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Corrosion Control

Part 192

U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration

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External Corrosion Programs

- External: atmospheric corrosion
- External: cathodic protection
- Interference
- External: casings
- Tank bottoms
- Monitoring
- Records

Definition of Corrosion

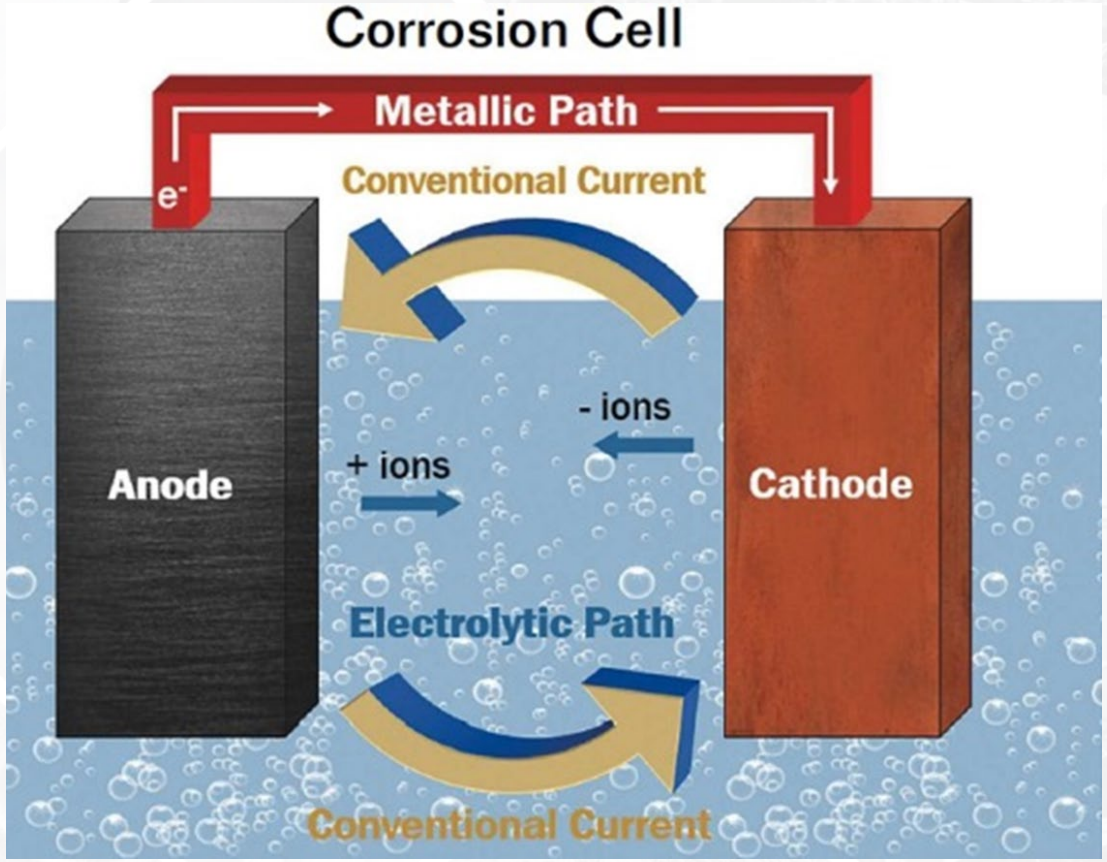
- The deterioration of a material, usually a metal, that results from a reaction with its environment
- Galvanic corrosion of a metal occurs because of an electrical contact with a more noble (positive) metal or non-metallic conductor in a corrosive electrolyte

§192.3 Active Corrosion

- Continuing corrosion that, unless controlled, could result in a condition that is detrimental to public safety

