainage systems prior to project completion.			•		•		
30	 <p>INLET PROTECTION GEOTEXTILE AND STONE</p>	Provides settling and filtering of silt laden water prior to its entry into the drainage system. Should be used in paved areas where drainage structures are existing or proposed. Allows for early use of drainage systems prior to project completion.			•		•		
<p>MICHIGAN DEPARTMENT OF TRANSPORTATION BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR</p> <p><b>SOIL EROSION &amp; SEDIMENTATION CONTROL MEASURES</b></p>									
			9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 4 OF 6			

KEY	DETAIL	CHARACTERISTICS	A	B	C	D	E	F	G
31	 INLET PROTECTION SEDIMENT TRAP	<p>An Inlet Protection Sediment Trap is a temporary device that can be used in areas where medium flows are anticipated.</p> <p>Effective in trapping small quantities of sediments prior to water entering the drainage system.</p> <p>Can be used in areas such as median and side ditches.</p>			•		•		
32	 SLOPE ROUGHENING AND SCARIFICATION	<p>A simple and economical way to reduce soil erosion by wind and water.</p> <p>Can be accomplished by harrowing with a disk, back blading, or tracking with a dozer perpendicular to the slope.</p>	•				•	•	
33	 MULCH BLANKETS AND HIGH VELOCITY MULCH BLANKETS	<p>Mulch blankets provide an immediate and effective cover over raw erodible slopes affording excellent protection against rain and wind erosion.</p> <p>High velocity mulch blankets work well for stabilizing the bottom of ditches in waterways.</p>	•		•		•	•	
34	 COFFERDAM	<p>Used to create a dry construction area and protect the stream from raw erodible areas.</p> <p>Must be pumped dry or dewatered according to DEWATERING WITH FILTER BAG (KEY 18).</p>		•					•
35	 TEMPORARY BYPASS CHANNEL	<p>Utilized when a dry construction area is needed.</p> <p>Isolates stream flows from raw erodible areas minimizing erosion and subsequent siltation.</p> <p>Can incorporate SEDIMENT BASIN (KEY 21), CHECK DAM (KEY 37), and GRAVEL FILTER BERM (KEY 13) to remove sediments from water.</p> <p>Construction sequence of events may be necessary.</p>		•					•
36	 CONSTRUCTION DAM	<p>Used to create a dry or slack water area for construction.</p> <p>Isolates the stream from raw erodible areas.</p> <p>Can be created out of any non-erodible materials such as SAND AND STONE BAGS (KEY 24), a gravel dike with clay core or plastic liner, steel plates or plywood.</p>		•					•
37	 CHECK DAM	<p>Can be constructed across ditches or any area of concentrated flow.</p> <p>Protects vegetation in early stages of growth.</p> <p>A Check Dam is intended to reduce water velocities and capture sediment.</p> <p>A Check Dam is not a filtering device.</p>	•		•			•	

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## SOIL EROSION & SEDIMENTATION CONTROL MEASURES

9-10-2010  
F.H.W.A. APPROVAL

6-3-2010  
PLAN DATE

R-96-E

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NOTES:

THIS STANDARD PLAN WILL SERVE AS A KEY IN THE SELECTION OF THE APPROPRIATE SOIL EROSION AND SEDIMENTATION CONTROL DETAILS. THIS PLAN ALSO PROVIDES THE KEY TO THE NUMBERED EROSION CONTROL ITEMS SPECIFIED ON THE CONSTRUCTION PLANS. REFER TO THE MDOT SOIL EROSION & SEDIMENTATION CONTROL MANUAL, SECTION 6 FOR SPECIFIC DETAILS, CONTRACT ITEMS (PAY ITEMS), AND PAY UNITS.

COLLECTED SILT AND SEDIMENT SHALL BE REMOVED PERIODICALLY TO MAINTAIN THE EFFECTIVENESS OF THE SEDIMENT TRAP, SEDIMENT BASIN, AND SILT FENCE. AGGREGATES PLACED IN STREAMS SHOULD CONTAIN A MINIMUM OF FINES.

