

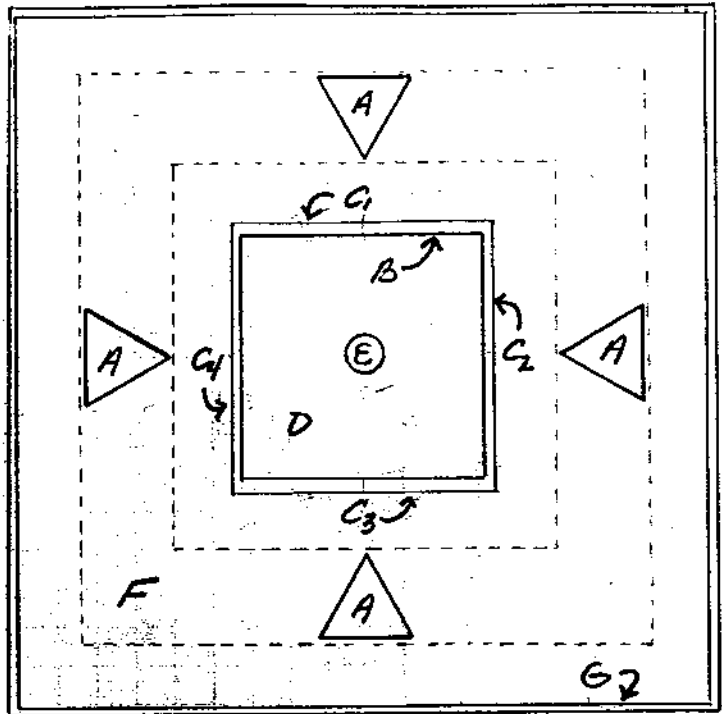
The Arcor "Reverse Cold Wall"/ Cathodic Disbondment Cell

Scope: This test cell was designed to investigate the resistance of a corrosion inhibitive coating to the simultaneous stress of "reverse cold wall" effects and cathodic disbondment. The test cell configuration complies with ASTM G 8-85 to experimentally model cathodic disbonding for pipeline coatings. Additionally, multiple magnesium anodes were introduced so that more than one coating could be stressed at the same time. The pipe sample size was increased dramatically in order that its interior dimension was of a suitable size to function as a hot oil bath to create a temperature gradient across the coating promoting "reverse cold wall" effective stresses.

Description: The metallic alloy sample is fabricated into an open ended box 7" wide x 7" long x 12" high and sealed at the bottom by a non-conducting material capable of withstanding the operating temperature of the oil bath. The sample is surface prepared and coated. This test can investigate 1, 2, 4 or 8 coatings symmetrically placed on the outside of the sample with respect to the anodes. Three holidays are drilled into each test area to complete a "circuit" between the pipe, the anode and the electrolyte solution. The coated sample is supported 1" off the bottom of a large polyethylene container by a wooden or cork shim. The anodes are placed 1.5" off the sample faces and 1.5" from the container walls. An electrolyte solution of 1% sodium chloride, 1% sodium sulfate and 1% sodium carbonate is placed in the annular space so that the immersed sample area is 3 times the total anode surface area (7 inches in this case). The four anodes are connected in parallel to one connection from the sample. Oil is placed in the center space of the sample and heated to steam temperatures via an immersion heater creating a large temperature gradient across the coating. The test is considered to function as long as the measured potential between a copper-copper-sulfate reference electrode and the sample is between -1.45 V and -1.55 V. The immersion heater shall operate for 4 or 8 hours per day at set intervals to cycle stress the coating for a total test duration of 30, 60 or 90 days. The attached diagram is a scale representation of the test cell.

Analysis: At the termination of the test, a new holiday is drilled into the test area above the immersion line for a control condition. Comparisons are made between the immersed holidays and the control by examining the relative resistance to disbond the coating with a sharp knife after scoring the surrounding area, by measuring the area of disbondment and by visual inspection.

VERTICAL PERSPECTIVE



- A. Magnesium Anode
2.78" Δ H=3"
- B. Metallic Alloy of Interest
(7" x 7") x 12"
- C. Arcor Coatings of Interest
(C₁, C₂, C₃, C₄)
- D. Oil Bath in Center
- E. Immersion Heater
- F. Electrolyte Solution in Annulus
1% NaCl 1% Na₂SO₄
1% Na₂CO₃ 97% H₂O
- G. Sturdy (8")³ Nalgene Container.
- H. Holiday
- I. Anode Electrical Attachments
- J. Specimen Electrical Attachment
- K. Electrolyte Level

HORIZONTAL PERSPECTIVE

