CULVERT AND STORM SEWER PIPE MATERIAL POLICY
ON FEDERALLY FUNDED LOCAL AGENCY PROJECTS
UPDATED March 2013

Background

Section 5514, a final rule for SAFETEA-LU was issued on November 15, 2006 and became effective on December 1, 2006. The Congressional intent of Section 5514 is to ensure that the States provide culvert selection policies that foster competition with respect to alternative pipe materials.

With the passage of MAP-21, as outlined in FHWA Memorandum, dated October, 9, 2012, the legislation returned autonomy for culvert pipe selection to the States in Section 1525:

> STATE AUTONOMY FOR CULVERT PIPE SELECTION
> Not later than 180 days after the date of enactment of this Act, the Secretary shall modify section 635.411 of Title 23, Code of Federal Regulations (as in effect on the date of the enactment of this Act), to ensure that States shall have the autonomy to determine culvert and storm sewer material types to be included in the construction project on a Federal-aid highway.

Applicability

In consultation with the County Road Association of Michigan (CRAM) and Michigan Municipal League (MML), MDOT has revised the earlier policy dated September 22, 2008, to return autonomy to the Local Agencies for the selection of pipe material. MDOT will no longer require the use of pay items that leave the selection of the material up to the contractor by using MDOT Standard Pay Items for sewer and culvert pipe with pay item descriptions of "Class A thru E." The Local Agency may now specify the pipe material utilizing MDOT Standard Pay Items or by their own Special Provision and utilization of unique pay items.

Local Agencies will also be allowed to continue the use of contractor selection of pipe material utilizing the MDOT Standard Pay Items with descriptions of "Class A thru E," should they so desire.

Design Life

The design life of culvert pipes is important to determine what culvert pipe material should be used for selected highway drainage systems. The design life according to the AISC handbook on drainage systems is period of service without major repair. Once the expected design life is defined, all products producing acceptable evidence of meeting that life should be considered for use on federal aid transportation products, providing they can provide all other specified structural and hydraulic requirements. The expected design life of the various drainage systems are as follows:

Cross Culverts	50 years (70 years if designated a county primary, all season or municipal major route; or depth of cover > 18')
Storm Sewers	70 years
Driveway Culverts	25 years
Bankdrains	25 years
Underdrains & Foundation Drains	35 years
Downspouts	25 years

The expected design life values considered ease of repair, the drainage function, and the expected life of the pavement system (subbase through wearing surface) above the drainage system.

This policy does not exclude the use of any products that meet the expected design life and required strength criteria. For example, it would be allowable for corrugated metal pipe to be supplied for storm sewers, although it would require an 8-gage galvanized metal pipe and a watertight (premium) joint.

Allowable Pipe Materials for Various Uses

Considering that a pipe material meets the requirements for design life, allowable pipe materials will then be mainly restricted for use by other factors such as structural requirements, installation requirements, and hydraulics. Thus, the following are the pipe material criteria for use in the specific drainage systems for federal aid funded transportation projects.

Storm Sewer	Reinforced Concrete Pipe, Smooth Lined Corrugated Polyethylene Pipe, Profile Wall Polyvinyl Chloride Pipe (AASHTO M304), Corrugated Metal Pipe (Manning's n value of $\leq$ 0.012)
Cross Culverts	Reinforced Concrete Pipe, Smooth Lined Corrugated Polyethylene Pipe (AASHTO M294), Profile Wall Polyvinyl Chloride Pipe (AASHTO M304), Aluminum Pipe, Corrugated Metal Pipe (Manning's n value $\leq$ 0.012)
Underdrains, Pipe Bankdrains, and Foundation Drains	Perforated Polyethylene Pipe, Perforated Corrugated Metal Pipe

In many cases, the County Drain Commissioner's office or other drain authority will assume jurisdiction of drainage facilities installed as part of the federal aid funded transportation project. If the County Drain Commissioner has published pipe material and joint requirements that do not compromise the integrity of the roadway, the local agency has a duty to consider the County Drain Commissioner material requirements.

Extended Pipe Life for Corrugated Metal Pipe

Through the advent of corrosion resistant coatings, it is possible to extend the expected life of corrugated metal pipe. The actual life of corrugated metal pipe is affected by several field conditions, most specifically pH and resistivity. In review of the MDOT corrosive soil study performed in 1977, relatively few locations studied in Michigan exhibited the characteristics that would have significantly accelerated the deterioration of corrugated pipe due to corrosion. Also, a review of the "California Method" for determining the expected life to first perforation as well as reviewed test sites in the Upper Peninsula where various pipe materials are being evaluated for performance.