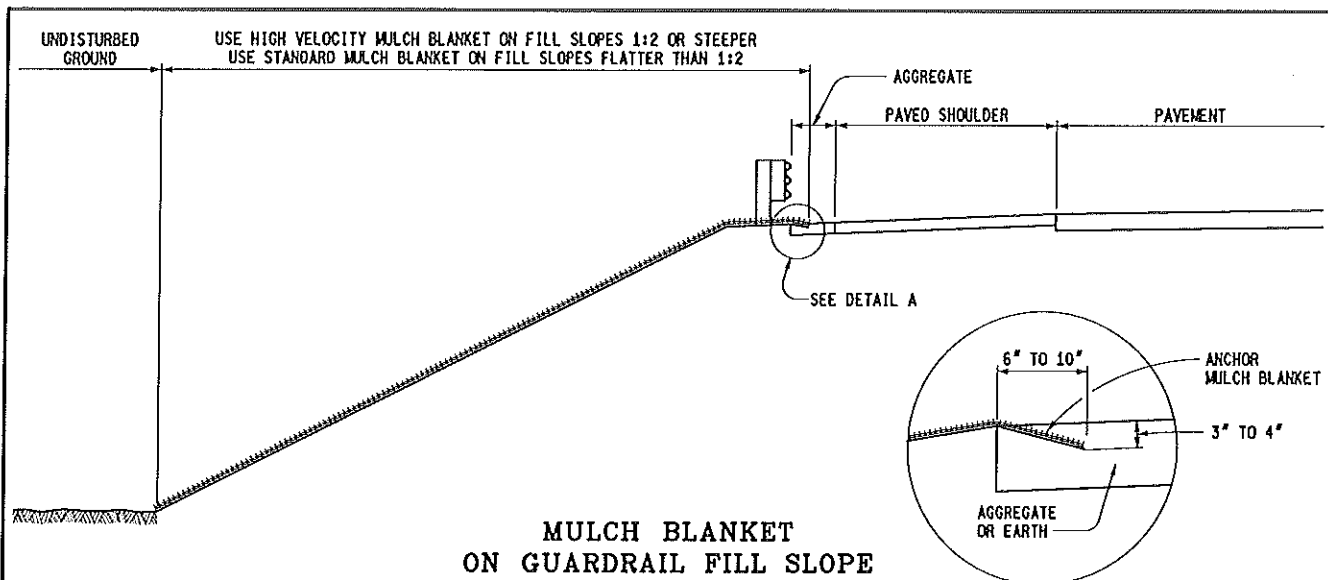
TEMPORARY EROSION AND SEDIMENTATION CONTROL PROVISIONS SHALL BE COORDINATED WITH THE PERMANENT CONTROL MEASURES TO ASSURE EFFECTIVE CONTROL OF SEDIMENTS DURING CONSTRUCTION OF THE PROJECT.

ALL TEMPORARY EROSION CONTROL DEVICES SHALL BE REMOVED AFTER VEGETATION ESTABLISHMENT OR AT THE DISCRETION OF THE ENGINEER. CARE SHALL BE TAKEN DURING REMOVAL TO MINIMIZE SILTATION IN NEARBY DRAINAGE COURSES.

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

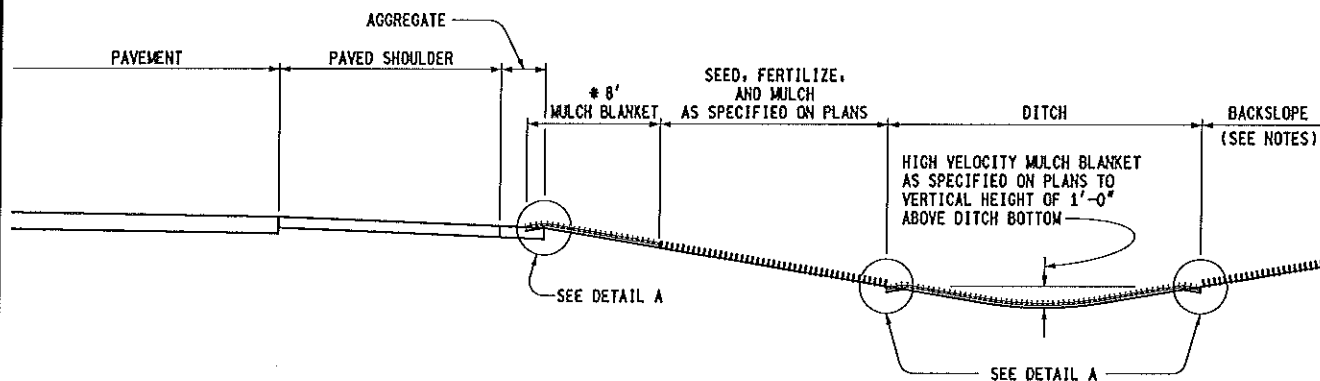
**SOIL EROSION & SEDIMENTATION  
CONTROL MEASURES**

