

Program information

Program title Refrigeration and air conditioning technician

Introduction

The competency based curriculum guide for refrigeration and air conditioning technician is designed to produce graduates equipped with knowledge, skills and attitudes required by the technicians having this occupation especially for the foreign employment.

Successful graduates of this program will be capable of performing installation of domestic and industrial refrigeration, industrial air conditions, provide after sales service and repair defective refrigerator and air condition. The program focuses mainly on practical activity, many of which will be performed as individual projects. Trainee must learn to use different tools and equipment and learn to work safely. Graduates of this program typically hold jobs as “refrigeration and air-conditioning technician”.

The features of this curriculum is:

1. The curriculum is designed on modular basis which gives enough flexibility in implementation.
2. The curriculum focuses practical experiences. However, the minimum theoretical knowledge which directly affects the task performance is included.

Aims

The aim of this training is to provide competent and confident refrigeration and air conditioning technician who can provide effective services to the foreign industries.

Duration

The total duration of the course is 205 hrs.

Entry requirements

Individuals designing to enter this program must be:

1. Youths who are seeking foreign employment and have passed grade 10 or above.
2. Citizens of Nepal with minimum 21years of age but not exceeding 40.
3. Physically and mentally fit.

Medium of instruction

The medium of instruction for this program will be Nepali and English, however, all technical terminologies will be taught in English.

Pattern of attendance

The trainees should have at least 95% attendance to be eligible to take test and receive completion certificate.

Teaching learning methodologies

Demonstration followed by guided practice, independent practice and performance test should be the key methods besides illustrated talks, assignments, group works, simulations etc.

Student's evaluation details

- Continuous evaluation of the trainee's performance is to be done by the related instructor/ trainer to ensure the proficiency over each competency under each module.
- Related technical knowledge learnt by trainees will be evaluated through written tests.
The test items will mainly be objective types.
- Trainees must secure minimum marks of 70% in an average of both theory and practical evaluations to obtain the course completion certificate.

Grading system

The trainees will be graded based on the marks in percentage secured by them in tests/ evaluations.

- Grade "A": passed with 90% or above
- Grade "B": passed with 80% or below 90%
- Grade "C": passed with 70% and below 80%
- Grade "D": (failed): below 70%

Trainer's qualification

- Vocational training institute graduate level III in related trade with minimum of 3 years field experience.
- Good occupational and instructional skills.
- Above qualification with 2 years experience in related foreign employment.

Trainer-trainees ratio

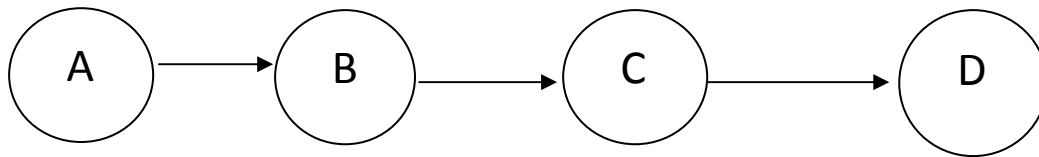
- 1:10 for practical instruction.
- 1:20 class room instruction

Course structure

The welder program consists of four modules that must be completed in the sequence according to the diagram below:

Modules:

- A. Mechanical work
- B. Electrical work
- C. Domestic refrigeration and air-conditioning
- D. Commercial refrigeration and air-conditioning



After completion of module A, B and C, the individual may work as “domestic refrigeration and air-conditioning technician”

After completion of all four modules, the individual may work as “Commercial refrigeration and air-conditioning technician”

s.no	Module name	Nature Pr. /th.	Time (hrs.) Pr. Th.		Total	Full marks Pr. Th.		Total
A.	Mechanical work	Pr. /th.	57.00	11.66	68.66	100	25	125
b.	Electrical work	Pr/th.	33.67	6.75	40.42	100	25	125
c.	Domestic refrigeration and air-conditioning	Pr. /th.	45.00	8.33	53.33	200	50	250
d.	Commercial refrigeration and air-conditioning	Pr. /th.	37.5	4.83	42.33	200	50	250

Program objectives

Upon completion of this program, the trainee will be able to do the following:

- Given installation manual, the trainee will be able to install split, packaged and commercial air condition and refrigerator system
- Given any faulty refrigerator or air condition, the trainee will be able to diagnose malfunctioning of the same and related equipment and replace/repair appropriate components, or wiring following all safety provisions.
- Given any faulty air conditioner, analyze the problem and adjust control devices to obtain desired results and instruct user in proper setting of the devices.

