Corrugated Steel Culvert Corrosion and Abrasion Performance

A comprehensive study to improve the accuracy of the Corrugated Steel Pipes service life prediction model to obtain more realistic estimates.

WHAT IS THE NEED?

The main objective of this research is to verify and improve a recent pilot study conducted by California Department of Transportation (Caltrans) to verify the accuracy of service life predictions model for Corrugated Steel Pipes (CSPs), which was built based on a previous study carried out by Caltrans’ Division of Highways Materials and Research Department in the 1960’s. The model developed has been in use by Caltrans for over 50 years, it uses inputs of soil/water acidity and resistivity, as well as consideration of constant flowing stream water, to arrive at its service life estimation.

In 2014, the researchers used a small sub-set (less than 50) of culverts for the pilot study. A small sample size is not sufficient to generate reliable results, thus, a significantly more robust research effort is required to improve the accuracy of the original research done in the 1960’s, which is used as the basis of CSPs Service Life predictions model today. Inaccurate predictions of the service life of CSPs pose negative consequences economically and functionally.

WHAT ARE WE DOING?

The proposed research approach is to divide the state of California into three regions: north, mid, and south. The California State University Northridge (CSUN) research team will perform field investigation and lab testing. Field work involves measuring the CSPs wall thickness and collecting soil samples to check the pH values and resistivity. The research team will determine the service life of CSP based on analysis in the different region of California, and generate a regression equation. The researchers will study approximately 170 culverts per year and over 500 culverts over a three-year research effort.

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In phase I, the researchers will use as-built plans, Caltrans Maintenance Culvert Inspection database, and existing corrosion data to develop a statewide list of steel culverts for investigation. Steel culverts will be selected to best represent California’s geography and climate-diversity.

In phase II, the research team will conduct field investigation and collect data in the three predetermined regions. The field data collection includes evaluation for perforation by visual inspection and a pick hammer, obtaining thickness measurements using an ultrasonic thickness gage, collection of corrosion data (pH and minimum resistivity), and verification of abrasion levels.

In phase III, the research team will develop a final report and compare the research results with the 2014 pilot study and the 1960’s research.

WHAT IS OUR GOAL?

The research team will compose a final report which will include recommendations and details of estimating the service life of CSPs.

WHAT IS THE BENEFIT?

Investigation on the effects of pH and resistivity on corrosion rate will improve the service life prediction model for CSPs.

WHAT IS THE PROGRESS TO DATE?

Currently, the CSUN research team is conducting investigation in the northern region of California. Fieldwork and lab testing will continue for the next few months. 475 out of 500 culverts have been inspected and the team will complete the field work by December 2018.

IMAGES