Considering the materials reviewed, the following are the recommended life expectancies to be used for corrugated metal pipes with the extended life of other materials or coatings of the pipe.

Galvanized Corrugated Metal Pipe, 16 gage	30 years
Aluminized Steel, Type 2, Corrugated Pipe	One gage differential (lesser gage) 18 gage, 30 years
Polymeric Coating (Ethylene Acrylic Acid Film only)	20 years additional life
Aluminum Corrugated Pipe	14 gage, 50 years 12 gage, 70 years

The above will be used to develop the gage requirements for the specific corrugated metal pipe materials. The tables will be provided with structural and design life requirements.

Trench Width and Bedding

Current MDOT trench details as well as AASHTO and ASTM trench details were reviewed for the three major allowable pipe material types: concrete, corrugated metal and polyethylene pipe. The review revealed that the current MDOT trench details are significantly narrower than recommended by AASHTO and ASTM, especially for polyethylene pipe systems. The current MDOT trench details, according to Standard Plan R-83 series, are sufficient for concrete and corrugated metal pipe materials.

Supplemental trench details for polyethylene pipe are included herewith.

Trench bedding shall be a minimum of 4-inches thick.

Flammability of Polyethylene Pipe

Polyethylene pipe and appurtenances can burn when exposed to flames. There have been reports of polyethylene pipe ends and flared end sections catching on fire as a result of crop, leaf, or controlled burning in roadside ditches. Controlled burning is most prevalent in rural locations.

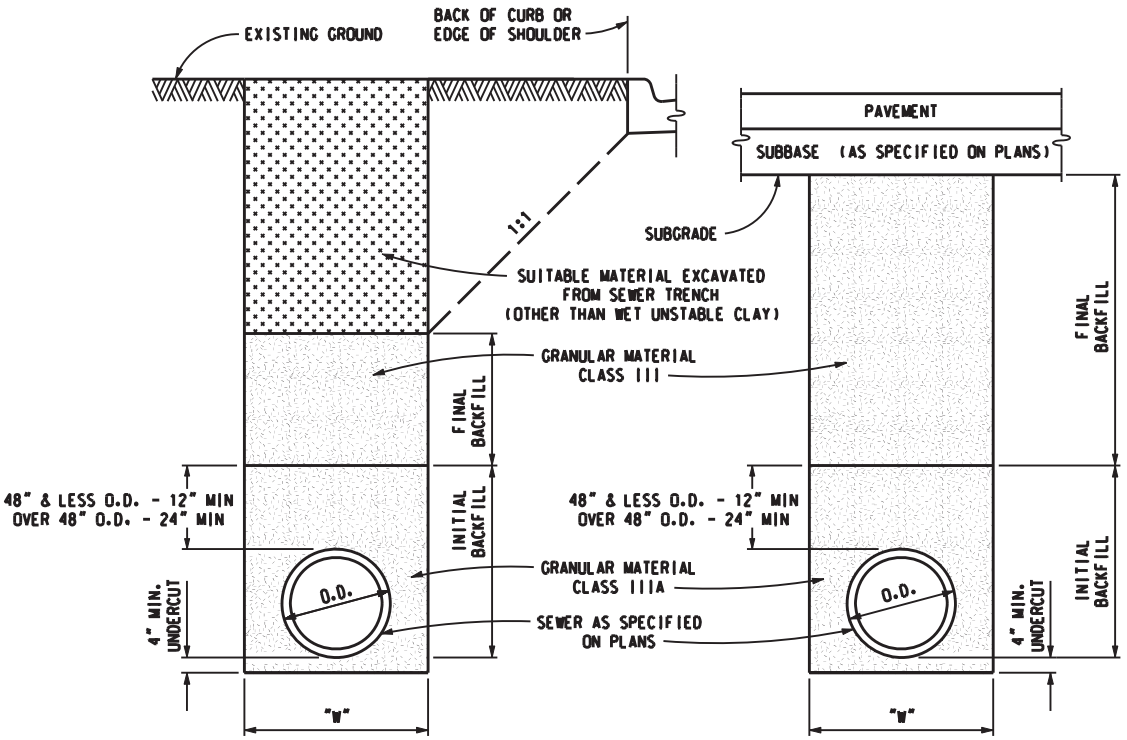
Therefore, in project locations where controlled burning is a common occurrence, concrete or metal culverts may be specified. It may be possible to specify polyethylene culverts as long as a metal or concrete flared end section is also installed.