9-10-2010 F.H.W.A. APPROVAL	6-3-2010 PLAN DATE	R-96-E	SHEET 6 OF 6
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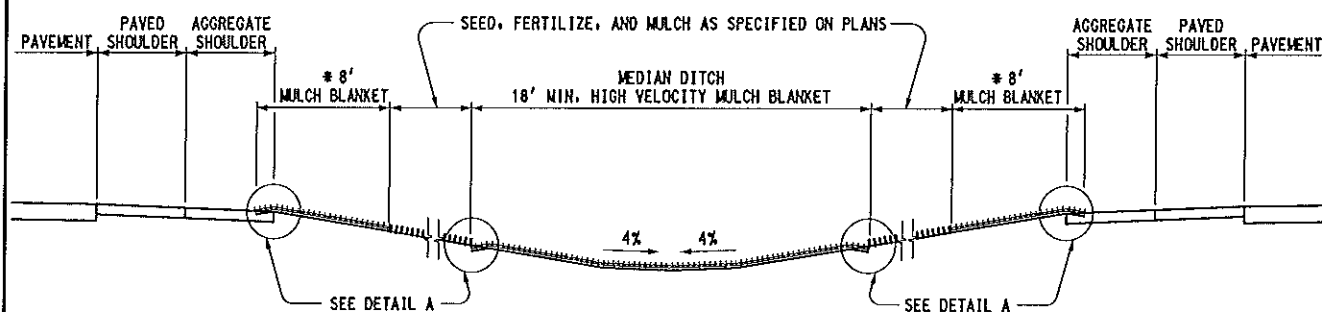


MULCH BLANKET  
ON GUARDRAIL FILL SLOPE

DETAIL A



TYPICAL SLOPE AND DITCH PROTECTION



MULCH BLANKET SPILLWAY DITCH

\* NOTE:

MULCH BLANKET SHALL BE USED ON BOTH SIDES OF NORMAL SECTIONS, HIGH SIDES OF ALL SUPERELEVATED SECTIONS, AND LOW SIDES OF PAVEMENTS HAVING A SUPERELEVATION OF 5% OR LESS. HIGH VELOCITY MULCH BLANKET SHALL BE USED ON THE LOW SIDE OF PAVEMENTS HAVING A RATE OF SUPERELEVATION GREATER THAN 5%.



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BY  
DESIGN DIVISION

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Kirk T. Steudle

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*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

SEEDING  
AND TREE PLANTING

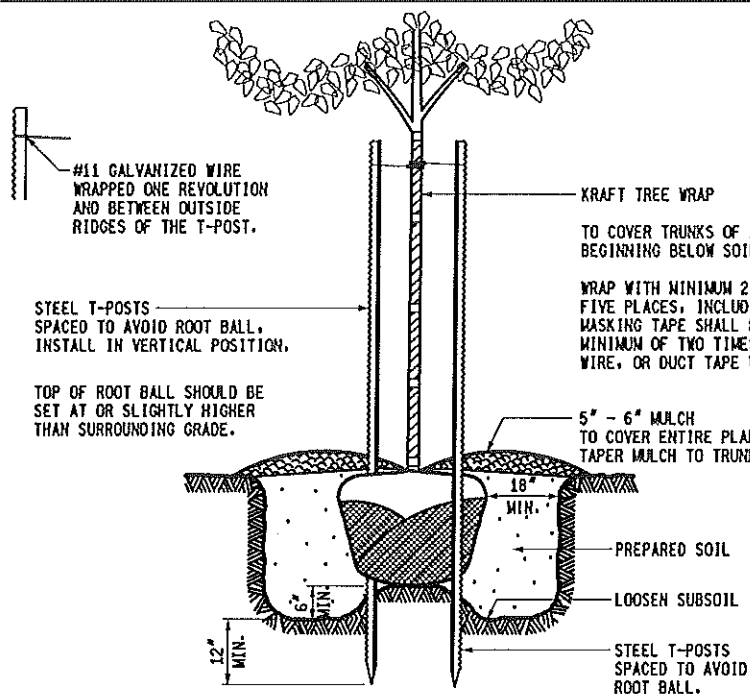
9-30-2014  
F.H.W.A. APPROVAL

9-26-2013  
PLAN DATE

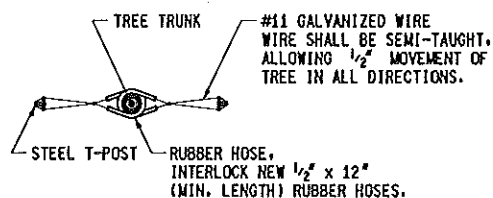
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1 OF 4





