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練習題

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Exam : **AMPP-CP3**

Title : Cathodic Protection Technologist (NACE-CP3-001)

Version : DEMO

1.A corrosion engineer is conducting a soil resistivity survey using the Wenner 4-pin method. The pin spacing is set to 4.5 meters, and the measured resistance on the soil vibroground is 1.8 ohms.
What is the average soil resistivity to a depth of 4.5 meters?
A. 81.0 ohm-cm
B. 2544.7 ohm-cm
C. 5089.4 ohm-cm
D. 810.0 ohm-cm
Answer: C
Explanation:
The Wenner 4-pin formula is rho = 2 * pi * a * R.
Given spacing (a) = 4.5 m = 450 cm, and Resistance (R) = 1.8 ohms.
rho = 2 * 3.14159 * 450 * 1.8 = 5089.38 ohm-cm.
Distractor A fails to convert meters to centimeters. Distractor B omits the multiplier of 2 from the formula.

2.During an annual survey of an impressed current cathodic protection (ICCP) system, a technician records the following pipeline potentials at a test station near a foreign pipeline crossing:
● Native Potential: -550 mV (CSE)
● On Potential: -1050 mV (CSE)
● Instant-Off Potential: -780 mV (CSE)
Based strictly on NACE SP0169 criteria for steel and cast iron piping, what is the status of the cathodic protection at this location?
A. The pipeline is adequately protected because the On Potential is more negative than -850 mV (CSE).
B. The pipeline is adequately protected because the polarization is greater than 100 mV.
C. The pipeline is not protected because the Instant-Off Potential is less negative than -850 mV (CSE).
D. The pipeline is not protected because the IR drop exceeds 250 mV.
Answer: B
Explanation:
NACE SP0169 allows for multiple criteria to determine CP effectiveness. The Instant-Off potential is -780 mV, which fails the -850 mV polarized potential criterion. However, the 100 mV polarization criterion is calculated as the absolute difference between the Instant-Off and the Native (depolarized) potential: |-780 mV - (-550 mV)| = 230 mV. Since 230 mV is greater than 100 mV, the pipeline meets the 100 mV polarization criterion and is considered adequately protected.

3.An ICCP system utilizing High Silicon Cast Iron (HSCI) anodes has a constant output of 24 Amps. The groundbed consists of 8 anodes, each weighing 60 lbs.
If the theoretical consumption rate for HSCI is 1.2 lbs/Amp-year and the design dictates a maximum utilization factor of 85%, what is the expected operational life of this groundbed?
A. 20.0 years
B. 14.1 years
C. 16.6 years
D. 23.5 years
Answer: B
Explanation:
The operational life of an anode groundbed is calculated using Faraday's Law adapted for CP:

Life (years) = (Total Mass * Utilization Factor) /(Current * Consumption Rate).
Total Mass = 8 anodes * 60 lbs/anode = 480 lbs.
Life = (480 lbs * 0.85) /(24 Amps * 1.2 lbs/Amp-year) = 408 /28.8 = 14.16 years.

4.A section of a coated steel pipeline runs parallel to a 25 kV AC overhead power transmission line. Field measurements show an AC voltage of 18 VAC on the pipeline relative to local earth.
Which of the following mitigation strategies is MOST appropriate to reduce the AC voltage on the pipeline while maintaining effective DC cathodic protection?
A. Install a direct metallic bonding cable between the pipeline and the AC transmission tower grounding system.
B. Install a polarization cell or solid-state decoupler between the pipeline and a dedicated grounding bed.
C. Increase the DC voltage output of the nearest ICCP rectifier to suppress the AC interference.
D. Install a galvanic magnesium anode directly bonded to the pipeline at the location of maximum AC voltage.
Answer: B
Explanation:
To mitigate AC interference without draining the DC cathodic protection current, a device that passes AC but blocks DC is required. Solid-state DC decouplers (SSDs) or polarization cells connected to a separate grounding bed allow the induced AC to drain safely to earth while preventing the DC current from shorting out. Direct bonding (A) would short the CP system. Increasing DC output (C) does not mitigate AC voltage.

5.A technician is troubleshooting a suspected shorted casing.
The following data is recorded at the casing vent test station:
● Carrier Pipe On Potential: -1050 mV (CSE)
● Casing On Potential: -1045 mV (CSE)
● Carrier Pipe Instant-Off Potential: -890 mV (CSE)
● Casing Instant-Off Potential: -888 mV (CSE)
When the rectifier is manually cycled on and off, the casing potential tracks the carrier pipe potential almost identically.
Which of the following is the MOST accurate conclusion?
A. An electrolytic short (e.g., water or mud in the casing annulus) exists.
B. A metallic short exists between the carrier pipe and the casing.
C. The casing is completely isolated from the carrier pipe, but both are well-coated.
D. The test station leads for the casing and carrier pipe are reversed.
Answer: B
Explanation:
A direct metallic short is characterized by the casing potential being nearly identical to the carrier pipe potential (usually within a few millivolts) and tracking the on/off cycling of the DC power source simultaneously. An electrolytic short (A) typically shows a noticeable potential difference between the pipe and casing and exhibits less dramatic or delayed tracking during current interruption.