

**Appendix D**  
**Answers To Chapter Review Questions**

**Chapter 1**  
**Standard Practices**

1. The purpose of pavement markings is to communicate information about the traveled roadway so motorists can safely reach their destination.
  - a) True
  
2. Standard markings shall only be used to convey the meaning prescribed for them in the Manual on Uniform Traffic Control Devices (MUTCD).
  - a) True
  
3. In Virginia, the normal specified width of a longitudinal line is:
  - b) 4 – 6 inches
  
4. The standard for a broken line separating traffic in the same direction at the same speed limit is:
  - c) 10 ft. segments with 30 ft. gaps.
  
5. Solid yellow lines are used to delineate the separation of traffic flows in:
  - a) opposing directions.
  
6. The left edge of divided highways and one way roads is delineated by:
  - d) a single solid yellow line.
  
7. White lines are used to delineate the separation of traffic flows in:
  - b) the same direction.
  
8. The right edge of divided highways and one way roads is delineated by:
  - c) a single solid white line.

9. Broken lines are restrictive in nature.  
b) False
10. Solid lines are restrictive in nature.  
a) True
11. A double line consists of two normal width lines separated by a 3 inch space.  
b) False
12. A pavement marking plan or sketch may not be required before a road is marked, but is strongly encouraged.  
a) True
13. A chalk line is the only approved way of pre-marking a road.  
b) False
14. Traffic control is not required when pre-marking on low volume roads.  
b) False
15. Which document takes precedence over all others:  
c) Special Provision Copied Notes
16. In the Road and Bridge Specifications Book, which section specifies that the publication, "Quality Standards for Workzone Traffic Control Devices" be used?  
c) Section 512

## Chapter 2 Reflective Glass Beads

1. Reflective beads are used with pavement markings:
  - c) to enhance nighttime visibility
  
2. The phenomenon where light is reflected directly back to the light source is called:
  - b) retroreflectivity
  
3. For glass beads, the light bending phenomenon is known as:
  - a) the refractive index
  
4. The optimum embedment depth for reflective beads is
  - b) 50 to 60%
  
5. When inspecting pavement markings with regard to glass beads, which of the following criteria should be met?
  - c) Both a & b
  
6. In order for glass beads to reflect light as intended, they must be:
  - d) round
  
7. Proper bead distribution and depth are critical in ensuring a \_\_\_\_\_ line.
  - a) durable and retroreflective
  
8. Correct glass bead application and embedment will result in the line feeling like:
  - c) sandpaper

## Chapter 3 Traffic Paint

1. Which of the following is in traffic paint?
  - d) All of the above
  
2. Reflective beads are normally:
  - b) spray applied to the wet paint immediately following application of the marking material.
  
3. The minimum surface temperature at which Virginia designated Type A traffic paint may be applied is:
  - c) 50 °F +
  
4. Before marking materials of any kind may be applied, the surface of the roadway must be:
  - c) both a & b
  
5. The specified application thickness for Virginia designated Type A traffic paint is:
  - c) 15 ±1 mil when wet

## Chapter 4 Liquid Thermoplastic

1. Liquid thermoplastic pavement marking material:
  - a) is a blend of solid materials that becomes liquid when heated.
  
2. Markings constructed with liquid thermoplastic pavement marking materials are considered:
  - a) durable markings.
  
3. Liquid thermoplastic comes from the manufacturer with reflective beads already intermixed.
  - a) True
  
4. Reflective beads have to be applied to liquid thermoplastic pavement markings.
  - a) True
  
5. Granular thermoplastic may be heated three (3) times.
  - a) True
  
6. Block thermoplastic may be heated three (3) times.
  - b) False
  
7. It is permissible to intermix alkyd and hydrocarbon thermoplastic materials in the same heating kettle.
  - b) False
  
8. Which of the following methods are acceptable for applying thermoplastic?
  - d) all of the above

9. Virginia Road & Bridge Specifications requires the thickness of thermoplastic markings to be:
  - b)  $90 \pm 5$  mils when set
  
10. Virginia specifies the application rate for glass beads applied to liquid thermoplastic pavement markings is:
  - a) 7 lb/100 ft.<sup>2</sup>

## Chapter 5 Preformed Thermoplastic

1. There is no need to add glass beads to newly applied preformed thermoplastic since they are intermixed with the material at the factory.  
c) False
  
2. When stored inside at a temperature between 35°F and 95°F, preformed thermoplastic has a shelf life of \_\_\_\_\_.  
c) 1 year
  
3. Preformed thermoplastic is considered to be a:  
a) durable pavement marking
  
4. When preformed thermoplastic has been positioned on the pavement, it is necessary to heat only the edges of the material to achieve a good bond with the pavement.  
b) False
  
5. When a small portion of freshly applied preformed thermoplastic has been chiseled up to inspect for bonding with the pavement, it should \_\_\_\_\_ on the underside.  
b) have some asphalt stuck to it

## Chapter 6 Epoxy Resins

1. Epoxy pavement marking material:
  - a) is a two component system.
  
2. Epoxy pavement marking material does not contain solvent.
  - a) True
  
3. For epoxy pavement markings, the ratio of resin to hardener is:
  - c) both a & b
  
4. The Virginia specified thickness for epoxy pavement markings is:
  - c)  $20 \pm 1$  mil when wet
  
5. The equipment used to apply epoxy resin pavement markings cannot be used to apply any other liquid binder material.
  - a) True
  