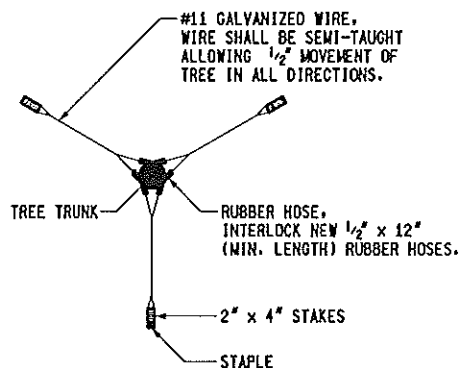
**BRACING - VERTICAL STAKES**



**BRACING DETAIL**

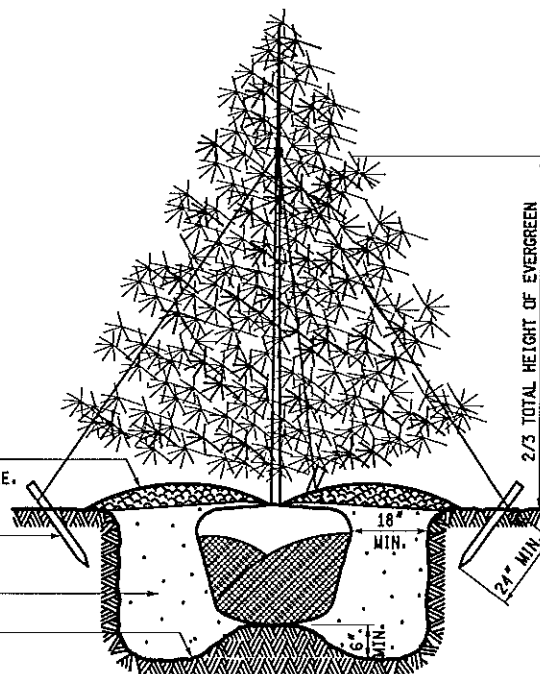
BRACE DECIDUOUS TREES 2" TO 4" IN CALIPER OR 8' OR MORE IN HEIGHT WITH TWO STAKES.

BRACE DECIDUOUS TREES LESS THAN 2" IN CALIPER OR 8' IN HEIGHT WITH ONE STAKE ON THE WESTERLY SIDE OF THE PLANT.

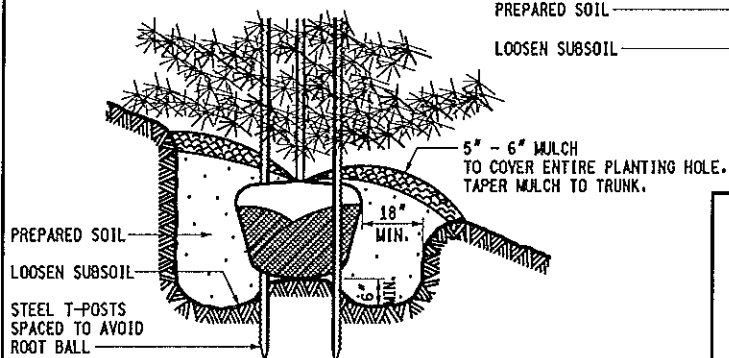


**TRIPOD GUYING DETAIL**

GUY EVERGREENS OVER 4" IN CALIPER OR 6' IN HEIGHT WITH THE TRIPOD METHOD AND UNDER 6' IN HEIGHT WITH TWO STAKES.



