

RSES & Elsevier eLearning – Course Outline

Safety for the HVACR Technician

Course Title: Safety for the HVACR Technician

A comprehensive module explaining numerous safety facts, guidelines, and recommendations for the HVACR service technician.

- CEUs: 12
- Course length: Approximately 12 hours
- User can stop and start the material at any point (e.g., after 20 minutes), bookmark where they leave off, and repeat all material as many times as desired.
- Price – Full course: \$225, \$150 for RSES members (£112 / £75; €150 / €100)
- Course uses Inch-Pound (I-P) units of measure.
- NATE CEHs: 16 - NATE-recognized for NATE recertification

Designed For:

- Service technicians

After Completing This Course, You Will Understand:

- The different types of personal protective equipment (PPE) as required by OSHA standards
- The basic precautions and safety tips while using tools and test instruments
- The electric hazards, their effect on human body and precautions related to such hazards
- The safe installation and maintenance of air-moving equipment and precautions for some of the hazards associated with this equipment.
- The hazards during soldering, brazing, and welding and precautions against these hazards
- Fire safety and related precautions
- The guidelines for the safe use of ladders prescribed by the U.S. Consumer Product Safety Commission.
- The correct methods of moving materials manually and moving materials using machinery

Course Description:

- On-demand, interactive course of 8 modules (“short courses”)
- Online course reader with easy-to-print PDFs
- Online self-assessment
- End-of-module exam and certificate of completion

Modules:

1. Personal Protective Equipment
2. Tools and Test Instruments
3. Electrical Safety
4. Fan Safety
5. Soldering, Brazing and Welding
6. Fire Safety
7. Ladders, Scaffolds, and Lifts
8. Material Handling

Every Module Includes:

- Module introduction
- Topic introduction
- Check-point questions
- Topic summary
- Assessment

Outcomes: The 8 online modules help you to understand:

- The types of personal protective equipment (PPE) as required by OSHA standards
- The safety tips for using tools and test instruments
- Electric hazards and related precautions
- Installation, maintenance, and precautions for air-moving equipments
- Hazards during soldering, brazing, and welding and related precautions
- Fire safety and related precautions
- Guidelines for safe use of ladders
- Correct methods of handling of materials

How This Course Relates to Existing RSES Training:

This online course is a great complement to the instructor-led trainings being offered by RSES Chapters.

The content of the **Safety for the HVACR Technician** online course and modules most closely resembles the “Safety for the HVACR Service Technician,” manual, however, the entire Safety eLearning course, or any independent module will further supplement and stress the safety issues related to the HVACR industry.

Module 1: Personal Protective Equipment

Description:

This module explains the different types of personal protective equipment (PPE) as required by OSHA standards.

Learning Outcome:

Upon the completion of this module, you will be able to:

1. Define hazard assessment.
2. Identify basic hazards on the work site.
3. Identify other potential hazards on the work site.
4. Explain the need for eye and face protection at the work site.
5. Identify appropriate eye and face protection for different types of hazards.
6. Identify the different categories of respirators.
7. Explain how the different respirators can be used effectively.
8. Describe the different classes of head protection.
9. Describe the different types of hearing protection available.
10. Describe the different gloves available as hand protection.
11. Explain the types of footwear appropriate for different work conditions.
12. Describe the different types of hazards for which you would need protective clothing.
13. Describe the appropriate use of fall protection.

Topic 1: Hazard Assessment

- Topic Introduction and Objectives
- Potential Hazards on the Job Site
- Check-Point Question: Classification of Hazards
- Walk-Through Survey: Potential Hazards
- Walk-Through Survey: Additional Checks
- Check-Point Question: Hazards Associated with Different Locations on Jobsite
- Topic Summary

Topic 2: Eye and Face Protection

- Topic Introduction and Objectives
- The Need for Eye and Face Protection
- Eye and Face PPE for Different Hazards
- Protection Against Radiant Energy
- The Three “Rights” of PPE
- Check-Point Question: The PPE
- Topic Summary

Topic 3: Respiratory Protection

- Topic Introduction and Objectives

- Categories of Respirators
- Supplied-Air Respirators
- Effective Use of Respirators
- Check-Point Question: Conditions in which Supplied-Air respirators are Used
- Check-Point Question: Features of Different Respirators
- Topic Summary

Topic 4: Head and Hearing Protection

- Topic Introduction and Objectives
- The Need for a Hard Hat
- Industrial Class Hard Hats
- Hard Hat Maintenance
- Check-Point Question: Types of Hats
- Decibel Levels and Hearing Loss
- Types of Hearing Protection
- Noise Reduction Ratings
- Check-Point Question: Calculating Noise Reduction Ratings
- Check-Point Question: Features of Hearing Protection
- Topic Summary

Topic 5: Hand and Foot Protection

- Topic Introduction and Objectives
- Various Types of Hand Protection
- Types of Foot Protection
- Check-Point Question: Glove Types and Usability
- Topic Summary

Topic 6: Protective Clothing and Fall Protection

- Topic Introduction and Objectives
- Protective Clothing for Potential Hazards
- When is Fall Protection Required?
- Personal Fall Protection
- Check-Point Question: Features of Fall Protection
- Topic Summary
- Assessment

Module 2: Tools and Test Instruments

Description:

This module explains the basic precautions and safety tips while using tools and text instruments.

