



8989

PIPING FUNDAMENTALS (9)

30S / 30E / 30M

A Refrigeration and Air Conditioning Technology
Course

8989 PIPING FUNDAMENTALS (12D) 30S / 30E / 30M

Course Description

A student wanting to develop skills in the refrigeration and air conditioning industry must have knowledge of the basic principles of the piping connection and brazing systems, pressure testing, and evacuation of piping systems. The student will be able to solder, braze, flare, bend, and assemble various piping materials and test for leaks.

Goal 1: Describe and apply appropriate **health and safety** practices as they apply to refrigeration and air conditioning.

GLO 1.1: Describe and apply appropriate **health and safety** practices.

- SLO 11B.1.1.1 Demonstrate awareness of the principles of Workplace Hazardous Materials Information Systems (WHMIS) as they apply to the refrigeration and air conditioning service and repair industry. (A3.11)
- SLO 11B.1.1.2 Describe the purpose of Material Safety Data Sheets (MSDS).
- SLO 11B.1.1.3 Describe workplace health and safety procedures (e.g., S.A.F.E., right to refuse). (A3.11)
- SLO 11B.1.1.4 Demonstrate the ability to follow safety information on supplier labels.
- SLO 11B.1.1.5 Identify the process for reporting injuries.
- SLO 11B.1.1.6 Identify ergonomically correct procedures to avoid injury (e.g., stress, strain). (A3.7)
- SLO 11B.1.1.7 Identify fire prevention and control strategies.
- SLO 11B.1.1.8 Identify emergency evacuation and response procedures.
- SLO 11B.1.1.9 Identify hazards and describe safe work practices pertaining to air compressors.

GLO 1.2: Create and maintain a **safe working environment**.

- SLO 11B.1.2.1 Identify hazards and precautions working with and around energized equipment. (A12.2)
- SLO 11B.1.2.2 Identify and report hazards (e.g., electrical safety, ergonomics, material handling, and chemical) related to processes, materials, tools, and equipment used in the refrigeration and air conditioning facility.

- SLO 11B.1.2.3 Follow the directions of the teacher/supervisor with regard to safe work practices.
- SLO 11B.1.2.4 Follow safe practices and procedures for facilities, processes, materials, tools, and equipment used in the refrigeration and air conditioning shop (e.g., keep work area clean and organized, avoid distractions).
- SLO 11B.1.2.5 Describe and use appropriate personal protective equipment (e.g., gloves, safety glasses or goggles, hearing protection, respirator mask, etc.). (A3.2)
- SLO 11B.1.2.6 Locate first aid and eyewash station.
- SLO 11B.1.2.7 Identify and report hazards (e.g., electrical, ergonomic, material handling, chemicals, and spills) related to materials, processes, tools, and equipment used in the refrigeration and air conditioning facility.

Goal 2: Demonstrate the safe and appropriate **selection, operation, and management** of shop **equipment and tools**.

GLO 2.1: Demonstrate the safe and appropriate **selection, operation, and management** of shop **equipment and tools**.

- SLO 11B.2.1.1 Identify types of piping tools, and describe their applications and procedures for use.

Goal 3: Demonstrate the safe and appropriate **use of materials**.

GLO 3.1: Demonstrate the safe and appropriate use of **fasteners and supports**.

- SLO 11B.3.1.1 Demonstrate the safe and appropriate selection and application of fasteners and supports used in piping fundamentals.

GLO 3.2: Demonstrate the safe and proper manipulation of **piping and tubing**.

- SLO 11B.3.2.1 Identify types of refrigeration piping and tubing, and describe their characteristics and applications. (A9.3)
- SLO 11B.3.2.2 Identify types of fittings, and describe their applications and procedures for use. (A9.4)
- SLO 11B.3.2.3 Identify types of equipment and accessories used to solder and braze, and describe their applications. (A9.8)
- SLO 11B.3.2.4 Identify types of soldering and brazing materials and fillers, and describe their characteristics and applications. (A9.9)

- SLO 11B.3.2.5 Identify types of threaded pipe, and describe their characteristics and applications. (A9.11)
- SLO 11B.3.2.6 Describe the procedures used to install piping and tubing. (A9.12)
- SLO 11B.3.2.7 Demonstrate installation of refrigeration piping and tubing. (A9.17)

GLO 3.3: Demonstrate the safe and proper manipulation of sheet metal.

No applicable SLOs.

GLO 3.4: Demonstrate the appropriate management of materials.

- SLO 11B.3.4.1 Demonstrate the safe and appropriate management of piping materials used in the refrigeration and air conditioning trade.

Goal 4: Install heating, cooling, and refrigeration equipment.

GLO 4.1: Demonstrate an awareness of the **installation requirements for** heating, cooling, and refrigeration equipment.

- SLO 11B.4.1.1 Identify procedures for, awareness of, and codes related to piping installations.

GLO 4.2: Demonstrate the appropriate **installation** of heating, cooling, and refrigeration equipment.

