

*Appendix F –  
Borescope Investigation of Pier E2 Rods  
Holes, SMR Reports (2011 and 2013)*

## PROJECT INFORMATION

04-0120F4

Self-Anchored Suspension Bridge

## SUBJECT

Borescope Investigation of Pier E2 Rod Holes – 2011

## BACKGROUND

A total of 288 ASTM A354 Gr. BD bearing and shear key anchor rods have been installed in Pier E2, per the contract requirements; 96 of these 3-inch hot-dip galvanized rods are shear key anchor rods that were embedded in concrete at Pier E2. The shear key anchor rods were fabricated in 2008 and assembled inside pipe sleeves in Shear Keys S1 and S2 after release to the jobsite. The locations of the shear keys (S1 and S2) are highlighted in Figure 1. The area around the pipe sleeves was grouted five years later, in 2013.

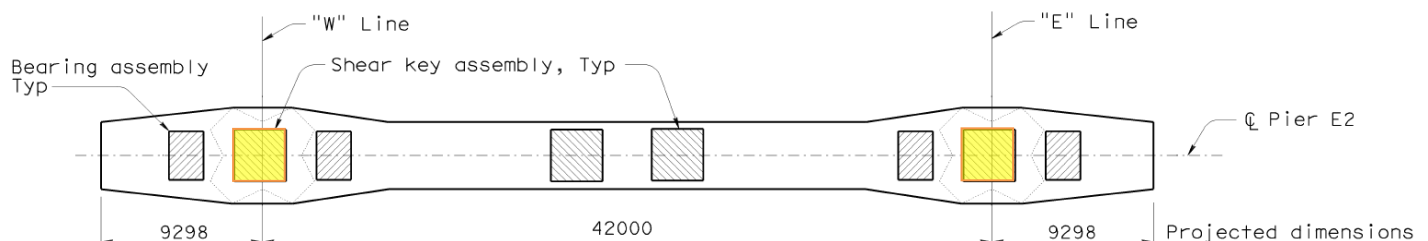


Figure 1: Locations of Shear Keys S1 (left) and S2 (right) on Pier E2

As shown in **Figure 2**, the details of the rods in S1 and S2 are different from the details for the bearing anchor rods. The embedment of the shear key E2 rods in concrete prevents access from below. Prior to installation of the shear keys, the rods had to be flush with the Pier E2 top surface; therefore, pipe sleeves were installed below the bearing plate to allow for the rods to be temporarily lowered (**Figures 3 and 4**). The area inside the temporary pipe sleeve was to be grouted after the rods were raised to their final position during installation of the shear key.

## PROJECT INFORMATION

04-0120F4

Self-Anchored Suspension Bridge

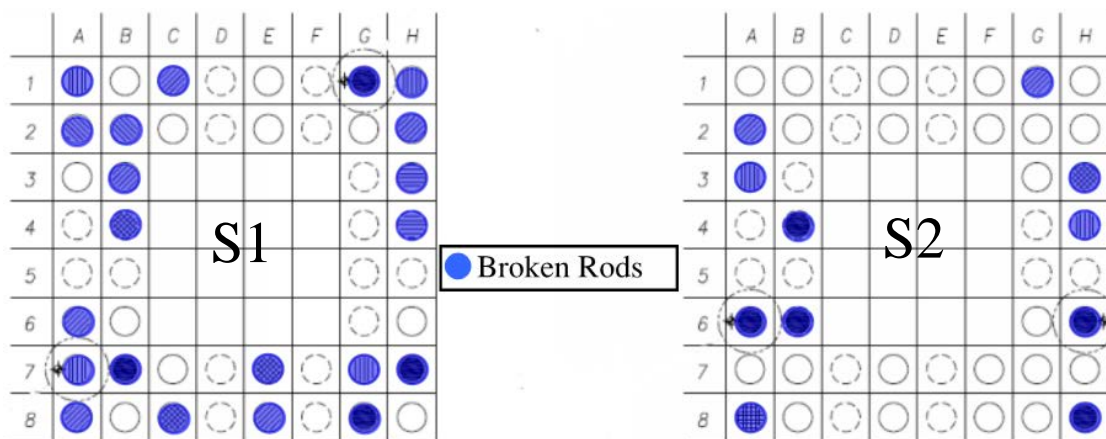
## SUBJECT

Borescope Investigation of Pier E2 Rod Holes – 2013

## BACKGROUND

A total of 288 ASTM A354 Gr. BD bearing and shear key anchor rods have been installed in Pier E2. 96 of these 3-inch hot-dip galvanized rods are shear key anchor rods that were embedded in concrete. The rods were fabricated in 2008 and assembled inside pipe sleeves in Shear Keys S1 and S2. The area around the pipe sleeves was grouted five years later, in 2013.

Once the grouting was complete, in Mar. 2013, thirty-two (32) of the shear key anchor rods fractured shortly after tensioning. The specific rods are highlighted in **Figure 1**. The top portions of the rods were extracted in segments for fracture analysis. It was not possible to retrieve the bottom fracture surfaces. The Department requested that METS investigate the interior of the rod holes with a borescope to evaluate the in-situ conditions and provide images of the fracture region.



**Figure 1: Locations of Failed Rods in Shear Keys S1 & S2**