

MSCAA – Hurricane Creek Culvert Investigation

Introduction

The Hurricane Creek Box Culvert is a drainage structure that conveys Hurricane Creek drainage on the east side of the Memphis International Airport to its outlet into Nonconnah Creek on the north side of the airport. The box culvert runs generally south to north and passes underneath Runway 9-27 as well as Taxiways A and V approximately 750-feet to the west of Taxiway A-2.

STRUCTURE INFORMATION

The box culvert is a four (4) barrel box culvert with each box being 14-feet wide and 13.5-feet tall. The structure was constructed in 1985 as part of a plan by the Memphis-Shelby County Airport Authority (MSCAA) to improve drainage and remove drainage ponds.

At approximately 1,580 feet long, the Hurricane Creek Box Culvert connects into an existing four (4) barrel box culvert on FedEx property at the north side of Taxiway V. On the south end of the structure, it connects into a reinforced concrete open drainage channel.

The construction drawings dated April 19, 1985 prepared by Allen Hoshell were made available by the MSCAA; however no design loading or methodology was identified in these drawings.

MAINTENANCE BACKGROUND

Records indicate that no major maintenance has been performed on the structure since construction. MSCAA personnel indicated that the structure is routinely cleaned to remove any debris that collects inside.

AIRFIELD MODIFICATIONS OVER BOX CULVERT

In 2009, Runway 9-27 was reconstructed. This reconstruction involved raising the grade of the existing runway approximately 1-foot near the Hurricane Creek Box Culvert. The entire pavement section of the runway was reconstructed and changed from a bituminous surface to a Portland cement concrete surface. No structural modifications were made to the box culvert during this construction except some additional storm sewer drainage linked to the culvert.

PROPOSED AIRFIELD MODIFICATIONS OVER BOX CULVERT

MSCAA is currently working on plans for reconstruction of Taxiways A and V over the Hurricane Creek Box culvert. We understand that no grade changes are proposed for these taxiway reconstructions. We have assumed that no major grade changes over the culvert will occur.

Observations

Visual observations of the box culvert were performed by Matt Jensen, P.E., a certified bridge safety inspector, on March 22 and 23, 2010. The visual observations were conducted to determine the physical and functional condition of the culvert and to form the basis for the evaluation and rating of the culvert.

VISUAL OBSERVATIONS FROM WITHIN CULVERT

The four (4) barrel box culvert was visually inspected during a walkthrough of the entire MSCAA culvert. Generally, the walk-through started at the south end of the culvert proceeding to the north end of the MSCAA culvert section about 1,582-feet north of the south end at the interface with the FedEx culvert. Kimley-Horn inspection staff was able to walk between the barrels of the culvert via equalization openings several hundred feet into the FedEx section of the culvert. Each barrel was walked the full length of the MSCAA culvert. The inspection procedures used meet the criteria for a routine inspection.

The structure appears to generally be constructed in accordance with the construction drawings. One notable difference was that a stay-in-place precast concrete form was used for the top slab. The construction drawings do not show the stay-in-place panels.

Overall, the 25-year-old culvert is in good condition. The barrels were generally clean, with little to no sediment or vegetation in the barrels. Site photographs of the culvert can be found in the Appendix A.

There were no areas of substantial cracking or deterioration that was visually observed in the culvert. No outward evidence of settlement was noticed, with the water flowing generally through the middle of each barrel. Expansion joints were generally located at 40-foot intervals, and no differential movements were observed at these joints. With rain immediately prior to the visual inspection, water migration was noticed at a majority of the culverts expansion joints. This infiltration did not appear to cause any deterioration of the top slab and would be considered normal for this type of structure.

The interior and exterior side walls and base slab did not show any significant abrasion, cracking, bulging, or other deterioration of the exposed concrete surfaces. Appendix A, Figures 11 and 12 show an interior wall with misaligned concrete faces. This condition likely occurred during construction due a misalignment of concrete formwork that supports the plastic concrete while concrete was being poured. The formwork faces did not line up, therefore creating a difference in wall thickness. The side that protrudes is thicker than the design drawings dictate, and is therefore more robust than necessary. This condition does not affect the integrity of the structure and actually results in a thicker section with greater strength.

The underside of the stay-in-place precast concrete deck panels visually appeared to be in good condition, with no observations of cracking, spalling, or other deterioration. The underside of the cast-in-place top slab was not visible, so no comments can be made regarding its condition, other than the core tests which are described later in this report.

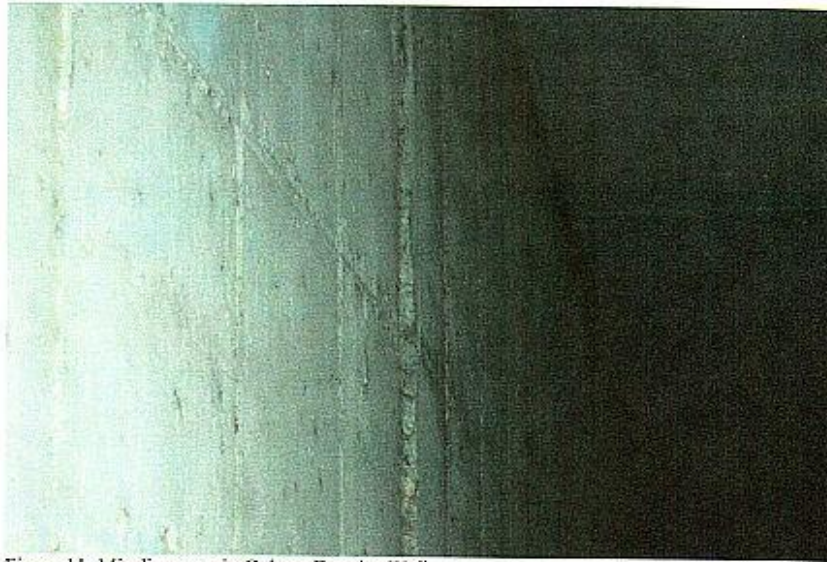


Figure 11: Misalignment in Culvert Exterior Wall



Figure 12: Misalignment in Culvert Exterior Wall