Prepared by: [redacted]

INSTALLATION AND MONITORING OF COUPON TEST STATIONS O-10.2

Asset Type: Gas Transmission **Function:** Maintenance and Construction

Issued by: [redacted] Original Signed By **Date:** 10-30-08

Rev. #01: This document replaces Revision #00. For a description of the changes, see Page 4.

Purpose and Scope

This gas numbered document provides specifications, and installation, commissioning, and monitoring instructions for coupon test stations.

Acronyms

ETS: electrolysis test station
mV: millivolt
psig: pounds per square inch gauge

References Documents

Electrolysis Test Station Connection to Main O-10
Corrosion Control of Gas Facilities O-16

Definitions

Pipe Coupon: The coupon normally connected to the pipeline.

Native Coupon: The coupon never connected to the pipeline.

General Information

1. Coupon test stations may be used for any location and may be especially useful when the environment makes conventional measurements inaccurate or not representative. See Numbered Document O-16 for applications.
2. Specifications: CC Technologies coupon test station (CS3100), 10' long, 1.4-square-inch coupon size, machined and grit-blasted. For unusually deep applications, 10' extensions may be ordered.

Ordering Instructions

To order a coupon test station, use Code 560691. To order an additional 10' extension, use Code 560700.

Responsibilities

Corrosion engineering personnel will review system performance and determine when conventional pipe-to-soil measurements are not sufficient to demonstrate cathodic protection. Corrosion engineering personnel will develop action plans to install, commission, and monitor coupon test stations on transmission lines where required.

Installation Procedures for CC Technologies Coupon Test Station

1. Install two wire leads on the pipeline per Numbered Document O-10, Type A or use the existing ETS. Leave at least 3' of undisturbed earth between the pipeline wire lead and the coupon-test-station excavation sites. Excessive soil disturbance at the coupon test station can affect measurement accuracy. The wire test leads from the pipe can be extended to the coupon-test-station hole by open trench methods, as long as the excavation is at least 24" above the top of the pipeline.
2. Coupons shall be installed to represent known locations of poor coating.
   A. When it is known that the most degraded coating is on top of the pipe, auger a 3" diameter hole to approximately 8" above the pipe.

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B. When it is known that the most degraded coating is on the bottom of the pipe, auger a 3" diameter hole approximately 8" from the side of the pipeline and to the depth of the bottom of the pipeline.

C. For all other cases, auger a 3" diameter hole approximately 8" from the side of the pipeline and to the depth of the mid-line of the pipeline.

3. Add a few inches of loose soil, removed from the bottom of the hole, back into the hole (or just loosen a few inches at the bottom of hole).
4. Insert the coupon-test-station assembly into the hole (See Figure 2 on Page 4). Each assembly contains two coupons. Make sure that the two coupons are lined up parallel to the pipeline (i.e., both are the same distance from the side of the pipeline). The coupon with white wires should be line up to either the north or the east.
5. Cut the 3" reference tube to the desired length, using a pipe cutter or other appropriate cutting device. Cut the smaller, unattached conduits to the proper length, such that when inserted over the coupon wires, they will be flush with the top of the reference tube.
6. Slide the conduits over the black and white coupon lead-wires and attach the conduits to the inside of the reference tube, using an appropriate fastening method such as pipe clamps, ties, or strong tape.

   Note: Conduits must be installed against the side of the 3" reference tube to allow the passage of the copper sulfate reference cells for test readings.
7. Bring the pipeline wire leads to the reference tube at below the grade. Route the wire leads from the pipeline through a drilled hole, into and up the reference tube. Alternatively, the pipe leads may be routed through the bottom of the reference tube.
8. Press the coupons into the loose soil at the bottom of the hole. Check if the conduits have moved with respect to the top rim of the reference tube. If they have moved (pushed up), the conduits must be pushed flush to the top edge of the reference tube to ensure that the coupons are properly positioned with respect to the bottom edge of the reference tube. If this cannot be done with the coupon assembly in place, the coupon test station must be removed from the hole, and the coupon must be repositioned and fixed with respect to the bottom of the reference tube.
9. Add soil to the reference tube. Fill the reference tube with soil to the grade level, a few inches at a time, and firmly tamp at each step. Use the native soil that was removed; it should have the same moisture as the surrounding soil. Screen the native soil, if necessary, to remove excessive rock. Remove all rocks larger than 1/2". In high-resistance soils (above 150,000 ohm-cm), fill the tube only 1' to 2' above the coupons. If the soil has dried out, water may be added. There is no need to excessively wet the soil.
10. After filling the tube with soil, request that the corrosion mechanic connect the wire leads to the coupon-station head (See Figure 1 on Page 3). Do not cut or shorten the wire leads. Do not connect any coupons to the pipe at this time.