6. The minimum surface temperature for applying epoxy markings in Virginia is:
  - c)  $50^{\circ}\text{F} +$

## **Chapter 7**

### **Polyester Resin**

1. What is one advantage for using polyester pavement marking materials?
  - b) It is a relatively inexpensive material.
  
2. The Virginia specified thickness for polyester pavement markings is
  - c)  $15 \pm 1$  mils when wet
  
3. Polyester resin will not cure properly if the appropriate amount of catalyst is not added.
  - a) True
  
4. Polyester pavement marking material may be applied over any existing type of marking.
  - b) False
  
5. The minimum road and air temperature required to apply polyester pavement marking is:
  - c) 50°F+
  
6. Polyester resin is dependent upon heat to make it set up.
  - b) False

## Chapter 8 Preformed Tape

1. Preformed tapes do not contain pigments.  
b) False
2. Preformed pavement marking tapes can be used for:  
c) both a & b
3. When patterned tape is inlaid, no primer is used.  
a) True
4. Glass beads are applied to pavement marking tapes:  
c) by the manufacturer
5. The minimum surface temperature at which pavement marking tapes may be applied is:  
d) as recommended by the manufacturer
6. Virginia specifications allow pavement marking tapes to be tamped with vehicle tires.  
b) False
7. Virginia Road & Bridge specifications state that the contractor is responsible for supplying a copy of the manufacturer's installation recommendations to the project inspector.  
a) True
8. Virginia designated Type E tape is:  
c) black

## Chapter 9 Pavement Markers

1. Pavement markers may be used in lieu of pavement markings.  
b) False
2. The most common types of pavement markers are:  
d) all of the above
3. Raised temporary pavement markers are glued to the roadway with a bitumen or epoxy adhesive.  
a) True
4. Raised temporary pavement markers are normally used with:  
b) construction zone markings.
5. Raised snow plowable markers are installed using bitumen adhesive.  
b) False

## Chapter 10 Installation & Quality Control

1. VDOT requires that by the end of each workday, form C-85, “Contractor’s Daily Log and Quality Control Report”, shall be signed by the Contractor and delivered to the:
  - c) Engineer
  
2. VDOT specs. state that before proceeding with work, surface temperature and weather conditions must be checked for compliance with the specifications by the:
  - b) contractor’s certified Q.C. technician
  
3. Layouts for pavement markings must be in conformance with:
  - b) The Manual on Uniform Traffic Control Devices(MUTCD).
  
4. VDOT requires that quality control tests be conducted in accordance with:
  - d) VTM-94.
  
5. Which of the following is not covered in VTM-94?
  - b) measuring pay quantities
  
6. What topics should be discussed at the pre-construction conference held prior to beginning pavement marking operations?
  - d) all of the above
  
7. A copy of the manufacturer’s recommended installation instructions for pavement marking tapes does not have to be supplied by the contractor.
  - b) False
  
8. A Material Safety Data Sheet (MSDS) must be obtained by the contractor for each material required for a particular type of pavement marking.
  - a) True

9. In Virginia, traffic control must be constantly monitored to minimize disruption and to ensure compliance with:
  - e) a and c
  
10. The contractor is required to measure the application thickness and bead application rate:
  - b) at the beginning of each workday and every three hours thereafter.
  
11. Both the contractor and the inspector should constantly monitor the installation and quality of the material being placed.
  - a) True
  
12. In addition to application rates and glass bead distribution, markings should be inspected with regard to:
  - d) all of the above
  
13. VDOT requires in order that corrective action be taken, the inspector should immediately report unacceptable work to:
  - c) the contractor.
  
14. When should pay quantities be compared and confirmed by the contractor and inspector?
  - b) at the end of each operation or the end of each workday
  
15. The Virginia specifications requiring the contractor to maintain an approved Inventory Tracking System are found in:
  - a) Section 704
  
16. Before beginning work, the Source of Materials Document is required to insure that:
  - d) all of the above
  
17. VDOT specifications require the Materials Inventory Tracking system to be maintained by the:
  - a) contractor

18. The contractor's inventory is monitored by the:
  - a) Materials Section Industrial Inspector
  
19. Inventory Tracking Ledgers are maintained by the contractor.
  - a) True
  
20. Copies of Certifications I & II are always delivered to the project.
  - b) False
  
21. Copies of materials certifications are to be retained by the contractor as part of the Materials Inventory Tracking documentation.
  - a) True
  
22. When materials are delivered directly from the manufacturer to a VDOT project, the project inspector will contact:
  - b) District Materials Section Industrial Inspector
  
23. When materials are delivered directly from the manufacturer to a VDOT project, the contractor will be required to maintain an Inventory Tracking Program.
  - a) True
  
24. Contractor's Daily Log and Quality Control Report is required on Federal Projects only.
  - b) False

## Chapter 11 Equipment

1. A long-line paint truck manufactured by one company should look exactly the same as that of a different manufacturer.  
b) False
2. Which item mentioned below is a component for a long-line truck?  
d) all of the above
3. The inspector should be knowledgeable with the pavement marking equipment to help identify problems.  
a) True
4. Clear communication and cooperation between the inspector and contractor helps ensure quality.  
a) True
5. One must inspect pavement marking “close up” to ensure quality.  
a) True  
b) False

## **Chapter 12 Eradication**

1. Failure to remove existing markings when there are shifts in the traffic pattern can:  
d) all of the above
  
2. Which of the following methods is not acceptable for long term eradication?  
e) both b and c
  
3. All residue created when eradicating pavement markings must be:  
b) contained.
  
4. Eradication methods, other than those specified, must be submitted to the project engineer for approval prior to beginning work.  
a) True
  
5. Eradicated lines should be inspected for:  
c) both a & b
  
6. Virginia designated Type E black tape may only be used on hydraulic cement concrete roadways.  
b) False
  
7. One of the criteria in Virginia for using Type E black tape in lieu of eradication is that the traffic pattern will shift back to the original pattern within:  
c) 120 days.