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**Description** To describe the installation procedure for corrosion control test stations. This will ensure that pipelines under cathodic protection have sufficient test stations or other contact points for electrical measurement to determine adequacy of protection.

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**Regulatory Applicability**

- Regulated Transmission Pipelines
- Regulated Gathering Pipelines (Type A)
- Regulated Gathering Pipelines (Type B)
- Regulated Distribution Pipelines

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**Frequency** As needed. May be required for new construction and/or for existing pipelines that require additional or replacement test stations.

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**Reference**

49 CFR 192.469	<i>External Corrosion Control: Test Stations</i>
49 CFR 192.471	<i>External Corrosion Control: Test Leads</i>
LA Title 43 Part XIII 2121	<i>External Corrosion Control: Test Stations</i>
LA Title 43 Part XIII 2123	<i>External Corrosion Control: Test Leads</i>

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**Forms / Record Retention** Update maps to show location.

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**Related Specifications** None

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**OQ Covered Task**

0041	Installation and Maintenance of Mechanical Electrical Connections
0051	<i>Installation of Exothermic Electrical Connections</i>

(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.)



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### **Procedure Steps**

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1. Determine location of needed test station. Test leads should be less than 1 mile apart.
  - a) Each pipeline must have test stations that are:
    - i) Installed at each cased segment of pipeline, public roads, and railroad crossings. Note: Two test leads should be installed on the casing and two leads should be installed on the carrier pipe.
    - ii) Installed at each foreign metallic pipeline crossing.
2. Determine how test lead will be attached (Cadmium, thermite welding, magnetic block, brazing, non-acid solder) and follow the appropriate portion of this procedure.
3. Gather all needed permits – hot work, confined space entry.
4. Excavate area around pipe where leads will be attached. Take care not to damage the pipe or any other facilities in the area of excavation. Follow procedure P-192.319.
5. Remove existing coating to attach leads. Clean pipeline carefully in area where attachment will be made.
6. Determine wall thickness (connection cannot be made in an area of thinned pipe).
7. Wrap test leads around pipe and tie in a knot. Ensure that the connection will be mechanically secure and electrically conductive.
8. Make permanent connection using the appropriate portion of this procedure.
9. Coat test lead wire and pipe connection with an electrical insulating material compatible with the pipe coating and the wire insulation.
10. Prior to backfilling, measure the pipe-to-soil potential to ensure electro-conductivity between the wire and pipe.
11. Backfill without disturbing the test station or wires. Follow procedure P-192.319.
12. Install post or pole that will be the station marker directly above the pipeline. Do not connect the post or pole directly to the pipeline.
13. If more than one pipeline is monitored at this test station, attach permanent labels designating each pipeline to the appropriate station terminals and wires.
14. Add test station number and location to the most recent annual survey and map.
15. Distribute revised maps as required.



*Inspect and Verify Test Lead Continuity*

1. Have a qualified individual measure structure-to-soil potential.
2. Verify that the reading is within the desired range.
3. Confirm that test leads are installed and terminated properly and that test leads are not damaged.
4. If test lead continuity is not found, identify damage if possible and recommend mitigation actions based on readings and visible condition of the test lead.
5. Document findings in proper format.

*Repair Test Lead*

1. Identify the test lead damage.
2. Where necessary, make proper notifications to operations prior to working around structure.
3. Repair test lead damage.
4. Verify that test leads function properly and are no longer damaged.
5. Where necessary, make proper notifications to operations that work has been completed.
6. Document actions and readings.

**Cadweld Procedure Steps**

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*Cadweld General and Safety Information*

1. Only CADWELD manufactured equipment and materials should be used to make CADWELD connections.
  - a) Do not connect items except as detailed on mold tag and in the instructions.
  - b) Do not use worn or broken equipment that could cause leakage.
  - c) Do not alter equipment or material without factory authorization.
  - d) Do not substitute for specified CADWELD manufactured equipment and materials.
  - e) Failure to comply with the above may result in hazards to the individual, improper connections, or damage to the items being connected.
2. Starting and welding materials are exothermic mixtures and react to produce molten materials with temperatures in excess of 2200° C (4000° F) and a localized release of smoke. These materials are not explosive. Ignition temperatures are in excess of 460° C (860° F) for starting material, and 900° C (1650° F) for welding material.



3. Make connections in accordance with the prescribed welding procedures and in consideration of surrounding conditions and personnel. Refer to ANSI Z-49.1 Safety in Welding and Cutting and your local safety procedures.
  - a) Personnel should be properly trained to use this product.
  - b) Avoid direct eye contact with flash of light from ignition of starting material.
  - c) Avoid breathing concentrations of smoke as it may be hazardous to health.
  - d) Avoid contact with hot materials.
  - e) Advise nearby personnel of welding operation in the area.
  - f) Remove or protect fire hazard in the immediate area.
  - g) Do not smoke when handling starting material.
4. Adhering to the recommended welding procedures will minimize risk of burns and fire caused by hot molten material spillage.
  - a) Make sure there is proper mold fit and assembly of equipment.
  - b) Avoid moisture and decomposable contaminants in mold and materials being welded. Contact of hot molten material with moisture or contaminants may result in spilling of hot material.
  - c) Material thickness must be sufficient for the size and type connection being made to prevent melt-through and leakage of hot molten metal.
5. Unusual application or condition may exist that require special considerations.
  - a) Provide adequate ventilation where natural air flow is not sufficient to prevent personnel breathing concentrations of smoke.
  - b) In case of fire, water or CO<sub>2</sub> will aid control of burning containers. Large quantities of water will aid in controlling a fire should the exothermic materials become involved. Water should be applied from a distance.