Commissioning Procedures

To establish a basis for cathodic protection monitoring, a corrosion mechanic shall perform the following commissioning procedures:

1. Allow 3 months after installation for the coupons to reach their free potentials.
2. After 3 months, connect the test coupon with the black lead to the pipeline. The test coupon with the white wire will **not** be connected to the pipeline; it will be the native coupon.
3. Allow at least two additional weeks for the test coupon connected to the pipe to polarize. After two weeks, read and record the potentials as follows (both inside and outside of the test tube at ground level):

   A. Disconnect the pipe coupon. Record the potentials of the pipe, the pipe coupon, and the native coupon, and the date and time of the readings.

   B. After several minutes, read the potential of the disconnected pipe coupon and compare to the first reading. Continue to read the potential, if necessary, until the reading is 100 mV more positive than the initial reading. Record the potential and the time it took for depolarization.

   Note: Depolarization could take up to, and in excess of, 48 hours at some locations.

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Installation and Monitoring of Coupon Test Stations

Using Test Coupons for the Monitoring and Evaluation of Cathodic Protection

1. One of the following criteria shall be used to indicate adequate cathodic protection:
   A. Pipe-to-soil potential: –850 mV or more negative, with cathodic protection current applied.
   B. Disconnected pipe coupon-to-soil potential: –850 mV or more negative.
   C. 100 mV polarization, established by one of the following:
      (1) At least a 100 mV difference between the disconnected pipe coupon and the native coupon.
      (2) At least a 100 mV difference between an initial, disconnected pipe coupon-to-soil potential and a subsequent, depolarized reading.
   D. As determined by corrosion engineering personnel.
2. At least once annually, for active coupon test stations, measure and record the potentials on Form FO-10.2-A, "Annual Monitoring Readings for Active Coupon Test Stations," on the data-collection forms generated by Paradigm, or by using hand-held dataloggers. The forms shall be kept in the Cathodic Protection History File, if not entered into the Paradigm computerized, cathodic protection database.

CAUTION

Avoid making any direct connections between a native coupon and a pipe or pipe coupon, which could polarize the native coupon and thus void its function to provide native potentials.

A. Record the pipe-to-soil potential, with the reference cell outside the test tube.
B. Record the disconnected pipe coupon-to-soil potential, with the reference cell inside the test tube.
C. Record the native coupon-to-soil potential, with the reference cell inside the test tube.
D. Record the disconnected pipe coupon-to-soil potentials (initial and final), with the reference cell inside the test tube (required when the 100 mV polarization criteria is being confirmed by the pipe coupon depolarization).