Basic Corrosion Cell

- Anode
- Cathode
- Electrolyte
- Metallic path



Corrosion on Pipelines

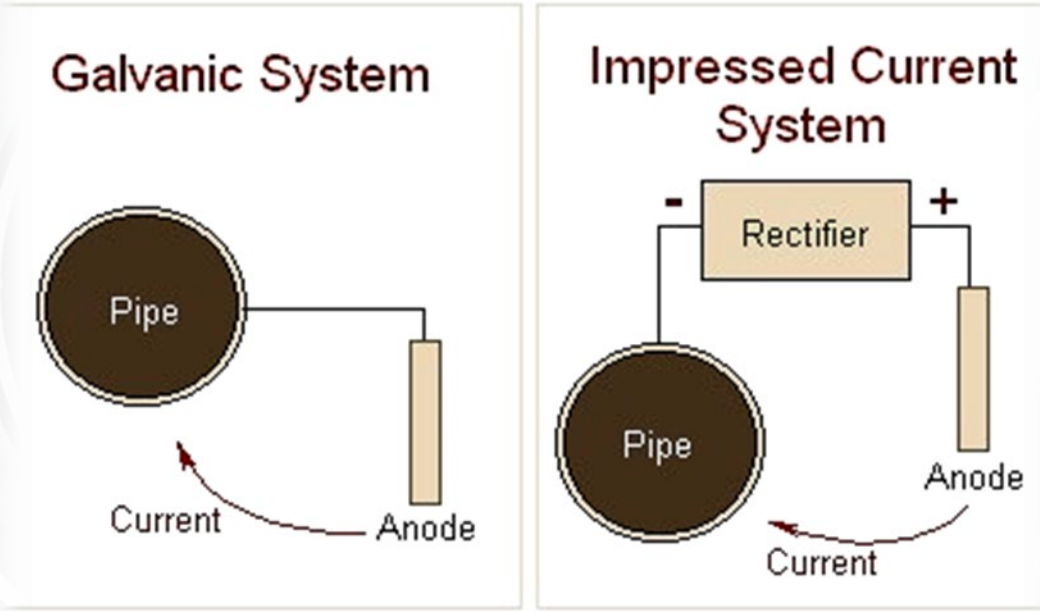
- Dissimilar metals
  - Steel/copper
- Dissimilar soils
  - pH in/out concrete
- Differential aeration
  - bottom compacted

Soil Resistivity vs. Corrosivity

Soil Resistivity(ohm-cm)	Degree of Corrosion
• 0-500	• Very Corrosive
• 500-1,000	• Corrosive
• 1,000-2,000	• Moderately Corrosive
• 2,000-10,000	• Mildly Corrosive
• Above 10,000	• Minimally Corrosive

Cathodic Protection (CP)

- The decrease of corrosion of a metal by forcing current to flow to the metal from a solution (electrolyte)
  - Galvanic sacrificial anodes
  - Impressed current



Test Stations/Test Leads

- Must have sufficient test stations or other contact points to determine the adequacy of protection

§192.453 Qualified Person

- Must be carried out by, or under the direction of, a person qualified in pipeline corrosion control methods

Gas Criteria

Part 192, Appendix D

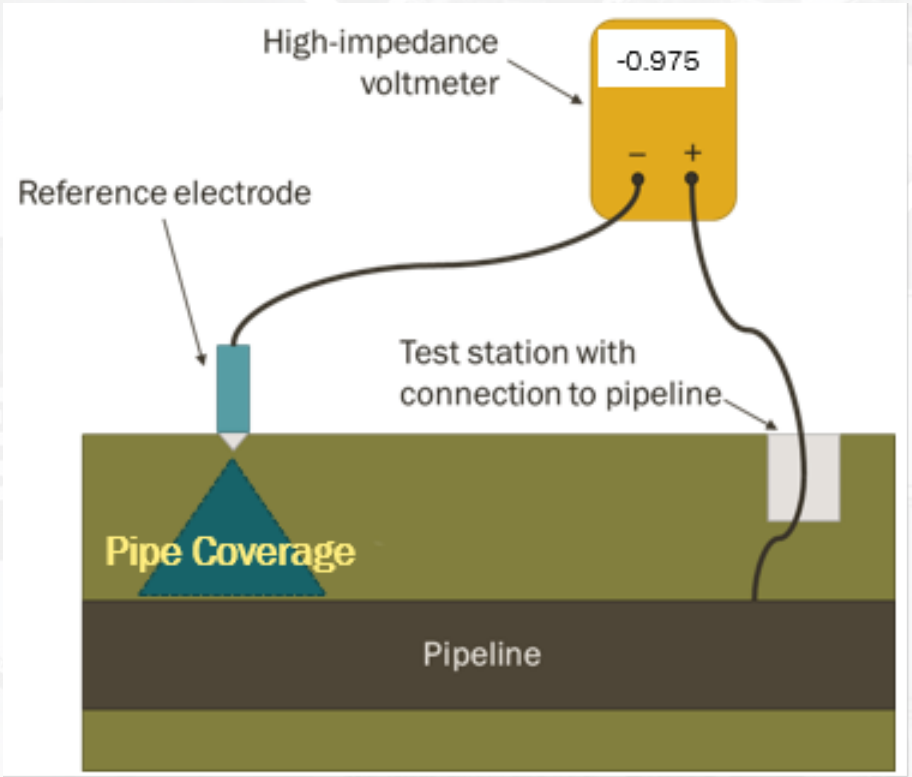
- Negative 850 mV
- Negative 300 mV shift
- 100 mV negative polarization decay
- E log I
- Net protective current

