# PROCEDURES
## C. P. MONITORING

### 7.0 PURPOSE

The purpose of this section is to establish procedures for the monitoring necessary to maintain appropriate cathodic protection (CP) levels on existing pipelines as an integral component of maintaining pipeline integrity.

### 7.1 SCOPE

The following surveys requirements are covered:

A. Pipe Coating Inspection
B. Atmospheric Corrosion Inspection
C. CP Surveys
D. Close Interval Survey
E. Isolated Steel Section Survey
F. Null / Short Survey
G. Stray Current / Bonding / Insulating / Electrical Isolation

### 7.2 PIPE COATING INSPECTION

A. Each time a buried or submerged pipe or pipeline facility is exposed the coating shall be visually inspected for:
   1. Deterioration and/or damage
   2. Cracking and/or disbondment
   3. Signs of external corrosion
   4. Document findings on appropriate form(s)
   5. Issue any appropriate work order(s)

B. Each time the pipe coating is removed or missing:
   1. A pipe-to-soil reading shall be taken
   2. Check for signs of external corrosion
   3. Perform remedial action as may be necessary including utilizing a holiday detector
   4. Re-wrap the section of pipe using appropriate procedure
   5. Document findings and actions on appropriate form(s)
   6. Issue any appropriate work order(s)

### 7.3 ATMOSPHERIC CORROSION INSPECTION

A. A survey for the signs of atmospheric corrosion shall be conducted once every three years.

B Atmospheric corrosion of iron/steel facilities may appear on above ground facilities in the form of:
1. Flaking or bubbling paint
2. Metal loss with rust
3. Scaling of the pipe
4. Pitting of the pipe

C. Atmospheric corrosion of aluminum facilities, meters and regulators, may appear on the surface as a build up of a grayish powdery substance.

D. Perform appropriate remedial action(s) as necessary.

E. Document findings and actions on appropriate form(s).

### 7.4 CATHODIC PROTECTION (CP) SURVEY

A. An annual (once each calendar year not exceeding 15 months) survey involving pipe to soil readings of each test station or otherwise identified location within the gas piping system shall be undertaken.

B. Documentation of the annual survey records shall be maintained for a minimum of 10-years.

C. Each reverse current switch, diode, and interference bond shall be inspected six times each year at intervals not exceeding two and one half months.

D. Readings outside of the acceptable range or other abnormal operating conditions shall be forwarded immediately to the gas supervisor or designee.

### 7.5 CLOSE INTERVAL SURVEY (C.I.S.)

A. CIS is an accepted method of indirect assessment. CIS is most often conducted on transmission facilities located in High Consequence Areas (HCA).

B When required, a close interval C.P. survey of the gas system shall be conducted. This

involves pipe to soil readings taken at close intervals (every 1 to 3 meters) for the entire length of the pipeline.

A connection is made to the pipe test lead in a test station, and the reference electrode is moved down the line as shown in *Fig 1*, the pipe to soil potential can be measured

