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Validation of Sleeve Weld Integrity and Workmanship Limit Development
1st Quarter Status Report

Office of Pipeline Safety, U.S. Department of Transportation
Agreement No.DTRS56-03-T-0011

This report summarizes the work completed in the first quarter of the project, and has been distributed to the program sponsors.

An initial meeting was held in Calgary in October 2003 to discuss the scope of the project and plans for field work in 2004. The minutes of this meeting are included in Appendix A. The earlier finite element modeling work sponsored by TCPL was reviewed and the results were critiqued for use and application to the present modeling work. The request for investigation into the sensitivity of installation pressure on the results will be incorporated into the finite element analysis (FEA) as it is too difficult to request specific pressures on the operating pipelines during field installation. The equipment for field instrumentation is going through final operational checks and consumables and equipment are being assembled for the field work. TCPL has a sleeve installation upcoming during the week of 1 March 2004 that is the first one targeted for field work. The final details and decision as to whether the instrumentation will proceed are being discussed this week (23 February 2004). Enbridge has a couple of excavation programs underway, so if the TCPL dig does not go ahead, then plans will proceed with the Enbridge excavations within the next month.

In preparation for the field work, gauge locations have been determined and plans have been assembled to record readings at different stages of the installation. In parallel with the field work, the FEA models have been refined on the basis of the earlier work and techniques for loading the sleeves and geometry variations are being investigated in the models. Available references on sleeve installation have been reviewed to provide guidance to the field work and modeling.

The field work should be completed in the next few months and will be reported in the second quarter report.

APPENDIX A

5666C Validation of Sleeve Weld Integrity and Workmanship Level Development
Kick-Off Meeting
10 October 2003

Attendees:

Location	Name	Company
Calgary	Dave Horsley	TransCanada PipeLines Ltd
	David Dorling	TransCanada PipeLines Ltd
	Dave Taylor	TransCanada PipeLines Ltd
	Brad Sadoway	TransCanada PipeLines Ltd
	Aaron Dinovitzer	BMT Fleet Technology Limited
	Robert Lazor	BMT Fleet Technology Limited
	Darren Begg	BMT Fleet Technology Limited
Edmonton	Scott Ironside	Enbridge Pipelines Inc.
Washington, D.C.	Rita Freeman-Kelly	U.S. Department of Transportation, Research and Special Projects Administration, Pipeline Safety R&D

The meeting was initiated at 1330h MDT at the TransCanada PipeLines Ltd. offices in Calgary, with Edmonton and Washington connecting to the meeting by conference call. The notes for the meeting address action items and clarifications that were raised during the discussions of the project scope and planning for field work and modeling.

A PowerPoint presentation had been sent to Scott and Rita to follow along at their locations.

Finite Element Models

Dave Horsley mentioned that they had completed some finite element analysis (FEA) modeling at the University of Waterloo using axi-symmetric models for a Stopple tee. As well there was a PRCI report describing some simplified modeling techniques that might be made available. In this previous work it was found that an axi-symmetric model could not pick up the variations in loading associated with the tee installation, particularly when the coupon had been cut out of the run pipe. While, the tee is a much more complex structure, not being considered in this project, the modeling in this project will utilize three-dimensional models. This more complex model will provide the potential for extension to tees in the future and allow for moment loading due to the branch connection.

Action: Dave Horsley will find the report describing the earlier work and provide details to the Sponsor Group to direct the investigations. If possible, the report will be made available to the project sponsors. Alternatively the technical direction provided by the report will be summarized and reported.

Installation Pressures

TransCanada had requested that the modeling work include a sensitivity study to investigate the influence of pipeline operating pressure during sleeve installation. The line pressure can range from 30% to 80% of the maximum operating pressure (MOP) on the TCPL system, while Scott indicated that Enbridge requires the line pressure to be no greater than 50% of the MOP during welding of the sleeve.

Action: BMT FTL to include a sensitivity analysis on pressure during sleeve installation.

Field Instrumentation

In discussing the steps that will be typically followed during installation of the sleeves in the field, it was noted that strain measurements should also be recorded:

1. Following pressurization of the sleeve annulus for installation of a pressure-containing sleeve.
2. After the mainline has been returned to full operating pressure following sleeve installation. As a minimum, readings should be taken after the sleeve has been installed and at another point in time when the line pressure has been changed, either higher or lower pressure. The intent is to confirm that the hoop gauges accurately follow the changes in operating pressure.

It was recommended to determine the loading on the jacks during sleeve installation. This will be investigated in relation to the specific techniques used by both TCPL and Enbridge to determine how these loads can be measured.

2003/2004 Sleeving Programs

Both TCPL and Enbridge will be installing sleeves over the winter and the opportunity for instrumentation during field work will be coordinated with their respective field programs. The pipe diameters covered with the sleeving programs will range from NPS 20 to NPS 42 pipe; the wall thickness will range from 6.25 to 12.7 mm.

BMT FTL will prepare a questionnaire requesting details of each of the sleeving programs, general dig locations, and timing of the work. This will allow the project team to best determine locations for field work and to select the type(s) of sleeve installations that will be instrumented. In addition, both TCPL and Enbridge will provide typical sleeve drawings and sleeve installation procedures so that field work planning can effectively be completed.

Action: TCPL and Enbridge to provide sleeve drawings and sleeve installation procedures. Note any restrictions on distributing this information to other sponsors.

Action: BMT FTL to prepare and distribute questionnaire requesting details of sleeving programs.

Rita asked for clarification as to how the weather can affect the field work. It is recognized that some of the work could proceed when the ambient temperatures are quite low. The main problem with instrumentation at low temperatures is that soldering of connections is difficult because the external surface of the pipe removes the heat quickly and solder connections are thus difficult to complete. The use of strain gauges with attached leads should obviate this concern for the field work. When necessary, the worksite will be covered and heated. Some sleeving work is currently underway on the Enbridge system within 50 km of Edmonton and we will try to schedule field work within the next 6 weeks. It is hoped that the weather should not play a significant role within this 6 week period until the end of November.

Rita requested that she be advised of the schedule for field work as she would like to travel to the field to view the procedures. All people involved with the project that attend the excavation sites will have to complete the respective Company's safety training.

Action: BMT FTL to provide schedule for field work to sponsors.

In order to plan the field work, Robert and Scott will make arrangements to view one of the current sleeve installation digs on the Enbridge NPS 34 system.

Action: Scott to advise Robert of possible dates and locations.

Aaron advised that if Enbridge and/or TCPL wanted to take advantage of sleeving material provided to the project by TDW they should provide details of sleeve dimensions to BMT FTL and TDW Services so that they can provide sleeves for the field work or future applications.

Instrumentation and Equipment:

BMT FTL is about to start a program of instrumentation calibration. If TCPL and Enbridge has any strain indicators, switch and balance boxes or strain gauge welders that need testing, please forward them to BMT FTL ASAP. Testing will be completed free of charge and repairs will be done (with Client authorization) at cost.

Action: Both Dave Horsley and Scott Ironside will review equipment on hand and send it to BMT FTL. The availability of any strain gauges that can be donated to the project will be reviewed.

Meeting was adjourned at 1430h MDT.