Learning Outcome:

Upon the completion of this module, you will be able to:

1. Describe the major hazards from using worn or poorly maintained tools.
2. List some important tips for proper usage of hand tools.
3. Describe the precautionary measures for working with electric tools.
4. Describe the precautionary measures for working with extension cords.
5. Describe the necessary steps for effectively maintaining battery operated tools.
6. List the precautionary measures for working with pneumatic tools and gasoline-powered tools.
7. Explain how powder-actuated tools work.
8. List the safety precautions for powder-actuated tools.
9. Explain the steps technicians should take to maintain and work with test meters.

Topic 1: Hand Tools

- Topic Introduction and Objectives
- Possible Hazards from Damaged Tools
- Basic Hand Tool Reminders
- OSHA Hand Tools and Equipment Checklist
- Non-Sparking Tools
- Check-Point Question: Hand Tool Precautions
- Topic Summary

Topic 2: Power Tools

- Topic Introduction and Objectives
- Ground Fault Circuit Interrupters
- Precautions When Working with Power Tools
- Tips for Working with Power Tools
- Power Tools and PPE
- Four Steps for Power Tool Safety
- Extension Cords
- OSHA Portable Tool and Equipment Checklist
- Cordless Tools
- Battery Maintenance for Cordless Tools
- Tools Guards
- Pneumatic Tools
- Gasoline-Powered Tools
- Check-Point Question: Hazard from Battery Operated Power Tools
- Check-Point Question: Features of Power Tools
- Topic Summary

Topic 3: Powder-Actuated Tools

- Topic Introduction and Objectives
- Operating Powder-Actuated Tools
- Safety Precautions for Powder-Actuated Tools
- OSHA Powder-Actuated Tool Checklist
- Check-point Question: Precautions for Powder-Actuated Tools
- Topic Summary

Topic 4: Test Meters

- Topic Introduction and Objectives
- Working with Test Meters
- Checking Test Equipment
- Test Meter Maintenance
- Safety Tips for Multimeters
- Check-point Question: Features of Test Meters
- Topic Summary
- Assessment

Module 3: Electrical Safety

Description:

This module explains the electric hazards, their effect on human body and precautions related to such hazards.

Learning Outcome:

Upon the completion of this module, you will be able to:

1. Explain how electric currents pass through the body.
2. Describe the types of injuries caused due to electrical shocks.
3. List the factors that affect the resistance around the body.
4. Describe the factors that determine the extent of injury caused due to electric currents.
5. Identify the different forms of burn injuries that can be caused due to electricity.
6. List the precautions for HVACR technicians when working with “hot” lines.
7. Identify electrical hazards related to:
 - fuses and circuit breakers
 - overhead wires
 - exposed wiring
 - overloaded circuits
 - improper grounding
 - wet conditions
8. Describe what a GFCI is and how it operates.
9. Explain the proper use of PPE when working on or near electrical equipment.
10. Describe the three potential electrical hazards for which the NFPA recommends the use of PPE.
11. List the different hazard categories for electrical work defined by the NFPA 70E.
12. Explain how to choose the appropriate electrical meter.
13. Describe proper lockout/tagout methods.

Topic 1: Electrical Injuries

- Topic Introduction and Objectives
- The Human Body and Resistance to Electric Current
- Injuries Due to Electrical Shocks
- Electric Voltage and Injuries
- Check-Point Question: Electric Injuries and Human Body
- Topic Summary

Topic 2: How Electrical Shocks Happen

- Topic Introduction and Objectives
- The Body as Path of Least Resistance
- Check-Point Question: Resistance Offered by Body to the Current
- Topic Summary

Topic 3: Electrical Burns

- Topic Introduction and Objectives
- Burns from Direct Contact with Current
- Burns from High-Amperage Current
- Check-Point Question: Effect of Electric Current on Body

- Topic Summary

Topic 4: Electrical Hazards—Precautions and Identification

- Topic Introduction and Objectives
- Precautions for Working with “Hot” Lines
- Two Conditions for Receiving an Electric Shock
- Fuses and Circuit Breakers
- Overhead Wires
- Exposed Wiring
- Check-Point Question: Do’s and Don’ts while Working with “Hot” Lines
- What Causes Overloaded Circuits?
- How to Avoid Overloaded Circuits
- Need for Grounding Protection
- Grounding for Water and Gas Piping
- Wet Conditions
- Check-Point Question: Electric Shocks and Precautions
- Topic Summary

