

BRIDGE ADVISORY NUMBER: **BA-2016-02**

DATE: June 22, 2016

SUBJECT: **Corrugated Metal Pipe Analysis Spreadsheets**

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The Michigan Department of Transportation is providing, as a service to contractors, consultants, and local agency bridge owners, three (3) spreadsheets and supporting documentation for the analysis of corrugated metal pipe culverts. The spreadsheets have been adapted from an Ohio Department of Transportation spreadsheet to incorporate MDOT's legal and overload vehicles, and they are based on National Corrugated Steel Pipe Association Design Data Sheet 19. The spreadsheets have been updated to include modifications that expand upon the NCSA method using the Soil-Culvert Interaction Design Procedures developed by Duncan & Drawsky¹.

The documents are available at the following location:

http://www.michigan.gov/mdot/0,4616,7-151-9625_24768_24773-201633--,00.html

Please note: MDOT makes no warranties or representations whatsoever regarding the quality, content, completeness, suitability, adequacy, sequence, accuracy or timeliness of the information and data provided in these electronic engineering data and/or analysis programs.

A description of the available files is as follows:

MDOT CMP LFR (ver. 2.0).xlsx

MDOT CMP LFR (ver. 2.0).xlsx is used to compute the federal and legal rating factors and MDOT Overload Class for corrugated metal pipe (CMP) structures by using the Load Factor Rating (LFR) Method. Version 2.0 has been updated to include Soil-Culvert Interaction Design Procedures developed by Duncan & Drawsky¹.

MDOT CMP LFR SAD (ver. 2.0).pdf

MDOT CMP SAD (ver. 2.0).pdf includes detailed documentation of all of the input and output values contained within the LFR spreadsheet as well as an explanation of the assumptions and limitations of the formulas contained within the sheet.

MDOT Truck Combinations.xlsx

Truck Combinations 6-13-2014.xlsx includes a detailed evaluation of federal, legal and overload trucks at depths ranging from one foot to 20 feet and determines the controlling trucks and

resulting line load pressures for each truck. A summary of this spreadsheet is included in each of the CMP spreadsheets. The summarized data is used to perform the calculations to determine the rating factors for federal, legal and overload trucks. **Note: This spreadsheet is not necessary to perform CMP load rating calculations unless the user intends to modify the loading in the CMP spreadsheets. It has been updated from the previous version to include the Live Load Patch Length at Depth, L_w , from AASHTO LRFD 3.6.1.2.6 in order to determine the thrust per unit length of wall according to AASTHO LRFD 12.7.2.2.**

MDOT CMP LRFR (ver. 2.0).xlsx

MDOT CMP LRFR (ver. 2.0).xlsx is used to compute the federal and legal rating factors and MDOT Overload Class for CMP structures by using the Load and Resistance Factor Rating (LRFR) Method. Version 2.0 has been updated to include the 2015 Interim Revisions to the AASHTO LRFD Bridge Design Specifications, 7th Edition, and the Soil-Culvert Interaction Design Procedures developed by Duncan & Drawsky¹.

MDOT CMP LRFR SAD (ver. 2.0).pdf

MDOT CMP SAD (ver. 2.0).pdf includes detailed documentation of all of the input and output values contained within the LRFR spreadsheet as well as an explanation of the assumptions and limitations of the formulas contained within the sheets.

¹ Duncan, J.M. and Drawsky, R.H. "Design Procedures for Flexible Metal Culvert Structures". Report No. UCB/GT/83-02. Department of Civil Engineering. University of California, Berkeley. May, 1983.