Inspection of Piping for Atmospheric and External Corrosion at Transmission Station Facilities

Introduction

This document describes how to perform required inspections, evaluations, and repair for atmospheric corrosion on exposed natural gas piping and components at Pacific Gas and Electric Company (Company) gas transmission station facilities. Inspections are required for the following steel piping:

- Piping at air-to-soil transitions.
- Aboveground station piping.
- Piping in pits and vaults.

Note: For the purposes of this document, "piping" means all parts of the transmission and distribution system used to transport natural gas, including pipe, fittings, gauge taps, valves, valve extensions, and equipment.

1. Inspection Requirements

For the transmission assets listed above, 49 CFR 192.48, "Atmospheric corrosion control: Monitoring," requires the Company to perform inspections for atmospheric corrosion on each pipeline that is exposed to the atmosphere once every 3 years, not to exceed 39 months, to the date.

2. Performing Inspections

2.1 Responsibilities for Performing Inspections

- District personnel must inspect all piping that is exposed to the atmosphere at stations on the backbone and other district-maintained stations.
- Division personnel must inspect stations on local transmission and distribution feeder mains (DFMs).
- Personnel performing inspections must document all inspection results on Form TD-4430P-02-F02, "Gas Facilities Station Maintenance Report," and make any necessary repairs. If repairs cannot be made at once, immediately notify the supervisor, who then requests support from corrosion engineering personnel.
- Corrosion engineering personnel must assess the condition of pipelines for which immediate corrections could not be made, prioritize those conditions for future repairs, and perform quality control (QC) on a sampling of the prioritizations.

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Employees who perform inspections must be properly trained and qualified under the following Operator Qualification (OQ) tasks:

- 03-04, "Corrosion Control – Atmospheric Corrosion"
- 03-05, "Corrosion Control – Pipeline Inspection"

2.2 Inspecting Piping at Air-to-Soil Transitions

Inspect for corrosion on exposed piping at air-to-soil transitions. Digging is not necessary as part of the inspection unless the transition region is buried.

Note: As a rule, the worst coating damage is to be expected at the soil level of the transition joint because that is where maximum severity of alternating conditions (wet/dry cycling and concentration of corrosive species) occurs.

2.3 Inspecting Aboveground Piping Covered with Insulation

On aboveground piping covered with insulation, cut inspection windows in the insulation at approximately 6 o'clock (i.e., on the bottom section of the pipe). Cut the windows in an area where water is most likely to accumulate (closest to gas flow pressure cuts, at low points, etc.).

Note: Make the windows removable so that the insulation can be removed again during future inspections to check the integrity of the pipe.

2.4 Inspecting Piping in Pits and Vaults

Conduct inspections for corrosion on exposed piping in pits and vaults. When deciding whether the existing coating needs to be replaced or repaired, judge the adequacy of the paint by attempting to remove some coating that appears to be well bonded at three small locations. If the coating appears to be in good condition, no recoating is needed. If the coating is in need of only spot repairs and there is no evidence of pitting corrosion, repairs to the existing coating can be made with that same system or with a wax tape system. See Gas Standards and Specifications (GS&S) E-35, "Selecting and Applying Coatings for Buried Transmission Pipe," for details on approved coating systems.

3. Evaluating Inspection Findings

This section describes how to evaluate the condition of the piping with respect to corrosion. A "No" answer to any of the questions in Table 1, "Checks for Station Piping," and Table 2, "Checks for Piping in Pits and Vaults," indicates that repairs may be required. Any evidence of pitting corrosion on exposed pipe surfaces must be further evaluated by gas engineering personnel for possible repairs (see Sections 4, "Evaluating Corrosion Repair Requirements after Removing Coating," and 5, "Replacing/Repairing Coating on Piping Systems").

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Table 1. Checks for Station Piping

Coating OK?	Pipe Integrity OK?	Paint OK?
No: Transition coating is not in good condition. Record notes describing condition.	No: Pitting is present. Record depth of pitting in notes.	No: Paint is chalking, peeling, or cracking. Record notes describing condition.
Yes: Transition coating is in good condition. (Coating is ideally 6 inches above grade: note length of area lacking coating.)	Yes: No pitting is present.	Yes: Paint is in good condition.

