HIGHWAY CONSTRUCTION

Test Code: 7569
Version: 01

Specific Competencies and Skills Tested in this Assessment:

Orientation, Safety, and Security
Identify the responsibilities of safety of the highway construction worker and the inspector
Demonstrate the use and care of appropriate personal protective equipment
Follow safe procedures for lifting heavy objects
Describe safe behavior around ladders and scaffolds
Describe fire prevention and fire-fighting techniques
Define safe work procedures around electrical hazards
Explain basic first aid procedures for the construction site
Describe what OSHA is and what part it plays in job-site safety
Describe what pieces of equipment are used by flaggers to control traffic
Describe what stationary operation means to construction traffic control
Practice job-site safety, prevention of slip and fall and pinch-point accidents and electrocutions
Identify the different types of shoring and know when each should be used
Define the responsibilities of highway inspector for job-site and project security

Math
Add, subtract, multiply, and divide whole numbers, with and without a calculator
Use a standard ruler or tape measure and a metric ruler to measure
Explain what a architect’s ruler/scal is and how it is used and read
Explain what an engineers rule is and how it is used and read
Introduction to Highway Construction Materials
Describe what a slump cone is and what it is used for
Describe how to use a hammer for testing concrete soundness
Describe what a pull-off test is and what is determines
Describe what compression testing is and how it is done
Describe what a test-beam is and what it is used for
Describe what a measure wheel is, how it is used, and what it is used for
Describe what a roll-a-meter is, how it is used, and what it is used for
Describe what PennDOT Bulletin 15 is, and what it is used for
Describe what the Department of Transportation 408 Spec Manual is and what it is used for
Describe what concrete is and it’s history
Describe what superplasticizers are, and what they are used for
Describe what fibermesh is, and what it is used for
Describe what a concrete retarder is, and what it is used for
Describe what concrete accelerators are, and what they are used for
Describe what air entrained concrete is and it’s benefits
Describe what curing compounds are, and what they are used for
Describe what wet curing is and when and how it is used
Identify the benefits to curing concrete
Describe the meaning of cold weather curing
Describe what shocking means during winter curing and identify how it happens
Identify the curing time requirements according to ACI
Describe what a bituminous paving is
Describe what fine aggregate is
Describe what course aggregate is
Describe what a construction joint is and where it is used
Describe what re-cycle asphalt pavement is. (RAP) processes, equipment and attachments
Describe what tack coat is and what it is used for
List the reasons for taking a core sample of a finished asphalt roadway
Identify the processes to check for surface tolerances on a roadway
Describe what concrete reinforcement is
List the reasons why epoxy coated rebar is now used
Describe what wire mesh is and what it’s used for
Describe what cement is and what it is used for
Describe aggregate and how it is manufactured, sized, and graded
Describe fly ash, where it’s originated and why it is used in concrete
Describe natural sand, manufactured sand and what they are used for in the construction trade
Identify weights of common construction material
**Highway Construction continued**

**Introduction to Plans, Specs, and Terminology**
- Describe what specifications are
- Describe what construction plans are
- Describe what a contract agreement is
- Describe what a right-of-way is
- Describe and list what the parts of a bridge are using construction terminology
- Describe what the crown of a roadway is
- List the major types of ditches used to control drainage and explain why each type would be used
- Describe what a pipe culvert is
- List different types of drainage pipes used in construction and explain why each type is used
- Match terms associated with soil to the correct definitions
- Select from a list of types of compacting equipment
- Name the basic soil stabilization methods
- Define terms associated with basic earth moving operations
- Describe various methods for keeping construction sites well drained
- Demonstrate silt fence inspection to meet PennDOT 408 criteria
- Identify common pipe structures

**Introduction to Concrete Testing**
- Identify what ACI is and what it means to the construction industry
- Demonstrate the use of a slump cone to perform a slump test on a sample of concrete
- Describe what types of molds are used for cementious samples
- Describe and demonstrate the proper use of a thermometer to test concrete samples
- Describe the weight of a cubic yard of concrete
- Identify the weight of a bag of Portland cement