**GUYING - TRIPOD METHOD**



**SLOPE PLANTING**

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

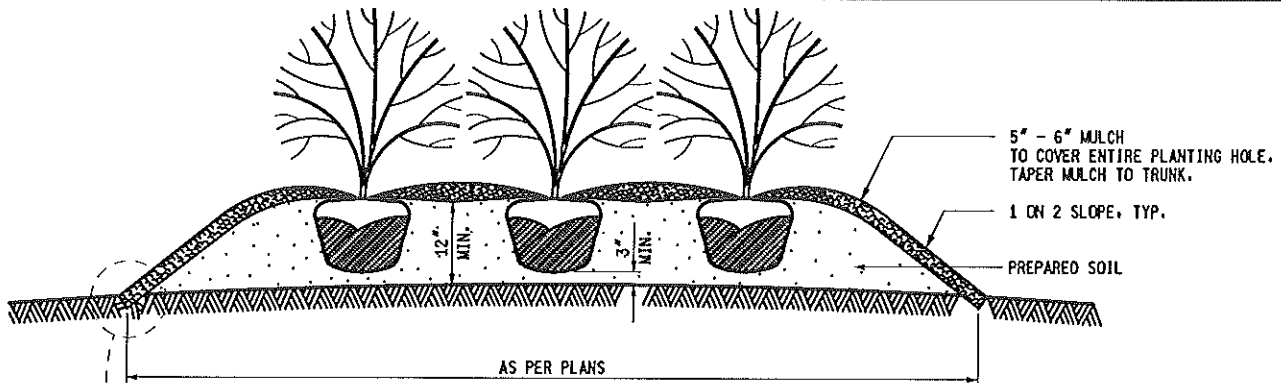
## SEEDING AND TREE PLANTING

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

9-26-2013  
PLAN DATE

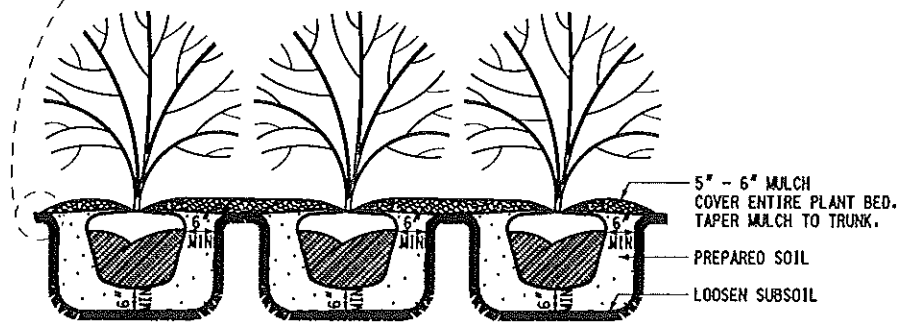
R-100-H

SHEET  
2 OF 4



RAISED SHRUB BED DETAIL

SHRUB BED EDGING DETAIL



SHRUB BED DETAIL

FIRST AND SECOND WATERING AND CULTIVATION SHALL INCLUDE SHRUB BEDS.

CUT 6" X 12" (MIN.) EDGING AROUND THE PERIMETER OF ALL SHRUB BEDS SHOWN ON THE PLANS. SPRAY A NON-PERSISTANT GLYPHOSATE HERBICIDE TO ENTIRE SHRUB BEDS PRIOR TO PLANTING AND BARK PLACEMENT.

SHRUB BEDS ARE TO BE PAID FOR BY THE PAY ITEM 'SITE PREPARATION'.

ALL PLANTS SHALL BE SET PLUMB AND HAVE THE BEST SIDE OF PLANT FACING THE MAIN VIEWING DIRECTION.

#### PLANTING NOTES:

ALL EXCAVATED MATERIAL SHALL BE REMOVED FROM THE SITE - IMMEDIATELY.

LOOSEN SUBSOIL TO A DEPTH OF 4". LOOSEN EARTH ON SIDES OF PLANT POCKET TO BREAK ANY GLAZING CAUSED BY DIGGING.

FILL PREPARED SOIL TO  $\frac{1}{2}$  THE DEPTH OF THE ROOT BALL, PACK FIRMLY, AND PUDDLE WITH WATER.