Premium Joint Requirements

As mentioned previously, corrugated metal pipe can meet the expected design life for storm sewers and cross culverts. All storm sewer and cross culvert installations shall utilize a premium (water tight) joint approved by the requesting agency.

Depth of Cover

Current MDOT requirements for depth of cover were reviewed for the three major allowable pipe material types: concrete, corrugated metal and polyethylene pipe. The review revealed that the current MDOT depths of cover are adequate for all three pipe material types. The depth of cover tables for culverts and storm sewers in the current MDOT Standard Specifications for Construction are recommended for use.



FLEXIBLE CULVERT & STORM SEWER TRENCH DETAIL UNDER ROADBED OR WITHIN INFLUENCE OF ROADBED

NOTES:

BEDDING UNDER THE UTILITY SHALL BE AS SPECIFIED AND THE UNDERCUT MATERIAL REPLACED WITH GRANULAR MATERIAL CLASS IIIA. BACKFILLING SHALL BE ACCORDING TO THE CURRENT STANDARD SPECIFICATION.

BACKFILL FOR UTILITY TRENCHES ABOVE GRANULAR MATERIAL CLASS IIIA SHALL BE PLACED AS FOLLOWS:

(A) GRANULAR MATERIAL, OF THE CLASS SPECIFIED ON DETAILS, SHALL BE USED TO BACKFILL TRENCHES UNDER THE ROADBED AND SHALL BE COMPACTED TO NOT LESS THAN 95% OF ITS MAXIMUM UNIT WEIGHT.

(B) GRANULAR MATERIAL, OF THE CLASS SPECIFIED ON DETAILS, SHALL BE USED TO BACKFILL UTILITY TRENCHES OUTSIDE THE ROADBED BUT WITHIN THE 1:1 ZONE OF INFLUENCE SHOWN. IT WILL ALSO BE USED AS BACKFILL UNDER SIDEWALKS, SURFACED AREAS, AND MISCELLANEOUS STRUCTURES, AND COMPACTED TO NOT LESS THAN 95% OF ITS MAXIMUM UNIT WEIGHT.

(C) WHEN ACCEPTABLE, MATERIAL EXCAVATED FROM THE UTILITY TRENCHES SHALL BE USED TO BACKFILL UTILITY TRENCHES OUTSIDE THE LIMITS OF THE 1:1 ZONE OF INFLUENCE AND SHALL BE COMPACTED TO NOT LESS THAN 90% OF OF ITS MAXIMUM UNIT WEIGHT.

GRANULAR MATERIAL CLASS I, II, IIA, OR IIIA MAY BE USED WHERE GRANULAR MATERIAL CLASS III IS SPECIFIED ON THE PLANS.

SUFFICIENT TRENCH WIDTH SHALL BE PROVIDED TO ALLOW FREE WORKING SPACE AND TO PERMIT COMPACTING THE BACKFILL AROUND THE PIPE.

THE FOLLOWING ARE MINIMUM TRENCH WIDTHS:

O.D. PIPE SIZE (INCHES)	15 OR LESS	18	21	24	30
"W" TRENCH WIDTH (FEET)	3.0	3.5	4.0	5.5	5.5

O.D. PIPE SIZE (INCHES)	36
"W" TRENCH WIDTH (FEET)	6.5

SMOOTH LINED CORRUGATED PLASTIC PIPE (CPE) PIPES ARE PERMITTED FOR USE IN 24-INCH DIAMETER PIPE AND UNDER INSTALLATIONS. 30 AND 36-INCH CPE PIPE INSTALLATIONS ARE PERMITTED FOR SELECTED PROJECTS ONLY AND MUST BE INSTALLED ACCORDING TO THE CONTRACT DOCUMENTS.

ESTIMATED PAVEMENT REMOVAL WIDTH IS TO BE TRENCH WIDTH "W" PLUS 1'-0" EACH SIDE OF THE TRENCH (6'-0" MINIMUM).

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