

Quarterly Report

Public Page

Date of Report: *September 30, 2015*

Contract Number: *DTPH56-14-H-00003*

Prepared for: *Government Agency: DOT*

Project Title: *Strain-based design and assessment in critical areas of pipeline systems with realistic anomalies*

Prepared by: *Center for Reliable Energy Systems (CRES), C-FER, NIST, and CANMET*

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For quarterly period ending: *September 30, 2015*

1 Work Completed in this Quarter

All pipes for full-scale tests and curved wide plate tests were received by the testing labs. The FCAW girth welds for the curved wide plate (CWP) tests were fabricated, inspected, and shipped to the testing lab.

Finite element analyses (FEA) for pipes with transition welds and anomalies, i.e., corruptions and dents, were continued. The focus was on (1) supporting the refinement of specimen designs and testing procedures, (2) identifying controlling parameters and mechanisms for different anomalies, and (3) developing preliminary recommendations on assessment models and procedures.

Based on recent analysis findings, the corrosion anomaly sizes for the burst tests were revised. The lengths of the thick and thin pipes for the full-scale bending tests of pipes with transition welds were revised. The key controlling parameters and failure mechanisms of the burst of corroded pipes and compressive buckling of dented pipes and pipes with transition welds were analyzed. Preliminary recommendations on the assessment of compressive strain capacity of pipes with transition welds, dents, and corrosion defects were developed. Preliminary recommendations on the assessment of the tensile strain capacity of pipes with corrosion anomalies were developed and the recommended procedures were evaluated with the testing data. The significance of wrinkles on the burst pressure of pipes was assessed with both numerical simulations and experimental testing data. It is concluded that the wrinkles have insignificant effects on the burst pressure of pipes.

The small-scale tests of the pipe materials used in the full-scale tests are underway



and will be completed early next quarter. The requirements for the small-scale tests of the FCAW girth welds and pipe materials to be used in the curved wide plate tests were reviewed.

Two 36" FCAW welds were received at NIST for curved wide plate testing. The NDE reports for both welds were obtained and a specimen sectioning plan is being developed. The critical small-scale test requirements have been discussed with the project team. SMAW welds have been removed from the scope of work.

The test set up for the full-scale bending tests of pipes with anomalies was completed and commissioned. This task consists of 10 tests, 3 tests with dent anomalies, 3 tests with transition welds, 3 tests with corrosion anomalies, and one reference test. The reference test and the first dent anomaly test were completed.

The full-scale test set up for bending as well as the burst containment for testing specimens with corrosion anomalies was completed and commissioned.

Four full-scale tensile tests were conducted for pipes with corrosion anomalies. Three tests were completed for pipes with different corrosion anomaly sizes. The fourth test was a reference test with no anomalies.

Monthly reports were submitted online. Two progress review meetings were held on 7/8/2015 and 8/31/2015, respectively.

2 Work Planned for the next Quarter

The work planned for the next quarter includes: (1) small-scale tests, (2) curved-wide plate tests, (3) finite element analyses and model development, (4) full-scale pipe tests, and (5) project management, monthly and quarterly reports, and meetings.