- SLO 11B.4.2.1 Define terminology associated with leak testing, evacuation, and charging.
- SLO 11B.4.2.2 Identify types of leak detection tools, and describe their applications and procedures for use.
- SLO 11B.4.2.3 Describe the procedures used to leak-test a refrigeration system.
- SLO 11B.4.2.4 Identify types of evacuation tools and equipment, and describe their procedures for use and maintenance.
- SLO 11B.4.2.5 Describe the procedures used to evacuate and dehydrate a system.
- SLO 11B.4.2.6 Demonstrate leak testing of refrigeration systems.
- SLO 11B.4.2.7 Demonstrate evacuating and dehydrating a system.
- SLO 11B.4.2.8 Demonstrate charging refrigerant into a system.

GLO 4.3: Test and document refrigeration and air conditioning systems.

SLO 11B.4.3.1 Test piping systems.

Goal 5: Repair heating, cooling, and refrigeration equipment.

GLO 5.1: Diagnose problems in heating, cooling, and refrigeration equipment.

SLO 11B.5.1.1 Identify problems with piping systems and with checking for leak testing.

GLO 5.2: Repair heating, cooling, and refrigeration equipment.

SLO 11B.5.2.1 Perform repairs on piping systems.

Goal 6: Service heating, cooling, and refrigeration equipment.

GLO 6.1: Demonstrate awareness of the **servicing needs** of heating, cooling, and refrigeration equipment.

SLO 11B.6.1.1 Identify service required for piping systems.

Goal 7: Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they pertain to the refrigeration and air conditioning service and repair industry.

GLO 7.1: Demonstrate skills from **information and communication technology**.

No applicable SLOs.

GLO 7.2: Read, interpret, and communicate information relevant to the refrigeration and air conditioning service and repair industry.

SLO 11B.7.2.1 Read, interpret, and communicate piping diagrams.

GLO 7.3: Apply the knowledge and skills related to the refrigeration and air conditioning service and repair industry from **mathematics**.

SLO 11B.7.3.1 Apply mathematical calculations to piping design and layout.

GLO 7.4: Apply the knowledge and skills related to the refrigeration and air conditioning service and repair industry from the sciences.

No applicable SLOs.

Goal 8: Demonstrate awareness of **sustainability** as it pertains to the refrigeration and air conditioning service and repair industry.

GLO 8.1: Describe the impact of **human sustainability** on the health and well-being of refrigeration and air conditioning mechanics and society.

SLO 11B.8.1.1 Discuss the long-term health hazards related to the service and maintenance of piping systems.

GLO 8.2: Describe the refrigeration and air conditioning industry's sustainability practices and impact on the **environment**.

SLO 11B.8.2.1 Demonstrate the safe and appropriate recovery and reclamation of refrigerant

SLO 11B.8.2.2 Discuss the impact of chemical hazards on the environment.

GLO 8.3: Describe **sustainable business practices** within the refrigeration and air conditioning service and repair industry.

SLO 11B.8.3.1 Discuss how business practices can help to sustain a HVAC/R business or department.

Goal 9: Demonstrate awareness of the ethical and legal standards as they pertain to the refrigeration and air conditioning service and repair industry.

GLO 9.1: Practise the **ethical and legal standards** as they pertain to the refrigeration and air conditioning service and repair industry.

SLO 11B.9.1.1 Identify legislation regarding HVAC/R, including certification of tradespersons and recovery and disposal of refrigerants.

Goal 10: Demonstrate **employability skills** related to the refrigeration and air conditioning service and repair industry.

GLO 10.1: Demonstrate **fundamental employability skills**.

SLO 11B.10.1.1 Demonstrate critical-thinking and problem-solving skills.

SLO 11B.10.1.2 Demonstrate regular attendance and punctuality.

SLO 11B.10.1.3 Demonstrate accountability by taking responsibility for their actions.

SLO 11B.10.1.4 Demonstrate adaptability, initiative, and effort.

- SLO 11B.10.1.5 Demonstrate the ability to accept and follow direction and feedback.
- SLO 11B.10.1.6 Demonstrate teamwork skills.
- SLO 11B.10.1.7 Stay on task and use time effectively.
- SLO 11B.10.1.8 Communicate respectfully and effectively with coworkers and customers.

GLO 10.2: Demonstrate an understanding of the business operation of a refrigeration and air conditioning service and repair facility.

- SLO 11B.10.2.1 Discuss the effect of inefficient work on the business operation of a refrigeration and air conditioning facility.
- SLO 11B.10.2.2 Discuss the advantages and disadvantages of cleaning or replacing existing piping systems when changing refrigerant types.

Goal 11: Understand **career opportunities** in the refrigeration and air conditioning service and repair industry and associated professions.

GLO 11.1: Describe **education** and **career opportunities** and **professional organizations** in the refrigeration and air conditioning service and repair industry and associated professions.

- SLO 11B.11.1.1 Demonstrate an awareness of education and career opportunities and professional organizations in the pipe trades.

Goal 12: Understand the **evolution, technological progression,** and **emerging trends** in the refrigeration and air conditioning service and repair industry.

GLO 12.1: Describe the **evolution, technological progression,** and **emerging trends** in the refrigeration and air conditioning service and repair industry.

- SLO 11B.12.1.1 Discuss the evolution, technical progression, and emerging trends in piping fundamentals.

