

ENGINEERING DIRECTIVES AND STANDARDS

Volume	Chapter	Section	Directive Number	Effective Date
II	2	1	6	2/4/2005

SUBJECT: PROCEDURE FOR DETERMINING COATING AND GAGE (THICKNESS) REQUIREMENTS FOR METAL PIPE

- PURPOSE:** The purpose of this directive is to establish the procedure to be used to determine, for a particular project, the suitability, coating, and gage (thickness) requirement of metal pipe.
- POLICY:** It will be the policy of the Department to ascertain the acceptability of and specify the coating and gage (thickness) requirements for metal pipe based on: structural requirements, the desired design service life, the pH and resistivity of the surrounding soil and water, and other miscellaneous factors affecting metal pipe longevity. The following is a detailed description of the procedures to be used.

A. GENERAL

The following discussion applies to round and arch pipe.

- All metal pipe shall be galvanized corrugated steel pipe (CSP) or 3004 alloy corrugated aluminum pipe (CAP).
- All metal pipe shall be minimum of 14 gage (2 mm thickness).
- For CSP, the graph in Figure 1 will be used to determine required gage (thickness) for design service life.
- No CSP is allowed if the pH is less than 5.0 or if the resistivity is less than 1500. No CAP is allowed if either the pH is less than 5.0 or greater than 9.0, or the resistivity is less than 1500.
- Minimum gage (thickness) requirements will be determined to satisfy durability and fill height up to 10 feet (3 m). For fill heights in excess of 10 feet (3 m), see standard plan SAM-1 (SAM-1M).

B. SERVICE LIFE FOR CORRUGATED METAL PIPE

- A chart for estimating years to perforation for CSP is shown on Figure 1. The chart is divided into two parts according to the environment as described below.
 - "Moderately Harsh" environment is a combination of pH and resistivity which combine on the chart to yield a service life of between 9 and 25 years, inclusive, for 16 gage (1.6 mm thickness) CSP.
 - "Mild" environment is a combination of pH and resistivity which combine on the chart to yield a service life greater than 25 years for 16 gage (1.6 mm thickness) CSP.
- The following coating system will add additional service life to the pipe as described. Bituminous coating (BCCSP) will add 8 years' life for "Moderately Harsh Environments" and 8 years for "Mild Environments" to the CSP.

C. FIELD DATA

1. Estimated service life for metal pipe depends on soil and water conditions in the field.
2. The District Laboratory will make a soils, water and foundation investigation for those projects which require drainage structures.
 - a) A soil sample and a water sample for pH and resistivity tests shall be taken to represent not more than 2000 linear feet of project. Such samples shall be representative of the conditions of that roadway segment. The soil sample and the water sample may be taken from different locations within that roadway segment. Soil samples should be taken from soil zones representing pipe bedding locations (invert of pipes).
 - b) Sampling site selection is to be carefully done so as to best represent soil and water conditions. Any unusual conditions - such as waste, industrial run off, etc. are to be specifically investigated and noted.
 - c) Each major culvert location is to be sampled for soil and water pH and resistivity in addition to soil type and consistency. Such locations will be specifically identified on the request for soils investigation originating from the project manager. Any such location may also be used as a sample representing not more than 2000 linear feet (600 m) of project regardless of additional minor pipe locations.
 - d) Major culvert locations will generally be larger diameter drains and multiple barrel drains. ("Larger diameter drains" will be individual culverts which are 72" (1800 mm) or larger in diameter. Any multiple barrel drain regardless of pipe size will be considered as a "major culvert location".)
3. Requests for the above investigations will generally be a part of sub-grade soil surveys.
 - a) The project manager requests this information from the Pavement & Geotechnical Services Section. Submitted along with the request should be a set of ½ size plans with the culvert crossings marked. The Pavement & Geotechnical Services Section forwards the request to the District Laboratory.
 - b) All field information and laboratory test data is to be reported in tabular form with any necessary narrative clarifications.
 - c) This information is to be submitted to the project manager and Pavement & Geotechnical Services Section. The information will also be scanned for future use.
4. The project manager will analyze the pH and resistivity values for each project and will determine the necessary information on gage (thickness) and coating requirements for any metal pipe that may be used on the project based on the criteria in this EDSM. Software to perform these calculations is available from the Road Design – Hydraulics Section.

The following procedure is to be used:

- a) Cross Drain Pipe and Storm Drain Pipe (Outfall):

The pH and resistivity information for the entire project will be used. The required metal pipe gage (thickness) will be chosen which meets the requirement of 70% or more of the readings. Exceptions to this procedure will be made if abnormal conditions exist at a particular site.

- b) Side Drains:

The pH and resistivity information for the entire project will be used. The required metal pipe gage (thickness) will be chosen which meets the requirement of a minimum of 80% or more of the readings.

D. OTHER CONDITIONS

1. For metal pipe used for non-highway drainage purposes, installed by others or installed by the Department for others:

Corrugated metal pipe shall be either CSP(A), BCCSP(A), or CAP(A). The gage (thickness) will be as required for fill height according to standard plan SAM-1 (SAM- 1M).

3. **OTHER ISSUANCES AFFECTED:** All directives, memoranda or instructions issued heretofore in conflict with this memorandum are hereby rescinded.
4. **EFFECTIVE DATE:** This policy is effective immediately and will be implemented on all projects except those where use of this EDSM would result in scheduling delays.

WILLIAM H. TEMPLE
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CHART FOR ESTIMATING YEARS TO PERFORATION OF GALVANIZED CORRUGATED STEEL PIPE (CSP)

MAXIMUM DESIGN SERVICE LIFE FOR 16 Gage (1.6 mm)
GALVANIZED CSP IS 50 YEARS

FIGURE 1