Cathodic Protection Criteria

- Both criteria must consider IR Drop
- Contributors to IR Drop
  - Contact between the reference cell and the soil
  - Electrolyte (soil)
  - Polarization at the pipe coating/soil interface

Components of IR Drop

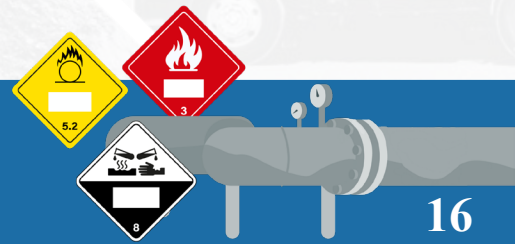
- Measuring Lead (+)
- Contact Lead (+)/Ref. Cell
- Reference Cell
- Contact Ref. Cell/Electrolyte
- Electrolyte
- Polarization
- Structure
- Contact text/Measuring lead
- Measuring Lead (-)



Where is CP NOT Required?

CP Not Required - Gas

- Installed after 7/31/71
  - §192.455(b) Demonstrate corrosive environment does not exist
    - 6 months after installation conduct test if corrosive conditions exist then the pipeline must be cathodically protected
  - §192.455(c) Temporary line with operating period not to exceed 5 years and corrosion during this period will not become detrimental to public safety
  - §192.455(f) Electrically isolated metal alloy fittings on plastics pipe
  - §192.455(g) if an electrically isolated metal alloy was installed after 1/22/2019 and doesn't meet paragraph (f) it must be cathodically protected and must be maintained in accordance with your integrity management plan
- Installed before 8/1/1971
  - §192.457(b) Cast iron and ductile iron



CP Required

CP Required - Gas

- Coated metallic pipelines installed after 7/31/71
  - Coated transmission lines
    - §192.455(a)
- Installed prior to 8/1/71
  - §192.457(a) (except station piping)
    - Areas of active corrosion
    - Bare or ineffectively coated transmission lines
    - Station piping (bare or coated)
    - Bare or coated distribution lines

Monitoring

§192.465 Monitoring

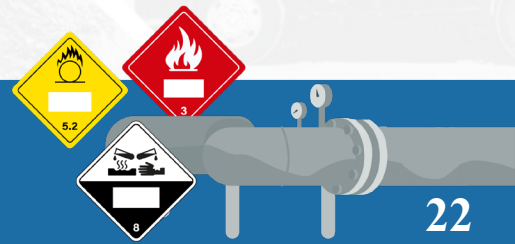
- Rectifiers, critical bonds, reverse current switches, and each diode
  - 6 times each calendar year not to exceed 2½ months
- Re-evaluation of unprotected lines
  - Every 3 years not to exceed 39 months and
- Determine areas of active corrosion via
  - Electrical survey (where practical)
  - Corrosion and leak history
  - Leak survey
  - Exposed pipe inspection records
  - Pipeline environment

§192.479 Atmospheric Corrosion

- Each operator must clean and coat each pipeline or portion of pipeline that is exposed to the atmosphere, except pipelines under paragraph (c) of this section
- Coating material must be suitable for the prevention of atmospheric corrosion

Atmospheric Corrosion

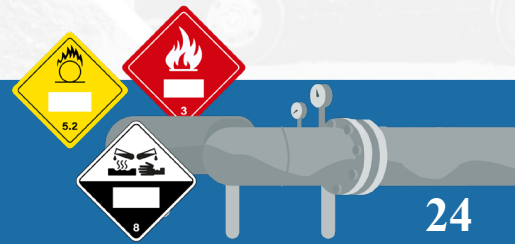
- Onshore inspection requirements
  - Other than service lines – 3 calendar years not exceeding 39 months
  - Service line - 5 calendar years not exceeding 63 months
  - If atmospheric corrosion is found on a service line during the most recent inspection, then the next inspection of that pipeline or portion of pipeline must be within 3 calendar years, but with intervals not exceeding 39 months
- Offshore pipelines
  - At least once each calendar year, but with intervals not exceeding 15 months
- Splash zones or soil-to-air interfaces
- Only be a light surface oxide
- Not affect the safe operation of the pipeline before the next scheduled inspection



Records

Corrosion Control Records

- Records or Maps
  - Location of protected piping
  - Cathodic protection facilities
  - Galvanic anodes
  - Bonds to other
  - Structures
  - Records of anode installations need not show specific distances
  - Retain for the life of the pipe
- Tests, Surveys, or Inspections
  - Required by Subpart I
  - Retain for at least 5 Years
  - Specified exceptions



Thank You

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