

# Full-Scale Testing of Trunion-Hub-Girder Assemblies of Bascule Bridges

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The project, "Parametric Finite Element Analysis (Phase I) and Full-scale Testing (Phase II) of Trunion-Hub-Girder Assemblies of Bascule Bridges" funded by the Florida Department of Transportation, involves investigating the reasons for failure of the hub during assembly with the trunion and girder (prior to installation).

Phase II of the project involves an experimental temperature and stress analysis of the THG (trunion-hub-girder) assembly. There are two assembly procedures: the first involves shrink fitting the trunion into the hub followed by shrink fitting the trunion-hub assembly into the girder, and the second involves shrink fitting the hub into the girder followed by shrink fitting the trunion into the hub-girder assembly. All interference fits are FN2 fits with liquid nitrogen as the cooling medium. Each assembly procedure takes approximately 40 hours for the four steps of cool-down, warm-up, cool-down, and warm-up.

Large tensile hoop stresses are developed in the hub at the trunion-hub interface, as a result of the interference fits between the trunion-hub and the hub-girder. It is possible that the cast steel may have some micro-cracks. These micro-cracks may grow in size when the hub is cooled in liquid nitrogen, because the fracture toughness of the steel decreases with a decrease in temperature.

The transient temperatures and stresses are measured, during both the assembly procedures. The results help us in assessing and comparing the possibility of hub failure in the two assembly procedures.

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