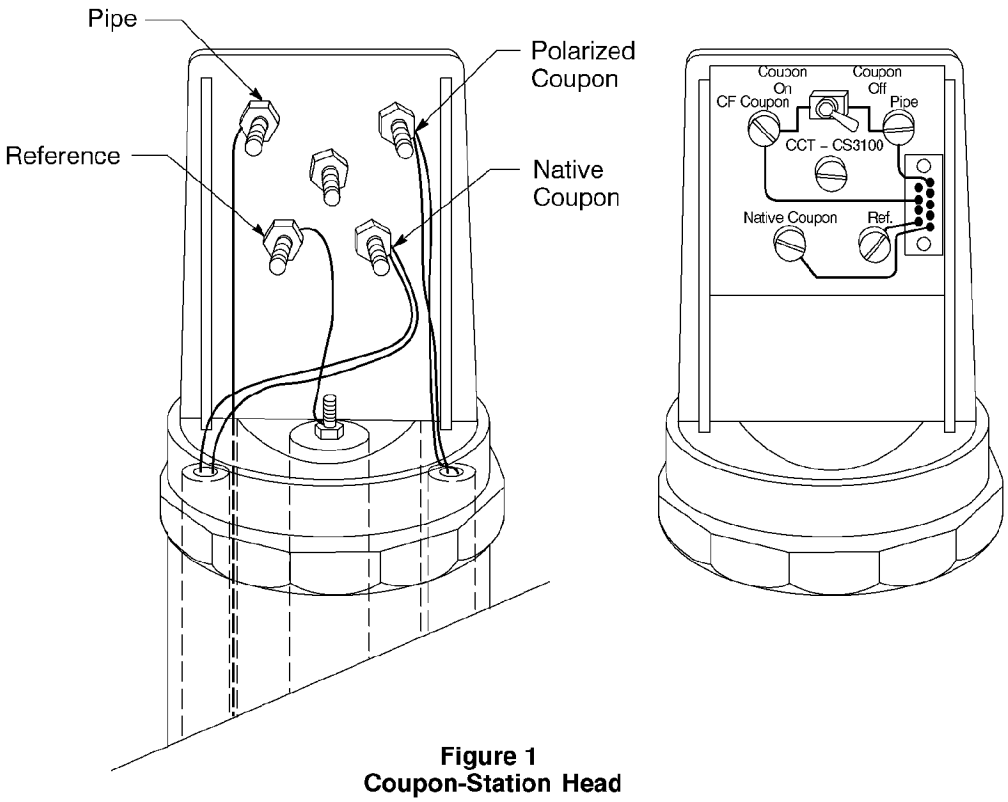

Figure 1
Coupon-Station Head

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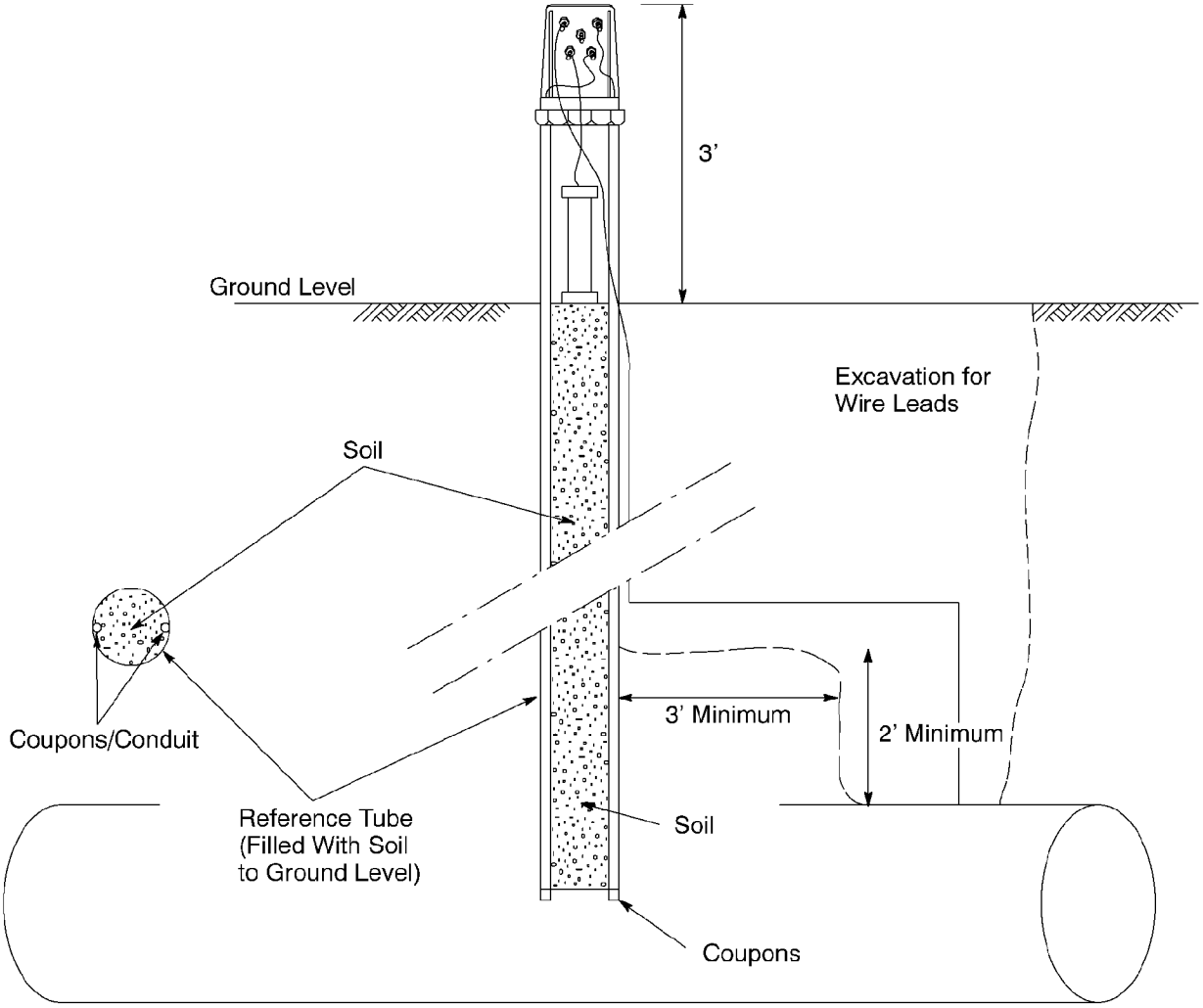

Figure 2
Coupon and Reference-Tube Configuration

Attachments

Attachment A . . . Form FO-10.2-A, "Annual Monitoring Readings for Active Coupon Test Stations"

Revision Notes

Revision 01 has the following changes:

1. Revised the reference document from Standard S4133 to Numbered Document O-16.
2. Extracted Attachment A from this document. Attachment A is now separate MS Word file, Form FO-10.2-A. See the "Attachments" section above.

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