Table 2. Checks for Piping in Pits and Vaults

Coating OK?	Pipe Integrity OK?	Perforation Sealed?
No: Transition coating is not in good condition. Record notes describing condition.	No: Pitting is present. Record depth of pitting in notes.	No: There is no seal. Record notes describing condition.
Yes: Transition coating is in good condition. (Coating is ideally 6 inches above grade; note length of area lacking coating.)	Yes: No pitting is present.	Yes: Seal exists. (Seal may be of any type; e.g., wax, coating, silicon, LinkSeals.)

Notes:

1. Coating extending at least 6 inches above the soil level is not cause for repairs.
2. The presence of cold-applied plastic tape or other coating systems that are not approved as replacement systems for transitions is not cause for repairs. For example, if a pipe is found to have a somastic coating at a transition that is in excellent condition (no pitting, no broken or loose bonding. is tightly adhered, etc), then the coating should not be replaced. even though somastic is not an approved transition coating.

4. Evaluating Corrosion Repair Requirements after Removing Coating

This section describes the process for obtaining additional data that is needed to further assess the condition of corroded piping for repairs. After the old coating is removed, perform the following steps when replacing coating:

1. Measure the extent of corrosion with ultrasonics or a conventional pit depth gauge to determine the maximum extent and depth of corrosion.
2. Compare the maximum corrosion depth to the actual wall thickness in the area that is not corroded. Any corrosion that does not exceed 20% of the measured actual wall thickness is acceptable as-is per RSTRENG.

   Note: RSTRENG does not apply to corrosion on welds.

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3. Apply RSTRENG cautiously to corroded piping in stations and on spans where secondary loads not accounted for in RSTRENG may be present.
4. In all cases in which the depth is greater than 20% of the measured actual wall thickness, contact the pipeline engineer for the area or corrosion engineering personnel. Pipeline engineering or corrosion engineering personnel, or their representatives, must evaluate the extent of corrosion and any action required. Table 3 below defines the evaluation strategies, which are categorized according to progressively increasing corrosion severity.

Table 3. Corrosion Evaluation Strategies

Strategy	Maximum Corrosion Depth	Corrosion Evaluation Criteria for Pipe	Comments
1	Less than or equal to 20% of actual wall thickness	None. Pipe is acceptable as is.	If fails 1, go to 2.
2	Greater than 20% and less than 80% of actual wall thickness	Perform RSTRENG analysis. Per RSTRENG, any length of corrosion less than 20% deep is acceptable. Use caution where secondary loads could be present.	If fails, repair or replace pipe or lower pressure. Contact pipeline or corrosion engineering personnel.
3	Greater than or equal to 80% of wall thickness	None. Repair or replacement of pipe is automatically required.	Repair or replace pipe.

5. Repairing/ Replacing Coating on Piping Systems

5.1 Coating for Piping at Air-to-Soil Transitions

Perform the following steps to replace coatings at air-to-soil transitions:

1. To select the appropriate coating, see GS&S E-30, "Selecting and Applying Coatings on Exposed Gas Piping," and GS&S E-35 for coatings approved for application at transition zones.
2. Excavate to a depth where there is good coating to tie into.

   Note: The transition region extends from a minimum of 6 inches above grade level to approximately 1.5 feet below grade level. When replacing the coating, it is not necessary to excavate deeper than 1.5 feet.
3. Tie the new coating into the existing coating as well as possible.

   Note: Additional excavation is required only if pipe that requires repair or replacement is found. In such cases, excavate until acceptable pipe is found and repair or replace.
4. Recoat the piping to a minimum of 6 inches above the ground.

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5.2 Coating for Aboveground Station Piping

1. To select the appropriate coating, see GS&S 6-30 for coatings approved for application on aboveground station piping.

   At compressor stations, special considerations apply on the hot sections between the compressor discharge and the cooling towers. Contact gas engineering personnel for specific recommendations.

2. Because color selection may be guided by local preference or environmental or aesthetic concerns, consult the district or division office to select the coating color.

5.3 Coating for Piping in Pits and Vaults

The coating selected must be able to withstand both environmental conditions found in pits and vaults. See GS&S 6-36 for details on approved coating systems.

Definition of Terms

Vault: An underground structure containing a pipeline segment. The structure may also contain any of the following: valves, flanges, control piping, sensing lines, pressure taps, filters, and strainers. The structure has a lid or a top that remains closed except when maintenance is being performed.

Pit: An underground structure containing a pipeline segment. The structure may also contain any of the following: valves, flanges, control piping, sensing lines, pressure taps, filters, and strainers. The structure does not have a lid.

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