



ASME PCC-2 Qualification Testing for the ComposiSleeve™ System

Prepared for:

Western Specialties, LLC



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**STRESS
ENGINEERING
SERVICES INC.**

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EXECUTIVE SUMMARY

Western Specialties, LLC (Western Specialties) contracted Stress Engineering Services, Inc. (SES) to perform an independent technical assessment of their ComposiSleeve™ pipeline repair system with respect to the qualification requirements of ASME PCC-2-2011, Repair of Pressure Equipment and Pipe, Article 4.1, Nonmetallic Composite Repair Systems for Pipelines and Pipework: High-Risk Applications.

The ASME PCC-2 standard provides composite manufacturers and operators with a comprehensive uniform approach for the proper design of composite repair systems based on required coupon material properties testing, along with assessing overall system performance using full-scale testing. Included within this review of the ComposiSleeve™ pipeline repair system is a comprehensive assessment to validate that the ComposiSleeve™ pipeline repair system is adequately designed for its intended use in accordance with ASME PCC-2. The emphasis of the work performed by SES in this assessment is the repair and reinforcement of high pressure transmission pipelines.

In addition to completing the tests required by ASME PCC-2, SES performed pressure testing to failure of simulated corrosion defects repaired with different combinations of the ComposiSleeve™ system (i.e. no composite overwrap, 8 layers, and 16 layers). Testing was also performed involving the application of cyclic pressures on a test sample with simulated corrosion until a failure occurred. Before issuing “official” documents qualifying the performance of composite repair systems, SES requires that these tests be conducted in addition to those required by ASME PCC-2.

This report provides specific insights on the performance of the ComposiSleeve™ pipeline repair system, including the ASME PCC-2 1,000 hour tests and the additional SES-required tests mentioned in the preceding paragraph. All of these tests are critically important in terms of qualifying the performance of the ComposiSleeve™ pipeline repair system.

Since the ASME PCC-2 qualifying standard was written primarily for wet wrap systems involving the use field-applied or pre-impregnated resins, the design of systems involving either pre-cured coils or half shell designs, like the ComposiSleeve™ system, are not explicitly addressed. Therefore, any evaluation of these systems must rely on assessments via full-scale testing performance and not rely explicitly on calculations to determine the minimum required reinforcing thickness.

In addition to steel half shells, the ComposiSleeve™ system uses the A+ Wrap™ composite system manufactured by Pipe Wrap, Inc. that has already demonstrated compliance with ASME PCC-2.¹ **Because there is no calculator for determining the required thickness of the ComposiSleeve™ repair system, the thickness for the composite overwrap must be in accordance with the calculator developed for the wrap system.**

Qualification testing was conducted on the ComposiSleeve™ repair system based on requirements of ASME PCC-2. When used to repair and reinforce pipelines, the ComposiSleeve™ repair system employs the A+ Wrap™ composite system that was qualified previously in 2011 to meet the minimum requirements of ASME PCC-2-2011, including the designation of the long-term design strength for the composite material based on 1,000-hour performance testing.

The applicability of the results associated with the testing work completed by SES in this study are based on the premise that all materials, techniques, and installation methods used to repair actual pipeline anomalies are consistent with those used in completing the tests detailed in this report, including those associated with testing specific to ASME PCC-2.

¹ ASME PCC-2 & ISO 24817 Certification Document for the A+ Wrap System (Rev. 2) , issued by Stress Engineering Services Inc. to Pipe Wrap, LLC, June 2011.