**Introduction to Hand and Power Tools**
- Recognize and identify some of the basic hand tools used in the construction trade
- Recognize and identify some of the commonly used power tools in the construction trade
- Describe proper power tool maintenance
- Demonstrate/describe the safe use of a bench grinder
- Demonstrate/describe the safe use of a chop-saw
- Demonstrate/describe the safe use of electric power hand tools
- Demonstrate/describe the safe use of a power tamper
- Demonstrate/describe the safe use of a jack-hammer
- Demonstrate/describe the safe use of generators/light towers
- Demonstrate/describe the safe use of portable pumps. Battery powered tools
- Demonstrate/describe the safe use of gas powered saws

**Basic Rigging**
- Identify and describe the use of slings and common rigging hardware
- Describe the basic inspection techniques and rejection criteria used for slings and hardware
- Describe basic load-handling safety practices
- Demonstrate proper use of American National Standards Institute (ANSI) hand signals
- Demonstrate the proper placement and the safe use of wooden cribbing to support heavy equipment
Highway Construction continued

**Welding and Cutting**
Successfully complete written welders safety test with a score of 100%
Properly demonstrate how to set up an oxy-fuel torch set
Properly demonstrate how to cut a piece of steel with an oxy-fuel cutting torch

**Identification of Equipment**
Identify the various types and uses of compaction equipment
Identify purpose and function of GPS systems
Written Assessment:

Administration Time: 3 hours
Number of Questions: 216

Areas Covered:

- 19% Orientation, Safety, and Security
- 5% Math
- 35% Introduction to Highway Construction Materials
- 15% Introduction to Plans, Specs, and Terminology
- 4% Introduction to Concrete Testing
- 9% Introduction to Hand and Power Tools
- 4% Basic Rigging
- 6% Welding and Cutting
- 3% Identification of Equipment

Sample Questions:

Oil rags should be stored in a
A. self-closing metal box
B. wooden crate
C. tool box
D. paper bag

Measure wheels are used to measure
A. linear distances
B. cubic feet
C. volume
D. square yards

Relief valves protect the hydraulic system from
A. over-pressurizing
B. over-speeding
C. under-pressurizing
D. under-speeding

Fly ash is a byproduct of
A. wood burning
B. recycled tires
C. coal burning
D. air filtering

A cementitious sample is used to perform which type of concrete test?
A. compression
B. stability
C. density
D. design
**Performance Assessment:**

**Administration Time:** 2 hours and 50 minutes  
**Number of Jobs:** 5

**Areas Covered:**

23% **Oxyacetylene Burning and Cutting**  
Comply with safety PPE requirements, assemble and set up the torch, verify no leaks at hose and body connection, layout the cutting on the steel, light torch, perform cutting operation, time to complete, accuracy of cutting.

11% **Set Up a Traffic Control and Work Zone**  
Review PennDOT 213 and their assigned blueprint, measure and layout, efficiency in layout procedures, time to complete.

23% **Form 10' x 10' Pad**  
PPE and safe work procedures, measurements and square, walls plumb, slope, pinning, time to complete.

23% **Tie Rebar 10' x 10' Mat**  
PPE and safe work procedures, secure the correct rebar for the diagram, lay out the pattern in the box, standard ties procedures, saddle ties procedures, edge clearance.

20% **Test Concrete Using Air, Slump, and Test Specimen**  
Prepare tools for slump test, collect sample material, conduct slump test, conduct air test, sample for compression test, proper cleanup, time to complete.

**Sample Job:** Tie Rebar for 10’ x 10’ Mat  
**Maximum Job Time:** 40 minutes  
**Participant Activity:** The participant will lay out the rebar with chairs and tie every intersection (8 standard and 8 saddle). Comply with all safety regulations.