Topic 5: Ground-Fault Circuit Interrupters

- Topic Introduction and Objectives
- What is a Ground-Fault Circuit Interrupter?
- Types of GFCI
- Check-Point Question: Features of GFCI
- Topic Summary

Topic 6: Personal Protective Equipment

- Topic Introduction and Objectives
- Using PPE
- NFPA 70E
- Standard 70E: Use of PPE
- NFPA 70E Hazard Categories
- Check-Point Question: Three Potential Hazards
- Check-Point Question: Class of Risk and Examples
- Topic Summary

Topic 7: Meter Safety and Lockout/Tagout Procedures

- Topic Introduction and Objectives
- Selecting an Electrical Meter
- The Need for Lockout/Tagout Procedures
- How Lockout/Tagout Procedures Work
- OSHA Practices
- Lockout/Tagout Procedures
- More Safety Standards
- Disabling the Equipment
- Safety First
- Check-Point Question: Steps in Lockout/Tagout Procedures
- Topic Summary
- Assessment

Module 4: Fan Safety

Description:

This module is designed to assist in the safe installation and maintenance of air-moving equipment and to warn operating and maintenance personnel of some of the hazards associated with this equipment.

Learning Outcome:

Upon the completion of this module, you will be able to:

1. Explain the need for personnel safety accessories when working with air-moving devices.
2. Describe the different types of fan guards and when they should be used.
3. Describe the necessary steps technicians should follow before putting any fan into operation.
4. Describe the procedures for periodic checks on operating fans.
5. Describe the necessary precautionary measures for special purpose systems.
6. Describe routine maintenance procedures for air-moving devices.
7. Describe maintenance procedures for specific fan-related problems, such as excessive vibrations, high motor temperatures, and high bearing temperatures.

Topic 1: Safety Accessories and Fan Guards

- Topic Introduction and Objectives
- Personnel Safety Accessories
- The Need for Fan Guards
- Inlet and Outlet Guards
- Drive Guards
- Check-Point Question: Features of Fan Guards
- Topic Summary

Topic 2: Working with Air-Moving Devices

- Topic Introduction and Objectives
- Special-Purpose Intake Screens
- Bolted Access Doors
- Start-Up Checklist
- Periodic Checks for Fans
- Electrical Isolation
- Check-Point Question: Features of Different Types of Fans
- Topic Summary

Topic 3: Routine Maintenance

- Topic Introduction and Objectives
- Special Purpose Systems
- Fan Types and Precautions
- Check-Point Question: Special Purpose Systems
- Safety Tips for Fan Plenums
- Tips for Routine Maintenance
- Tips for Specific Problems
- Check-Point Question: Fan Safety
- Topic Summary
- Assessment

Module 5: Soldering, Brazing and Welding

Description:

This module describes hazards during soldering, brazing, and welding and precautions against these hazards.

Learning Outcome:

Upon the completion of this module, you will be able to:

1. Describe the safety requirements technicians should follow during welding operations.
2. Explain the safety precautions that should be followed when breaking, cleaning, and rejoining piping and connections.
3. Describe the potential health hazards faced by welders.
4. Describe the hazards involved when working with an oxyacetylene welding setup.
5. Describe the necessary precautions for handling oxygen and acetylene cylinders.
6. Describe the necessary precautions for handling propane cylinders.

Topic 1: Safety Precautions for Soldering, Brazing, and Welding

- Topic Introduction and Objectives
- Personal Safety for Torches and Welding Equipment
- Checks for Torches and Arc Welding Equipment
- Tips for Safety While Brazing
- OSHA Soldering, Brazing, Welding, and Cutting Checklist
- Check-Point Question: Safety Tips
- Piping and Connections
- Isolating Sections of Piping
- Fumes from Welding
- Safeguarding Against Fire Hazards
- Health Hazards for Welders
- Check-Point Question: Safety Precautions
- Topic Summary

Topic 2: Working with Oxygen, Acetylene, and Propane

- Topic Introduction and Objectives
- Hazards and Precautions for Oxyacetylene Welding Setup
- Precautions for Handling Oxygen and Acetylene Cylinders
- Working with Propane
- Check-Point Question: Working with Acetylene
- Check-Point Question: Working with Propane
- Topic Summary
- Assessment

Module 6: Fire Safety

Description:

This module describes fire safety and related precautions.

