

# 8-D Installation of Cathodic Protection Facilities

DESC O&M Manual - Version 2022.5 October 5, 2022

## [1.0 SCOPE](#)

## [2.0 REGULATORY REFERENCES](#)

## [3.0 PROCEDURE](#)

## [4.0 TRAINING/QUALIFICATIONS](#)

## [5.0 DOCUMENTATION/FORMS](#)

## [6.0 RELATED DOCUMENTS](#)

## [7.0 APPENDICES](#)

### **1.0 SCOPE**

This chapter covers the requirements and installation of cathodic protection facilities, electrical isolation, test stations and test leads.

### **2.0 REGULATORY REFERENCES**

49 CFR Part 192 [Appendix D](#), §§ [192.463](#), [192.467](#), [192.469](#), [192.471](#)

### **3.0 PROCEDURE**

[3.1 Cathodic Protection \[192.463\]](#), [\[192 Appendix D\]](#).

[3.2 Electrical Isolation \[192.467\]](#)

[3.3 Test Stations \[192.469\]](#)

[3.4 Test Leads \[192.471\]](#)

#### **3.1 Cathodic Protection [[192.463](#)] [Part 192 [Appendix D](#)]**

Cathodic protection systems are an important and regulated component in the DENC and DESC corrosion control program; therefore, careful maintenance of these systems is essential to maintaining structural integrity and regulatory compliance. Cathodic protection *shall* be provided through the use of sacrificial anodes or impressed current (rectifier) systems.

##### (1) Sacrificial Anodes

One method of causing current to flow from the earth to the *pipe* is to intentionally create a strong bi-metal corrosion with the steel pipe as the cathode and some other metal as the anode. DENC and DESC commonly uses magnesium anodes to provide a strong and uniform current output.

*Engineering* with assistance from qualified CP personnel shall specify the number, type, size and location of anodes installed on new construction. This *may* be done through custom designs or through DENC and DESC Standards.

## (2) Rectifier Systems

Another method of providing current for cathodic protection is to install an AC rectifier to produce direct current. This current is forced into the ground through a ground bed consisting of anodes buried in a special backfill material. These anodes are usually made of graphite or mixed metal oxide and will be consumed at a much slower rate than magnesium. Rectifier systems are typically used to protect larger pipeline systems.

Engineering with the assistance of qualified CP personnel shall specify the location and design of rectifier systems. Rectifiers shall be operated and maintained in accordance with manufacturer's instructions. Consideration *should* include any potential interference it may have on foreign lines. In particular, the anode gradient impacts should be considered. The design will also consider soil resistivity, number of anodes required, and amount of coke breeze to use.

## 3.2 Electrical Isolation [[192.467](#)]

- (a) Insulating devices shall be used to electrically isolate all pipeline facilities that are cathodically protected. If these facilities are not isolated, cathodic protection current will try to protect more than what it was designed to protect. If this happens, the desired protection levels on the pipeline may not be reached.
  - (1) All insulating devices or locations shall be checked at the completion of installation to ensure the electrical isolation is adequate to maintain the required protection.
  - (2) Insulating devices may not be installed in an area where a combustible atmosphere is anticipated unless precautions are taken to prevent arcing.
  - (3) Devices shall be installed, as needed, to protect against stray current and lightning.
- (b) The location of all insulating devices installed on DENC and DESC distribution mains and transmission lines shall be determined by Engineering with the assistance of qualified CP personnel.
- (c) Insulated meter swivels or approved insulating devices shall be installed on all steel service lines in order to electrically isolate the *service line* from the customer's fuel line. Failure to install the proper insulating device can result in shorting an entire cathodic protection system.

See [Appendix 8-D-1](#) for installation detail drawings.

## 3.3 Test Stations [[192.469](#)]

DENC and DESC will have sufficient test stations or other contact points for electrical measurements to determine the adequacy of cathodic protection. It shall be the responsibility of Engineering with the assistance of qualified CP personnel to determine the location of test stations. Local operations personnel are responsible for pipe to soil readings and maintaining the test stations.

Typical test station locations should include, but are not limited to:

- Pipe casing installations

- Foreign metallic structure crossings
- Insulators
- Waterway crossings
- Bridge crossings
- Road crossings
- Impressed current installations

See [Appendix 8-D-1](#) for installation detail drawings.

### 3.4 Test Leads [[192.471](#)]

- Test leads should be attached directly to steel pipelines by pin brazing or thermite welding, using copper oxide and aluminum powder. The size of the thermite welding charge should be limited to a 15 gram cartridge. Wire should be installed with slack. Two sets of wires should be installed at a set distance.
- Damage to insulation should be avoided, but repairs should be made if damage occurs. Test leads should not be exposed to excessive heat.
- Coating *must* completely surround all bare wire and metallic areas so as to prevent voids.
- Use precaution when applying hot tape and primer to prevent blistering of the insulation.
- Existing test wires in previously installed valves boxes should be located so that they will not be damaged by valve wrenches or other maintenance activities.

See [Appendix 8-D-1](#) for installation detail drawings.

## 4.0 TRAINING/QUALIFICATIONS

See the appropriate system Operator Qualification Program.

## 5.0 DOCUMENTATION/FORMS

System specific forms should be used where applicable.

### State Specific: South Carolina

- [Add/Modify Rectifier or Anode System Record \(DESC Form OM-501\)](#) (PDF file)
- [Add/Modify Test Station Record \(DESC Form OM-501\)](#) (PDF file)

Corrosion control documentation shall be maintained for the life of the pipeline.

## 6.0 RELATED DOCUMENTS

None at this time.

## **7.0 APPENDICES**

### Appendix 8-D-1 Corrosion Control Drawings (PDF files)

- [Couplings for Distribution System Only \[Drawing No. 8-D-A-968-17\]](#)
- [CP Anode Bed - Isolated System \[Drawing No. 8-D-A-968-07\]](#)
- [Horizontal Anode Installation - New Main \[Drawing No. 8-D-A-968-11\]](#)
- [Insulating Flange Kit Installation \(3 Options\) \[Drawing No. 8-D-A-968-26\]](#)
- [Insulation at Bridge Crossing \(3 Options\) \[Drawing No. 8-D-A-968-25\]](#)
- [Standard Foreign Pipeline Crossing Cathodic Test Station \[Drawing No. 8-D-A-968-23\]](#)
- [Test Point - Above Ground \[Drawing No. 8-D-A-968-09\]](#)
- [Test Point - Flush Mount \[Drawing No. 8-D-A-968-08\]](#)
- [Typical Casing Installation \[Drawing No. 8-D-A-968-20\]](#)
- [Typical Current Span Test Station Installations \[Drawing No. 8-D-A-968-24\]](#)
- [Typical Insulator Installation \(Aboveground Insulator with Electrical Bonding\) \[Drawing No. 8-D-A-968-18\]](#)
- [Typical Insulator Installation \(Underground Insulator\) \[Drawing No. 8-D-A-968-21\]](#)
- [Typical Magnesium Anode \[Drawing No. 8-D-A-968-10\]](#)
- [Typical Test Station Installations \[Drawing No. 8-D-A-968-27\]](#)
- [Vertical Anode Installation - New Main \[Drawing No. 8-D-A-968-12\]](#)

(UNCONTROLLED IF PRINTED)