



Description	This procedure gives steps in minimize stray currents and to prevent the adverse effects on gas pipelines.	
Regulatory Applicability	<input checked="" type="checkbox"/> Regulated Transmission Pipelines <input checked="" type="checkbox"/> Regulated Gathering Pipelines <input checked="" type="checkbox"/> Regulated Distribution Pipelines	
Frequency	As needed	
Reference	49 CFR 192.473 <i>External Corrosion Control: Interference Currents</i>	
Forms / Record Retention	F-192.455	Installation of Cathodic Protection Systems / Life of Pipeline
	WTG 1200	Rectifier Inspection Form / Life of Pipeline System
	WTG 1201	Interference Bond Data Sheet / Life of Pipeline System
Related Specifications	Section 9 of NACE RP0169-02 <i>Control of External Corrosion on Underground or Submerged Metallic Piping Systems</i>	
OQ Covered Task	None (In order to perform the tasks listed above; personnel must be qualified in accordance with West Texas Gas's Operator Qualification program or directly supervised by a qualified individual.)	



Procedure Steps

1. For WTG's pipelines systems that are subject to stray currents will have in effect a continuing program to minimize the detrimental effects of such current.
2. The company shall actively participate in corrosion coordinating committees or groups when available. These committees distribute information concerning the operation of cathodic protection systems for the purpose of providing opportunity for utilities to conduct cooperative interference testing to detect stray current interference conditions. When corrosion coordinating committees do not exist in the area, the company will make attempts to identify area utilities and structures that may be affected by company-operated cathodic protection systems and notify these utilities. The cathodic protection system information is distributed for new installations prior to activation and for existing systems if the output will increase above previously approved levels. When detected, the stray current interference conditions shall be resolved by mutual agreement between affected parties. Resolution of the stray current interference conditions may include but are not limited to installation of interference bonds, installation of galvanic anodes, and repair of coating deficiencies.
3. Unexpected and/or unusual variations in cathodic protection measurements encountered during normal testing will be evaluated to determine whether these test results may be caused by stray current interference. The company will work through corrosion coordinating committees or by direct contact with area utilities or other pipeline operators to resolve whether interference may be the cause of the unexpected and/or unusual test results and to resolve the stray current interference condition, if it exists.
4. Designs and installation for new cathodic protection systems will include evaluation of possible stray current interference effects on adjacent metallic structures. The design of the cathodic protection system will be modified to eliminate or minimize the stray current interference affects. If the cathodic protection system design can not be modified to eliminate or minimize the stray current interference effects, the owner of the adjacent metallic structure shall be contacted to determine if there will be objections to the proposed installation and what mitigative measures could be installed to resolve the objections. Use the process defined in Step 2 to resolve the issue of stray current interference on adjacent metallic structures.
5. Section 9 of NACE RP0169-02, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems" may be used for guidance with stray current mitigation.

General Discussion

To establish foreign interference, two fundamental conditions must exist. First, there must be at least two conductive breaks or "holidays" in the coating of the affected line. One will let foreign current get onto the line, and the other(s) will allow the foreign current to leave.

Secondly, the foreign line must have enough voltage difference between parts of its own system so that it has pipe-to-soil voltages (in different areas) that are both higher and lower than the pipe-to-soil potentials of the pipeline being interfered with. Some part of the foreign pipeline (or structure) must be more positive in DC potential than the pipeline being interfered with, in order to get current to flow onto the affected pipeline. Additionally, voltage at another part of the foreign



pipeline must be more negative than voltage on the affected line at the location where the foreign interference current leaves. This happens by the voltage of the interfered-with pipeline becoming less negative and rising at the point of current discharge, rather than any perceptible negative shift happening to the voltage on the foreign line.

The anode-side of a rectifier is the most positive voltage source to be considered in looking for a high (positive) DC potential on a foreign structure. Foreign current coming onto the affected pipeline will cause the affected pipeline's pipe-to-soil voltage to be more negative than the normal voltage in the immediate surrounding area. Foreign current leaving the affected pipeline (which is the location of possible severe localized corrosion) will shift the affected line's pipe-to-soil voltage to be less negative than the line's "normal" voltage in areas immediately adjacent to the current discharge area.

The shifts in the affected pipeline's pipe-to-soil potentials are visible on a close-interval survey.

Also, note that the voltage shifts caused by foreign interference can be sharp, and confined to small areas. It is likely that foreign interference will not be detected by review of test-station data alone.

The locations of current in-flow and out-flow on the affected line may be very close to each other, or they can be widely separated, perhaps several miles apart.

It is also possible, especially near the area of a foreign pipeline's rectifier, for foreign current to get onto a neighboring pipeline by flowing in reverse through the neighboring (affected) pipeline's sacrificial anodes. The presence of an anode in this case acts like a break in the coating, and will cause a corresponding current discharge at another location. This discharge will cause corrosion to the affected line, and possibly pipeline failure, if it is either not stopped, or if it does not occur through either a metallic bond with the foreign pipeline or through anodes installed at the location of the current discharge.

Checking for Interference Procedure Steps

1. Review close interval survey or structure-to-soil potentials for possible interference. Look for unexplained rises or falls in voltage not explained by positioning/condition of anodes, or changes in soil condition.
2. Determine possible sources of the cathodic interference. Note: This can sometimes be difficult to accomplish. The following steps are often useful:
 - a) Determine whether any impressed current ground-beds for foreign structures are near the affected pipeline.
 - b) Consider routes of foreign pipelines and locations of any associated rectifiers in deciding which foreign pipelines to investigate. Foreign pipelines that run parallel to the affected pipeline are more likely to contribute to interference than pipelines that approach and cross the affected pipeline's route only a single time. Also consider the proximity of any branches of a foreign pipeline to the affected pipeline.
 - c) Either measure directly the structure-to-structure potential difference between the affected pipeline and foreign structure(s) suspected of causing interference, or measure the



structure-to-soil potentials of both pipelines separately, but without moving the reference half cell between the pairs of readings.

- d) Discuss with personnel representing a suspected foreign structure the usefulness of impressing clearly distinguishable on/off cycles of applied known potential on the foreign structure(s), and look for a corresponding response pattern of changing pipe-to-soil potentials on the affected (interfered with) pipeline.
3. Recommend the most effective method of interference mitigation between the structures. If it is possible to do, repair of the coating break(s) on the affected pipeline that allows foreign current to enter that pipeline should be considered.
4. Document readings and recommended mitigation in appropriate format.
5. If a foreign interference is determined to exist, and the pipeline's pipe-to-soil voltage is more positive than -0.85 volts, time will be of the essence. It will be imperative that corrective action be taken quickly in order to avoid a possible leak. Management must be immediately notified that such a condition exists.
6. If a bond is used to mitigate interference effects, use Form F-WTG 1201 to record initial information about connection. Use Form F-WTG 1200 to record performance information at least 6 times annually, at intervals not to exceed 2 ½ months.
7. High Voltage Alternating Current (HVAC) power lines, new or enlarged power substations, wind energy and solar installations can cause both AC and DC interference. They can also include additional generation, voltage, uprating and or additional power lines. WTG performs pipeline patrols and pipe-to-soil surveys which ensure the total pipeline is inspected at required intervals. Upon discovery of interference, WTG will perform remedial actions from detrimental interfering currents no later than 15 months after discovery with allowance for permitting. This is only applicable to Transmission pipelines.