#### Preparation

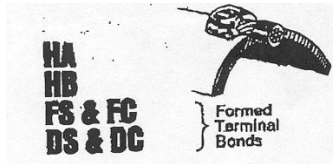
1. Cable, Ground Rods, and Lugs
  - a) Use cable cutters to minimize deforming cable. Burnt or out-of-round cable ends may mold open, causing leaks.
  - b) Conductor ends and adjacent length must be clean and dry to insure a good weld.
  - c) When using adaptor sleeves, let conductor protrude 1/8" beyond end of sleeve.
2. Steel or Cast Iron Surfaces
  - a) Surface must be clean to insure a good weld. Remove any surface protection. Use CADWELD CAT-321 rasp to avoid contaminating welding areas.



- b) Abrade “standard galvanized” surface with emery cloth to remove surface oxides in weld area. Clean “double or triple” galvanized surfaces with rasp to remove galvanizing in weld area.

Welding Procedure

1. Check the following:
  - a) Mold is correct for the conductor sizes and application. DO NOT MODIFY MOLDS.
  - b) Weld metal indicated on mold tag and steel disks are available. USE ONLY CADWELD WELD METAL.
  - c) Frame is attached to mold and adjusted properly.
  - d) Flint igniter is in working order.
2. Make sure mold is dry, clean and in good condition. Mold can be dried by heating to about 120° C (250° F).
3. Position mold on conductors following appropriate positioning instructions making a reference mark on conductors at entry point on mold aids in conductor positioning. Check before ignition and for inspection of completed connection.
4. Close mold and lock tightly with handle clamp if split type mold.
5. Use ERICO packing material to pack all openings around conductors at entry point into mold to prevent leaks of molten material, especially where noted on positioning instructions.
6. Insert steel disk, ditched (concave) side up, in crucible to cover tap hole.
7. Pour weld metal into crucible being careful not to upper the steel disk.
8. Tap weld metal container to loosen starting material. Place approximately 1/4 to 1/3 of the starting material on the top lip of the mold at cover opening. Distribute the remaining starting material over the welding material.
9. Close cover.
10. Check reference marks on conductor to verify correct positioning.
11. Stand to side of cover opening and unwind. Aiming flint igniter from the side, ignite starting material on mold lip. Withdraw igniter quickly to prevent fouling.
12. Allow approximately 30 seconds for completion of reaction and solidification of molten material.
13. Open and remove mold. Use care to prevent chipping mold.
14. Clear mold of residue using natural bristle, a soft-cloth, or newspaper before making the next weld. Dispose of residue and weld material package properly. USE CARE TO AVOID BURNS FROM HOT MOLD, CONNECTION, CONDUCTORS OR RESIDUE.

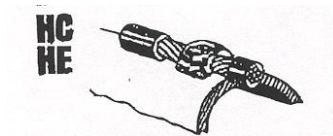


Place mold against surface with end of cable under center of tap hole #1 AWG and larger cables require the use of packing material to seal the mold cable opening. Use the handle or Cat. No. CAT-340 Chain Clamp to secure mold to surface.

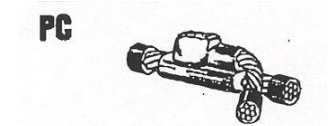
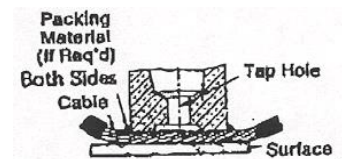


Field Made Formed Terminal Bonds

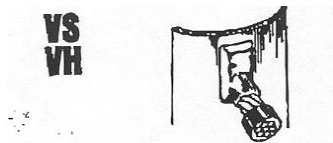
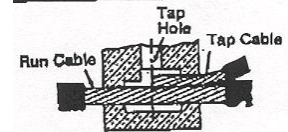
1. Insert cable thru sleeve with end protruding 1/8". Place in hammer die, close cover and form with cable protruding as noted.



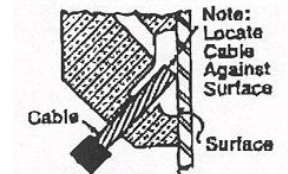
2. Place mold over cable and against surface. Follow "HA" instructions.



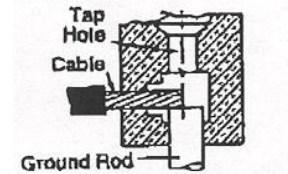
3. Place mold on run cable with end of tap cable under center of tap hole.