Learning Outcome:

Upon the completion of this module, you will be able to:

1. Describe the three components that are required to start a fire.
2. Describe the four classes into which fires are grouped.
3. Explain how portable fire extinguishers are classified and labeled based on their function.
4. Describe the different types of portable fire extinguishers.
5. Explain how fire extinguishers should be used effectively.
6. List some basic tips for on-the-job fire awareness.
7. Describe the chief sources of fire hazards associated with refrigeration and air conditioning work.
8. Describe basic housekeeping practices at the job site that help prevent fires.
9. List out some basic tips on reducing the risk of fires.

Topic 1: Introduction to Fire Safety

- Topic Introduction and Objectives
- The Portable Fire Extinguisher
- The Fire Triangle
- Fire extinguishers—Use and Labeling
- Fire Extinguisher Maintenance
- Check-Point Question: Classes of Fire
- Check-Point Question: Fire Extinguisher
- Topic Summary

Topic 2: Types of Portable Fire Extinguishers

- Topic Introduction and Objectives
- Extinguishers for Class A Fires
- Extinguishers for Class B Fires
- Extinguishers for Class C Fires
- Extinguishers for Class D Fires
- Check-Point Question: Classes of Fire and Extinguishing Agents
- Check-Point Question: Features of Fire Extinguishers
- Topic Summary

Topic 3: Proper Use of Fire Extinguishers

- Topic Introduction and Objectives
- Fire Extinguisher Usage
- Selecting and Locating Fire Extinguishers
- Inspecting Fire Extinguishers
- Check-Point Question: Use and Selection of Fire Extinguishers
- Topic Summary

Topic 4: Fire Awareness

- Topic Introduction and Objectives

- Carry a Fire Extinguisher
- Fire Hazards
- Check-Point Question: Types of Fire Extinguishers
- Check-Point Question: Chief Sources of Fire Hazard
- Topic Summary

Topic 5: Housekeeping and Precautions

- Topic Introduction and Objectives
- Best Practices for Housekeeping
- Common Conditions that Cause Fires
- Reducing the Risk of Fire
- More Vital Tips on Preventing Fires
- Check-Point Question: Reducing the Risk of Fire
- Topic Summary
- Assessment

Module 7: Ladders, Scaffolds, and Lifts

Description:

This module describes the guidelines for the safe use of ladders prescribed by the U.S. Consumer Product Safety Commission.

Learning Outcome:

Upon the completion of this module, you will be able to:

1. Describe the methods for proper use and maintenance of ladders.
2. List safety guidelines for working on scaffolds.
3. List the requirements for workers operating aerial lift devices.
4. Describe the rules of operation for aerial lift devices.

Topic 1: Ladders

- Topic Introduction and Objectives
- Classification of ladders
- Inspection of Ladders
- Care and Safe Use of Ladders
- Safe Use of Ladders
- Permanent Vertical Ladders
- Preventing Injuries with Ladder Safety
- Check-Point Question: Safe Use of Ladder
- Check-Point Question: Ladder Safety
- Check-Point Question: Vertical Access Ladder
- Topic Summary

Topic 2: Scaffolds

- Topic Introduction and Objectives
- Safety on Scaffolds
- Additional Safety for Scaffolds
- Check-Point Question: Safety on Scaffolds
- Topic Summary

Topic 3: Aerial Lift Devices

- Topic Introduction and Objectives
- Operating Aerial Lift Devices
- Rules of Operation
- Check-Point Question: Operating Aerial Lift Devices
- Check-Point Question: Operating Aerial Lift Devices
- Topic Summary
- Assessment

Module 8: Material Handling

Description:

An introduction to the correct methods of moving materials manually and moving materials using machinery.

Learning Outcome:

Upon the completion of this module, you will be able to:

1. Describe the methods for storing materials manually.
2. List the potential injuries that can occur when moving materials manually.
3. List the proper lifting techniques technicians should follow to avoid injuries.
4. Describe the safety precautions that should be followed when operating various material handling equipment.

Topic 1: Material Storage and Moving Materials Manually

- Topic Introduction and Objectives
- Chemical Safety
- Material Storage
- Moving Materials Manually
- Safety Tips When Moving Materials
- Potential Injuries During Manual Movement of Material
- Lifting Safely
- Preventative Exercises
- Lifting Techniques
- Check-Point Question: Safety Tips for Moving Materials
- Topic Summary

Topic 2: Material Handling Equipment

- Topic Introduction and Objectives
- Hand Trucks and Carts
- Pallet Jacks
- Forklifts
- Guidelines for Powered Industrial Trucks
- Leaving Forklifts Unattended
- Cranes
- Precautions When Operating a Crane
- Rigging
- Rigging Rules
- Check-Point Question: Safe Rigging
- Slings
- Precautions When Working with Slings
- Check-Point Question: Slings and Forklifts
- Rope and Tackle Blocks
- Check-Point Question: Precautions Related to Equipments
- Topic Summary
- Assessment