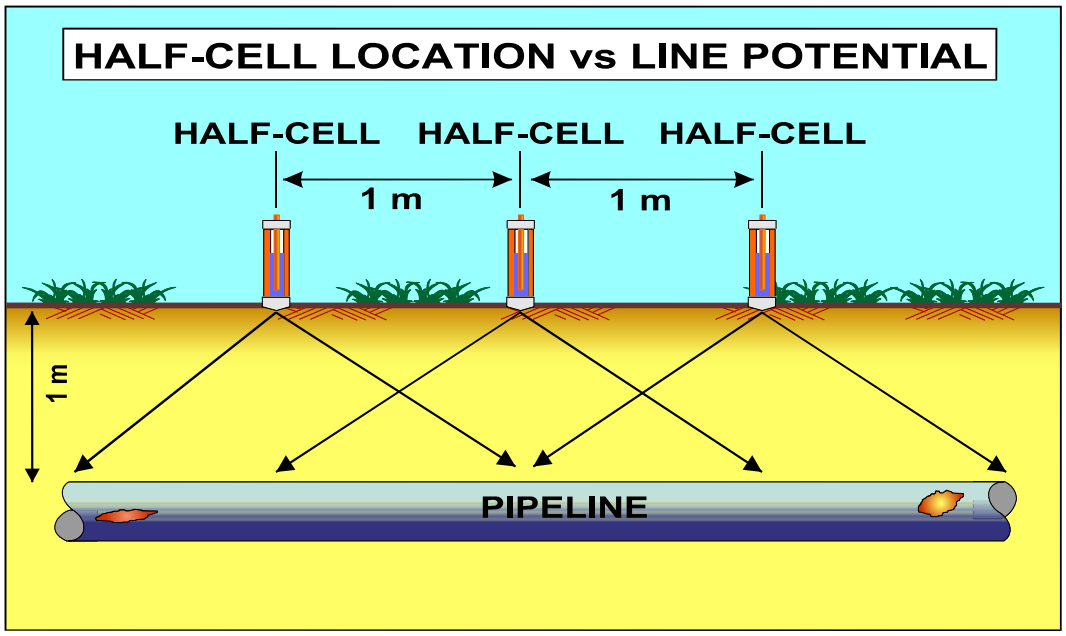


**Fig 1**

at numerous sequential locations. This is the basis of the C.I.S. The reference electrode spacing is usually either 1 m or 3 m, and by taking pipe to soil potential measurements over a fixed distance, a graph plot of potential vs. distance can be produced.

In cases where direct current is flowing, the pipe to soil potential that is measured, will include the actual pipe to soil potential, the voltage gradient in the ground, the voltage drop across the coating and the voltage drop **(IR Drop)** in the pipeline.

In this case, the pipe to soil potential is not the true pipeline potential. If the true pipe to soil potential is to be measured, the direct current flow causing the voltage gradients and pipe **IR Drop** must be removed.

This can be accomplished by temporary interruption of the Cathodic Protection rectifier current outputs, which will remove the direct current flowing in the system.

Therefore, there are two pipe-to-soil potentials that may be measured and recorded at each location when direct current flow in the ground is a factor.

The potential recorded with current flowing is called the "on" potential, and the potential recorded while the current flow is interrupted, is called the "off" or "polarized off" potential. Some surveys require both "on" and "off' potentials to be recorded. Other types of survey, e.g. on sacrificial anode systems, require only "on" potentials. Note that in sacrificial anode systems, the magnitude of current flow is generally less than for rectifier systems, and the current flow is more localized due to anode distribution.

### 7.6 ISOLATED STEEL SECTION SURVEY

A. An isolated steel section is a section of gas pipe not in excess of 100 linear feet in total length that is in some way isolated from other metallic piping and / or from the CP system.

B. Monitoring and testing of the level of CP shall be conducted testing a minimum of 10% per each calendar year and a different segment(s) tested each year so that the entire system is tested over a ten year period.

C. Pipe to soil readings shall be taken at each location and the readings recorded.

D. Documentation shall be maintained for a minimum of ten years.

E. Be aware of the potential that the locator wire may be attached affecting the pipe-to-soil readings. If in the judgment of the technician, a problem may exist, remedial action would be warranted and should be documented.

### 7.7 NULL / SHORT SURVEY

Null surveys are conducted to determine where shorts may exist along the Operator's pipeline facilities. Shorts or loss of CP protection from the facilities of the Operator to other facilities including underground and / or aboveground facilities other utilities and / or privately owned or customer facilities.

1. A null survey is conducted using a Tinker Razor fault finder, or approved pipe locator

2. Connect fault finder in accordance with manufacturer's directions. (Refer to Section K-2)
3. Refer to system maps and follow pipe accordingly. Watch for indications that the pipe is not following the path indicated on the system maps.
4. Note where indications exist that the pipe is possibly shorted.
5. Take pipe to soil reading that may further indicate that a short exists at the suspected location.
6. Take corrective action to eliminate all shorts:
   a. Dig up and isolate buried shorts
   b. Repair or replace, or install insulators where necessary
   c. Disconnect attached locator wire if a problem
7. Record all findings and necessary remedial action.

The following surveys requirements are covered:

### 7.8 STRAY CURRENTS

A. Stray AC and or DC electrical current may adversely affect the Operator's Cathodic Protection. Current will stray from one source to another along the path of least resistance. Samples of stray current sources may include:
   1. Other cathodicly protected structures
   2. Electric lines
   3. Railroads or electric rail transportation systems

B. Means of managing stray currents include:
   1. Insulating, installing insulated fittings at connection points such as meters and taps to prevent the flow of current from one structure to another.
   2. Bonding, from one source of current to another to create a path for the current to flow without damaging one or the other structure.
   3. Electrical isolation, of one structure from another where a short may exist.