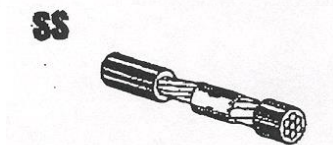
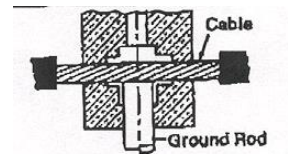
4. Place mold against surface with cable positioned as shown. Secure mold to surface with Cat. No. CAT-339 Chain or with "C" clamp.



5. Place mold on ground rod with end of cable positioned on top of rod and under center of tap hole. Cable must sit on top of rod as shown.

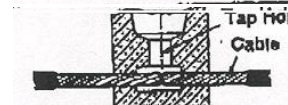


6. Place mold on ground rod with cable positioned across top of rod as shown.



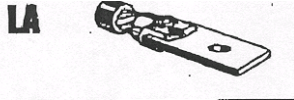
**#4 AWG and LARGER**

Place mold on cables with ends butting under center of tap hole.

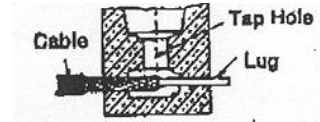
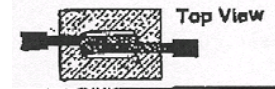


#6 AWG and SMALLER

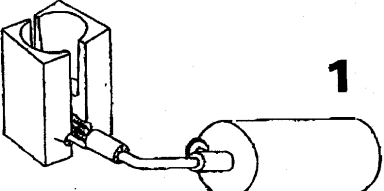
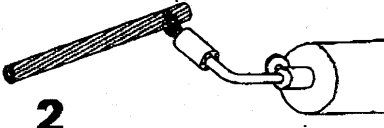
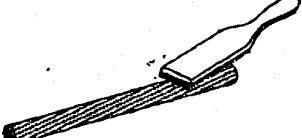
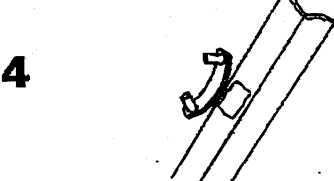
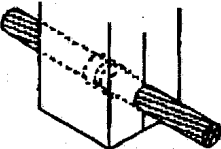
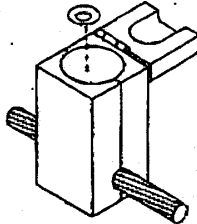
Place mold on overlapped cables and push each cable in until they bottom in weld cavity



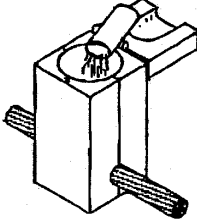
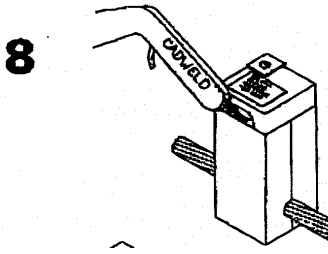
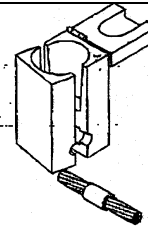
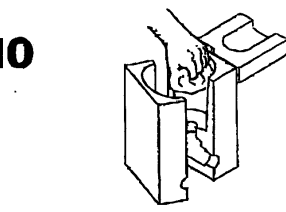
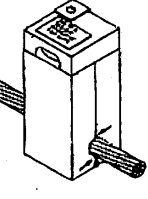
7. Place mold on cable and lug with ends butting under center of tap holes.



**Cadweld Condensed Instructions**

 <p><b>1</b></p>	<p>Before first connection of the day, dry the mold by heating with a torch.</p>
 <p><b>2</b></p>	<p>Dry conductors to be welded with a torch.</p>
 <p><b>3</b></p>	<p>Clean dried cable ends with a brush to remove dirt and oxides.</p>
 <p><b>4</b></p>	<p>When welding to a steel surface, use a rasp or Erico approved grinding wheel SBS2333 to remove paint, rust and mill scale from area to be welded. (Bright metal showing.)</p>
 <p><b>5</b></p>	<p>Position mold over conduction with conductor ends under center of tap hole. Gap distance, if required, is noted on mold tag.</p> <p>Lock mold handles.</p>
 <p><b>6</b></p>	<p>Insert round metal disk (packaged with weld mold) in bottom of crucible. Make sure it covers tap hole.</p>



	<p><b>7</b></p> <p>Dump in weld material.</p> <p>Sprinkle starting material on mold lip and over weld material.</p>
	<p><b>8</b></p> <p>Close cover.</p> <p>Ignite with spark from flint igniter.</p> <p>Note: Do not use a torch or matches</p>
	<p><b>9</b></p> <p>Wait 10-15 seconds.</p> <p>Open mold and remove from finished connection.</p>
	<p><b>10</b></p> <p>Remove slag and dust with clean rag or mold cleaning tool.</p> <p>Do not use a wire brush.</p> <p>*(An old natural bristle paint brush is ideal.)</p>
	<p><b>11</b></p> <p>Discard mold when excessive leakage occurs around mold openings or if mold disk seat is worn or chipped. Molds are not permanent equipment. They do wear out.</p>



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