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Examination for **Engineering and Design CONDUITS, CULVERTS,  
AND PIPES**

**Corrugated Metal Pipe for Rural Levees and Culverts**

1. Corrugated metal pipe may be used as an option in agricultural levees where the levee embankment is less than \_\_\_\_\_ above the pipe invert.
  - a. 6 feet
  - b. 12 feet
  - c. 18 feet
  - d. 24 feet
  
2. Corrugated metal pipe is susceptible to corrosion, primarily in the invert. The pipe should always be galvanized and protected with a bituminous coating and should have bituminous paving applied to the invert. Bituminous coatings and paving can add about 50 to 100 years of service life to the pipe.
  - a. true
  - b. false
  - c. not enough information for a specific answer
  - d. too many variables for a specific answer
  
3. When spiral rib steel pipe is used, the material should conform to AASHTO M 36 and M 245. When bituminous coatings are required, the material should conform to AASHTO M 190.
  - a. true
  - b. false
  - c. not enough information for a specific answer
  - d. too many variables for a specific answer
  
4. Acceptable backfill material for corrugated metal pipe includes
  - a. plastic clays
  - b. organic soils
  - c. peat
  - d. none of the above

5. When multiple lines of pipe are installed in the same excavation, a minimum spacing between pipes of \_\_\_\_\_, should be used for adequate compaction of the backfill material. These minimum spacings are for compacted backfill and may be less when using slurry or flowable backfills.
  - a. one-half of the pipe diameter
  - b. 3 feet
  - c. both a and b, whichever is less
  - d. both a and b, whichever is greater
  
6. Earth loads and live loads (highway, railways, runways, and impact) for corrugated metal pipe are defined in ASTM A 796 and ASTM B 790 for steel and aluminum, respectively, as vertical pressures.
  - a. true
  - b. false
  - c. not enough information for a specific answer
  - d. too many variables for a specific answer

### **Concrete Culverts**

7. The culvert invert gradient should be the same as the natural streambed to minimize erosion and silting problems. Foundation settlement should be countered by cambering the culvert to ensure positive drainage.
  - a. true
  - b. false
  - c. not enough information for a specific answer
  - d. too many variables for a specific answer
  
8. Wheel loads for highway HS 20 live loads may be distributed in accordance with ASTM C 857. This standard includes roof live loads, dead loads, and impact loads.
  - a. true
  - b. false
  - c. not enough information for a specific answer
  - d. too many variables for a specific answer
  
9. Which type of joint or joints is used in concrete culvert construction?
  - a. O-ring gasket
  - b. flat gasket
  - c. packed joint
  - d. all of the above

10. This ASTM C \_\_\_\_ covers the testing of joints by using air or water under low pressure to demonstrate the joint integrity of pipes with a diameter greater than (27 in.).
- a. ASTM C 924
  - b. ASTM C 969
  - c. ASTM C 1103
  - d. ASTM C 1214

### **Plastic Pipe for Other Applications**

11. Thermoset reinforced plastic mortar (RPM) pipes are considered fiberglass and do not meet the AASHTO Flexibility Factor (FF) limits for adequate installation stiffness.
- a. true
  - b. false
  - c. not enough information for a specific answer
  - d. too many variables for a specific answer
12. The strength of all plastic pipe systems depends on the quality and placement of the bedding and backfill material. Unless flowable concrete or controlled low-strength materials (CL, SM) are used, ASTM D 2321 will be followed for all installations except for perforated pipes in subdrainage applications.
- a. true
  - b. false
  - c. not enough information for a specific answer
  - d. too many variables for a specific answer
13. A minimum depth of final backfill over plastic pipe of \_\_\_\_\_ is recommended when installing plastic pipe under paved surfaces. Since these soils do not completely rebound, the surface pavement will crack and settle with time if less than minimum cover is used. Therefore, a well-compacted backfill is required for the pipe to function properly.
- a. 2 feet
  - b. 3 feet
  - c. 4 feet
  - d. 5 feet

14. Excessive pipe deflections should not occur if the proper pipe is selected and it is properly installed and backfilled with granular materials. However, when pipes are installed in cohesive soils, the deflection can be excessive. Deflections occur from installation loadings (the placement and compaction of backfill) and service loads due to soil cover and live loads.
- a.true
  - b.false
  - c.not enough information for a specific answer
  - d.too many variables for a specific answer

### **Ductile Iron Pipe and Steel Pipe for Other Applications**

15. Do to the fact that ductile iron pipe is susceptible to corrosion caused by acids and highly septic sewage it is not suitable for pressure sewers and for gravity sewers where watertightness is essential.
- a.true
  - b.false
  - c.not enough information for a specific answer
  - d.too many variables for a specific answer
16. When backfilling ductile iron pipe it is recommended that a \_\_\_\_\_ bedding be used and that actual pipe beddings and backfills be verified by a geotechnical engineer.
- a.Type 1
  - b.Type 2
  - c.Type 4
  - d.silty and clayey gravels and sand
17. Which types of joints are available for ductile iron and steel pipe?
- a.push-on
  - b.flanged
  - c.both a and b
  - d.neither
18. Joints can be restrained for thrust forces by using thrust blocks, restrained joints, or tie rods. Thrust restraint is required at tees, closed valves, reducers, dead ends, or wyes.
- a.true
  - b.false
  - c.not enough information for a specific answer
  - d.too many variables for a specific answer

## Pipe Jacking

19. Pipe jacking is a method of installing a pipe under roadways, railways, runways or highways using an open cut trench.
  - a.true
  - b.false
  - c.not enough information for a specific answer
  - d.too many variables for a specific answer
  
20. The earth load on a jacked pipe is normally the prism weight of soil above the crown of the pipe. However, the full prism load does not occur unless the soil is saturated.
  - a.true
  - b.false
  - c.not enough information for a specific answer
  - d.too many variables for a specific answer
  
21. Cohesion of the overburden soil is used to reduce the earth load on the installed casing pipe.
  - a.true
  - b.false
  - c.not enough information for a specific answer
  - d.too many variables for a specific answer



Answer Sheet for Conduits, Culverts & Pipes  
 TPDH-00012

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Please completely fill in one box for each answer

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