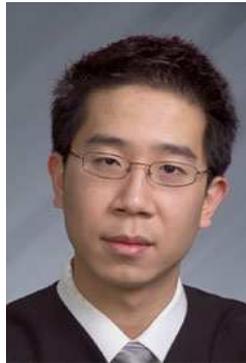


## Case Study: The Need to Improve Specifications to Ensure Quality Control in Galvanized Steel

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### Summary

This paper presents a case study where the silicon content of the steel for a Structural Plate Corrugated Steel Pipe (SPCSP) was outside of specifications resulting in a product that developed defects in the galvanizing which mimicked a potentially serious problem. This paper describes the defect's presentation, the investigation process, and illustrates how a single small defect can elude several levels of quality control inspections to cause a severe problem. Despite the various quality control inspections, the defect went undetected until the material had already been assembled into the final constructed product. It was found that existing specifications did not provide any guidance on the appearance of the galvanized surface and as such, the quality inspectors at each step of the quality control process had no indication to be concerned or any basis for rejection. It is proposed that existing specifications be modified to provide guidelines to address this issue.

**Keywords:** culverts, galvanizing, silicon, steel, defects, construction, specifications, quality, inspection

### 1. Introduction

Bridge structures must be safe, durable, environmentally responsible, and perform as designed. Therefore, if one ensures proper quality control of the constructed structure, one is also ensuring the public's and environment's safety and protecting cost overruns for the construction and maintenance of the bridge.

Specifications are in place to assist in the quality control and quality assurance processes. Over time, as problems and defects are identified, specifications are modified to mitigate short-term and long-term issues in the bridge project. However, despite years of development and improvements in the quality management process, problems can still slip through the system. Ironically, it is often these rare defects that elude the system that can have the greatest impact.

In this paper, a case study is presented that involves the discovery of a galvanizing defect in a structural plate corrugated steel pipe (SPCSP) arch culvert. The defect bypassed a series of quality control measures and ended up in the final constructed product. The need to modify existing specifications to prevent a repeat of this defect is discussed.

### 2. Case Study: Galvanizing Defect Eludes Quality Management

In 2008, construction started for a bridge-sized SPCSP arch culvert. The project was specified to conform to local bridge construction specifications. A defect in the structural material used for the culvert was discovered after the defective material had been installed.