

ATLB-2160: TUNNEL CONSTRUCTION

Cuyahoga Community College

Viewing: ATLB-2160 : Tunnel Construction

Board of Trustees:

2012-06-28

Academic Term:

Spring 2019

Subject Code

ATLB - AIT-Construct/Hazard Material

Course Number:

2160

Title:

Tunnel Construction

Catalog Description:

History and terminology of tunneling in the construction industry. The need for tunnels and methods of boring is addressed. Skill development using specialty tools and equipment including jack-leg drills and hand tools for tunneling is included. Installation procedures, alignment and bolting of steel liner plates are demonstrated and practiced.

Credit Hour(s):

4

Lecture Hour(s):

4

Requisites

Prerequisite and Corequisite

Departmental approval: admission to the Construction Tending and Hazardous Material Abatement program.

Outcomes

Course Outcome(s):

1. Discuss the history of tunneling, identify safe work practices and employ methods for tunnel stabilization.

Objective(s):

1. Discuss the history of tunneling.
2. Define terms specific to tunneling.
3. Discuss safety regulations as prescribed in the Occupational Safety and Health Administration (OSHA) standards under OSHA 1926 Subpart S.
4. Identify and explain ground support practices and techniques.

Course Outcome(s):

2. Demonstrate skill with a jack-leg drill.

Objective(s):

1. Maintain tunneling equipment including various drill motors and compressors.
2. Compile a list of equipment and material needed for drilling operations specific to job assignments.
3. Demonstrate collaring a hole.
4. Apply proper revolutions per minute (RPM) and feed rate of drill.

Course Outcome(s):

3. Demonstrate skill with various hand excavating tools and equipment for mining.

Objective(s):

1. Compile a list of equipment and material needed to excavate specific to ground conditions.
 2. Demonstrate skill in excavating in soft ground and hard rock conditions.
 3. Demonstrate skill in removing of spoils and muck.
 4. Maintenance of 35lb. pneumatic chipper and compressor.
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Course Outcome(s):

4. Demonstrate skill in gauging, installing, aligning and bolting of liner plates.

Objective(s):

1. Compile a list of tools and material needed to support excavation area.
 2. Demonstrate the starting point of excavation.
 3. Demonstrate use of hand tools required for installation.
 4. Demonstrate ability to gauge excavation sufficiently to receive liner plate.
 5. Demonstrate ability selecting correct liner plate to be installed.
 6. Demonstrate ability to line up holes, install bolts and torque nuts to specifications.
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Methods of Evaluation:

1. Quizzes
2. Tests
3. Class participation
4. Field excercises

Course Content Outline:

1. History, safety and stability
 - a. History of tunnels
 - i. Egyptian times
 - ii. Water
 - iii. Excavations
 1. Unitary excavation
 2. Timber support
 - iv. Pressurized tunnels
 - v. Tunnel boring
 - b. Application and methods
 - i. Shafts
 - ii. Compressed air
 - iii. Tunnel boring
 - iv. Hand mining
 - v. Nitrogen freezing
 - vi. Stabilization
 1. Mesh
 2. Fencing
 3. Shotcrete
 - c. Safety
 - i. 1926 subpart S
 - ii. Ventilation
 - iii. Lighting
 - iv. Falling rock
 - v. Personal protective equipment
 - vi. Loci train
 - vii. Well points
 - d. Terminology
 - i. Jack-leg drill
 - ii. Tunnel boring machine
 - iii. Liner plates
 - iv. Lagging

- v. Spiling
- vi. Poling board
- vii. Mucking
- e. Ground support
 - i. Breast boards
 - ii. Overhead
 - iii. Grout
 - iv. Shotcrete
 - v. Wood lagging
- 2. Jack-leg drill
 - a. Maintenance
 - i. Components
 - ii. Lubrication
 - iii. Hydraulics
 - iv. Hoses
 - b. Equipment and material
 - i. Rock drill oil
 - ii. Hoses
 - 1. Air
 - 2. Water
 - 3. Clips
 - a. Bits and wrenches
 - c. Hole collaring
 - i. Procedure
 - ii. Accuracy
 - iii. Safety
 - d. RPM and feed
 - i. Speed balance
 - ii. Depth control
 - iii. Geological resistance
 - e. Set up
 - i. Positioning
 - ii. 1. Drill
 - 2. Leg
 - 3. Operator
 - iii. Connections
 - iv. Lubrication
 - v. Operation
 - f. Ground conditions and boring
- 3. Excavation hand tools and equipment
 - a. Chippers
 - i. Clay spade
 - ii. Chipper point
 - b. Hand tools
 - i. Scaling bar
 - ii. Spade
 - iii. Pick
 - c. Equipment
 - i. Boring machine
 - ii. Conveyors
 - iii. Muck cars and loci
 - iv. Jumbo drill
 - d. Soft ground drilling
 - e. Hard rock
 - f. Spoils removal

- i. Equipment
- ii. Safety
- iii. Procedure
- 4. Liner plates
 - a. Gauging
 - i. Tools
 - ii. Equipment
 - iii. Depth and width determination
 - b. Installation
 - i. Procedure
 - ii. Accuracy
 - c. Plate selection
 - i. Grout plates
 - ii. Full, half, and shaft
 - iii. Calculation
 - d. Alignment
 - i. Plates
 - ii. Tunnel
 - iii. Equipment
 - 1. Laser
 - 2. Spads and plumb bobs
 - iv. Specifications
 - v. Grade
 - 1. Alignment
 - 2. Accuracy

Resources

LIUNA Training and Education Fund. *Tunnel Construction Manual*". Pomfret Center, CN: LIUNA Training and Education Fund, 2008.

Southern Nevada Laborers Training Trust Fund. *Tunnel and Shaft Worker*. Las Vegas, NV: Southern Nevada Laborers Training Trust Fund, 2011.

David Chapman, Nicole Metje, Alfred Stärk. *Introduction to Tunnel Construction*. Spon Press, 2010.

Resources Other

1. Tunnel Workers Training. <http://www.hardrocktunnel.com/>
2. TunnelBuilder. <http://www.tunnelbuilder.com/>

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