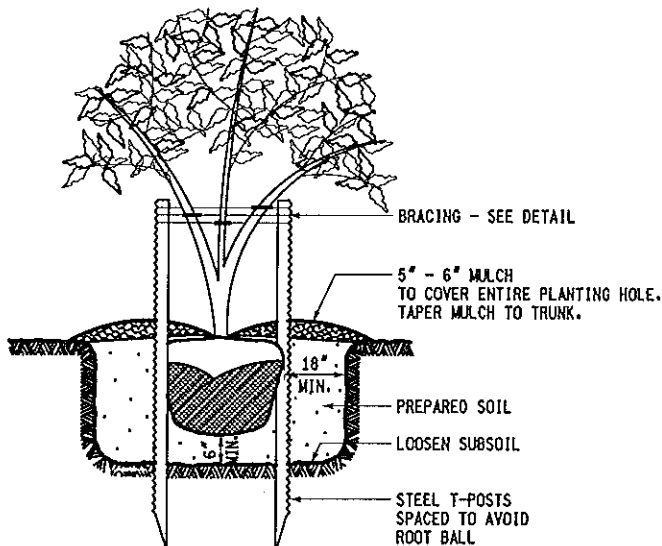
BACKFILL WITH PREPARED SOIL WHICH, AFTER COMPACTION, IS FLUSH WITH SURROUNDING GROUND LEVEL.

COVER ENTIRE PLANT POCKET AREA WITH 5"-6" MULCH. PRUNE, WRAP, AND BRACE AND GUY.

WHEN PLANTS ARE FURNISHED IN CONTAINERS, CONTAINERS SHALL BE COMPLETELY REMOVED AT THE TIME OF PLANTING.

TREE HEIGHTS ARE SHOWN BEFORE PRUNING. TREE PLANTING DEPTHS ARE SHOWN AFTER SETTLING.

TREES AND SHRUBS SHALL NOT BE PLANTED WITHIN 50' AND 30' RESPECTIVELY OF THE NEAREST EDGE OF METAL - EXCEPT WHERE INACCESSIBLE TO VEHICLES.



MULTIPLE STEM TREES

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

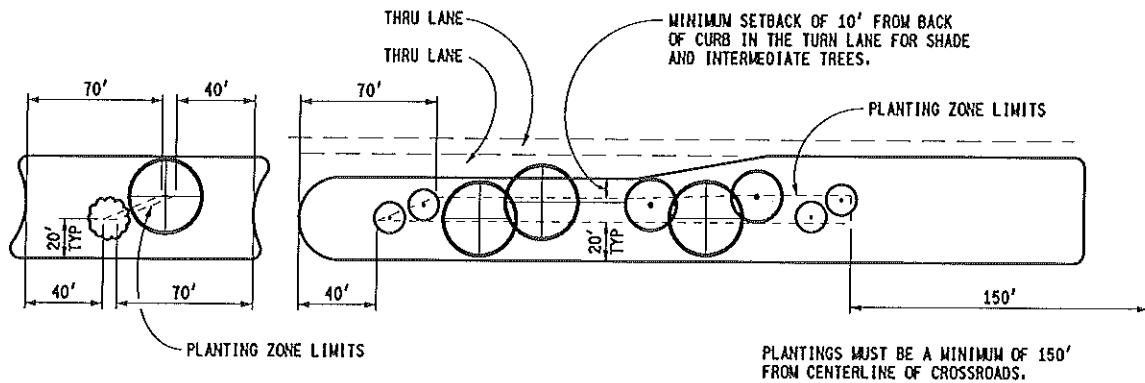
## SEEDING AND TREE PLANTING

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

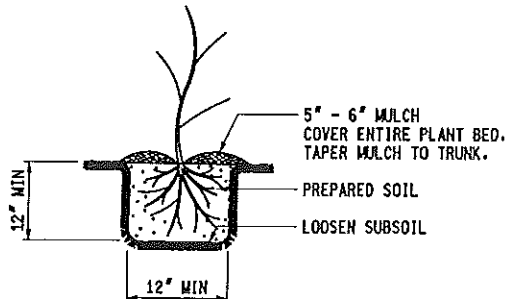
9-26-2013  
PLAN DATE

R-100-H

SHEET  
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### MEDIAN PLANTING NOT TO SCALE



### BARE ROOT PLANTS

#### PLANTING BARE ROOT PLANT MATERIAL

REFER TO THE "SPECIAL PROVISIONS FOR BARE ROOT PLANTING" FOR SHIPPING, STORAGE AND HANDLING REQUIREMENTS.

MAINTAIN ROOT MOISTURE BY KEEPING ROOTS IMMersed IN WATER PRIOR TO PLANTING.

