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Examination for Cathodic Protection Systems

1. Cathodic protection systems consist of _____ that pass a protective current to the structure through the electrolyte environment.
 - a) anodes
 - b) diodes
 - c) electrodes
 - d) transistors

2. Cathodic protection systems can be one of two types, sacrificial anode or _____ current anode.
 - a) impressed
 - b) direct
 - c) alternating
 - d) static

3. The first cathodic protection systems were installed on the _____ on an experimental basis.
 - a) Hudson River
 - b) Potomac River
 - c) Euphrates River
 - d) Mississippi River

4. A sacrificial anode can be beneficial without continually applying current to the structure.
 - a) true
 - b) false

5. Cathodic protection should be provided on all submerged metallic structures.
- a) true
 - b) false
6. A corrosion _____ plan should be developed by the district corrosion protection coordinator for each hydraulic structure.
- a) litigation
 - b) deterioration
 - c) mitigation
 - d) none of the above
7. There should be specific prescribed time intervals for testing cathodic protection systems.
- a) true
 - b) false
8. Personnel who have limited experience and expertise in CPS's are encouraged to seek assistance from other districts and/or laboratories through their _____.
- a) Corrosion Protection Coordinator
 - b) Corrosion Prevention Coordinator
 - c) Corrosion Control Coordinator
 - d) none of the above
9. Test equipment should consist of a fresh and calibrated copper-copper-sulfate reference cell, a submersible connection, cabling suitable for immersion use, and a _____ voltmeter capable of measuring polarized potentials with the CPS on.
- a) low-impedance
 - b) low-voltage
 - c) high-impedance
 - d) high-voltage
10. The reference electrode should be placed in the electrolyte adjacent within _____ to the face of the gate at each test point.
- a) 75 mm
 - b) 100 mm
 - c) 200 mm
 - d) 225 mm

11. Data collected during the test should be reviewed, and any necessary adjustments should be made. The systems should be properly optimized by adjusting the rectifier until _____ of the potentials fall within the range of polarized (cathodic) potential of between negative 850 mV and negative 1200 mV or 100-mV polarization according to NACE RP0169-96.

- a) 90 percent
- b) 85 percent
- c) 80 percent
- d) 75 percent

12. This system helps reduce surface corrosion of a metallic structure immersed in an electrolyte by metallicity coupling a less noble, i.e., more negative, metal with the structure.

- a) sacrificial system
- b) scarified system
- c) solidified system
- d) none of the above

13. Two types of anodes can be used in an impressed current cathodic protection system; _____ anodes are installed either adjacent to or on the structure, and _____ anodes are installed on the structure.

- a) string, button
- b) string, squared
- c) tapered, button
- d) none of the above

14. Which of the following is not a basis for selecting an impressed current system?

- a) Can be designed for a wider range of voltage.
- b) Higher ampere-years can be obtained from each installation.
- c) Voltage and current can be varied to meet changing conditions. This provides an operational flexibility that is very desirable to increase protection of the surface coating.
- d) External power source is not required.

15. Which of the following is not a basis for selecting a sacrificial anode system?
- a) System can be used for protecting bare or poorly coated surfaces of metallic structures.
 - b) Installation is less complex since an external power source, including rectifier, is not required.
 - c) This system works very well when resistivity is low, the structure is well coated, easy access to the structure is available, and significant deterioration of coating (paint) is not expected within 5 to 10 years.
 - d) This system is easier to install on moving complex structures such as tainter valves where routing of cables from an impressed current system could present a problem.

16. CPS's should be designed to attain and maintain a level of protection of the structure as defined in the section "Criteria and Other Considerations for Cathodic Protection" in NACE RP0169-96. In order to achieve this level of protection, design calculations must be made to determine the _____ of anodes required.

- a) number and cost
- b) type and performance
- c) number and types
- d) cost and performance

17. The design of CPS's should be accomplished under the supervision of a

- a) certified NACE corrosion specialist,
- b) cathodic protection specialist,
- c) professional engineer licensed in corrosion engineering, or
- d) all of the above.

18. Guide Specification CW-16643, "Cathodic Protection Systems (Impressed Current) for Lock Miter Gates," should be used in preparing _____ for procurement of CPS's. This specification, in addition to providing the technical requirements for various items of equipment for the CPS, addresses methods for protection from ice and various debris of the string anodes and the electrical leads to the button and string anodes.

- a) contract documents
- b) cost estimate documents
- c) chain of custody documents
- d) none of the above

19. In waterway areas with potential for _____ infestations, the CPS components may be at risk of failure or disruption.

- a) kelp
- b) zebra muscle
- c) sponge
- d) none of the above

20. Installation of a CPS by a construction contractor should be accomplished only under the supervision of an NACE International corrosion specialist.

- a) true
- b) false

21. The primary purpose for testing of a CPS is to determine if it has been _____ in accordance with and effectively meets design criteria.

- a) designed
- b) constructed
- c) optimized
- d) none of the above

22. An _____ manual should be provided for each CPS installed.

- a) instruction and operations
- b) operations and maintenance
- c) instruction and specifications
- d) none of the above

23. A _____ guide should be provided for use with the CPS. This guide should address possible symptoms associated with failure of various items of equipment of the system.

- a) troubleshooting
- b) technical analysis
- c) technical specifications
- d) none of the above

24. Which of the following is part of a corrosion mitigation plan applicable to the restoration of a cathodic protection system?

- a) A list of materials and cost.
- b) An assessment of impact protection and consideration of the need for additional impact protection devices
- c) A copy of the latest structure-to-reference-cell potential readings.
- d) All of the above.

25. A _____ course on corrosion control provides the required training on design and testing of cathodic protection systems.

- a) CPS training
- b) CECW-ET
- c) HQUSACE
- d) PROSPECT



Answer Sheet for Cathodic Protection Systems for Civil Works Structures
 TPDH-00027

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