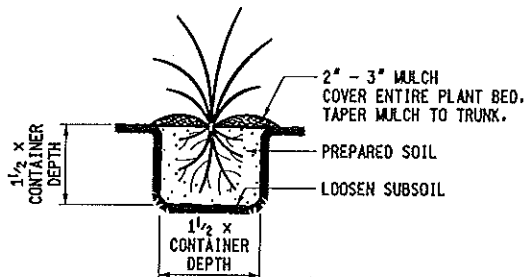
ROOT PRUNE AS NECESSARY TO REMOVE ALL DAMAGED OR BROKEN ROOTS, AND AS REQUIRED BY THE DISTRICT FORESTER OR RESOURCE SPECIALIST.

DIG PLANTING HOLES AT LEAST 12" WIDE AND 12" DEEP TO ACCOMMODATE ROOT MASS.

SET PLANTS PLUMB WITH THE ROOTS SPREAD PUT IN A NATURAL POSITION AT A DEPTH EQUAL TO THE DEPTH AT THE NURSERY.

HOLD PLANT FIRMLY AND PUDDLE (NOT TAMP) THE BACKFILL AROUND THE ROOTS WITH WATER. SUFFICIENT WATER SHALL BE USED TO ENSURE SATURATION OF THE BACKFILL, BUT CARE SHOULD BE TAKEN NOT TO OVERWATER, CAUSING A FLOATING SOIL MASS THAT PREVENTS COMPACTION AND MAY RESULT IN AIR POCKETS ADJACENT TO THE ROOTS. BACKFILL SHOULD BE FLUSH WITH THE GROUND AFTER COMPACTION.

COVER ENTIRE PLANT POCKET AREA WITH 5" - 6" MULCH AS SHOWN.



### PERENNIAL PLANTS

FIRST AND SECOND WATERING AND CULTIVATION SHALL INCLUDE PERENNIAL BEDS.

PERENNIALS ARE TO BE FULLY DEVELOPED TWO YEAR #2 CONTAINER PLANTS.

ENTIRE PERENNIAL BED SHALL BE EXCAVATED DOWN 12" AND REPLACED WITH 12" OF PREPARED SOIL.

PERENNIAL BEDS ARE TO BE PAID FOR BY THE PAY ITEM 'SITE PREPARATION'.

#### SEEDING NOTES:

THIS STANDARD ILLUSTRATES THE TYPICAL USE OF SEEDING WITH MULCH, AS THESE ITEMS RELATE TO ROADWAY CONSTRUCTION. THE ACTUAL DESIGN AND MATERIALS USED TO CONSTRUCT THE COMPLETE SECTION, WHICH INCLUDES SEEDING WITH MULCHING, WILL BE ACCORDING TO THE PLANS AND CURRENT SPECIFICATIONS.

ITEMS CALLED FOR ON THIS STANDARD MAY ALSO BE USED DURING CONSTRUCTION AS AN EROSION CONTROL MEASURE. SEE STANDARD PLAN R-96-SERIES.

ALL DITCHES SHOULD HAVE HIGH VELOCITY MULCH BLANKET FOR EROSION CONTROL.

THE FIRST 6' BEHIND THE CURB OR SHOULDER IN URBAN MEDIAN AREAS WILL BE SEEDED, FERTILIZED, AND MULCHED WITH MULCH BLANKET. THE REMAINING AREAS WILL BE SEEDED, FERTILIZED, AND MULCHED WITH MULCH BLANKET OR STANDARD MULCH ANCHORED IN PLACE WITH A MULCH ADHESIVE OR WITH A MULCH NET.

ALL AREAS WHERE MULCH BLANKET IS CALLED FOR SHALL BE SEEDED, FERTILIZED, AND TOPSOILED AS SPECIFIED ON PLANS. NO MULCH OR ANCHORING MULCH IS REQUIRED WHERE MULCH BLANKET IS INSTALLED.

BACKSLOPE RESTORATION TREATMENT SHALL BE THE SAME AS THE FRONT SLOPE.

MICHIGAN DEPARTMENT OF TRANSPORTATION  
BUREAU OF HIGHWAY DEVELOPMENT STANDARD PLAN FOR

## SEEDING AND TREE PLANTING

9-30-2014 F.H.W.A. APPROVAL	9-26-2013 PLAN DATE	R-100-H	SHEET 4 OF 4
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