- Perform preventive and general maintenance service such as cleaning, washing, vacuum equipment, oiling parts and changing filters of the installed refrigeration and air-conditioner.
- Given installing drawing, install auxiliary components to heating-cooling equipment, such as expansion and discharge.
- Valves, air ducts, pipes, blowers, dampers, flues and stokers.
- Given installation manual, adjust system controls to setting recommended by manufacturer to balance system.
- Given any installation of refrigeration or air-conditioning system, test pipe or tubing joints and connections for leaks, using pressure gauge or soap-and-water solution.
- Given installing drawing, cut and drill holes in floors, walls to equipment using hand/power saws and drills.
- Lay-out and connect electrical wiring between controls and equipment according to wiring diagram, using electrical hand

Assessment

Formative and summative evaluations are conducted to assess the performance of trainee.

Certification

For certification of the training, an individual learner must have 95% attendance and a minimum score of 70% in aggregate of theory & practical test, pass percentage for both theory and practical tests are 70% however individual should pass both theory and practical separately.

Module and Tasks

S.N	Skills	Theory credit hours(providing related information)	Practical credit hours (Demonstration and assignment)	Total credit hours	Remarks
A.	Mechanical Work				
1	Cut copper tube using pipe cutter	20'	1 hr 30'	1 hr 50'	
2	Ream copper tube	20'	1 hr 15'	1 hr 35'	
3	Flare copper tube	20'	1 hr	1 hr 20'	
4	Make flare joint using flame tool	30'	2 hr 30'	3.00 hrs	
5	Braze copper	15'	2 hrs	2 hrs 15'	

	tube				
6	Make swage joint	30'	2 hrs15'	2 hrs45'	
7	Bend copper tube	15'	2hrs	2 hrs45'	
8	Set oxy-acetylene flame for gas welding	25'	2hrs	2hrs25'	
9	Gas weld copper tube	30'	3hr 30'	4hrs	
10	Join capillary tube	20'	2hrs	2hrs20'	
11	Solder swage joint	25'	2hrs	2hrs25'	
12	Replace capillary tube	30'	2hrs	2hrs30'	
13	Check temperature of refrigerator	25'	3hrs	3 hrs 25'	
14.	Replace gasket	30'	2hrs 30	3hrs	
15.	Replace line tap excess valve	25'	2hrs 15'	2 hrs 40'	
16.	Perform nitrogen pressure test	40'	3hrs	3hrs 40'	
17.	Check leakage using soap water solution	20'	1 hrs 30	1hrs 50'	
18.	Create vacuum in system	25'	3hrs	3hrs 25'	
19.	Charge refrigerant in system	20'	2hrs	2 hrs 20'	
20.	Check performance of air-conditioner	45'	2hrs 15'	3hrs	
21.	Insulate pipe with foam tube	30'	2hrs	2hrs 30'	
22.	Insulate pipe with thermocoal	30'	2hrs	2hrs 30'	
23.	Align refrigerator door	25'	1hrs 45'	2 hrs 10'	

24.	Replace thermostat	20'	2hrs 30'	2hrs 50'	
25.	Clean evaporator	20'	1hrs 30'	1hr 50'	
26.	Clean drain pipes	20'	1hrs 30'	1hrs 50'	
27.	Lubricate moving part	25'	1hr 15'	1hr 40'	
28.	Clean air cool condenser	20'	2hr	2hr 20'	



Electrical work

1.	Solder electrical wire	25'	1hr 30'	1hr 55'	
2.	Check line voltage using multi-meter	20'	1hr 15'	1 35'	
3.	Check resistance using multi-meter	15'	1hr 10'	1hr 25'	
4.	Check current using ampere meter	15'	1.0hr 05'	1hr 20'	
5.	Install current relay	20'	2hr 30'	2hr 50'	
6.	Install potential relay	20'	3hr 30	2hr 50'	
7.	Install run capacitor	20'	2hr 15'	2hr 35'	
8.	Wire current relay	15'	2hrs	2 hr 15'	
9.	Wire potential relay	15'	2hrs	2hrs 15'	
10.	Test continuity of overload protector	30'	2hrs 15'	2hrs 45'	
11.	Replace damage wire	25'	1hrs 45'	2hrs 10'	
12.	Replace defrost timer	25'	1hr 45'	2hrs 10'	
13.	Replace door switch/cabinet light	25'	2hr 10	2hr 35'	
14.	Replace defrost heater	25'	2hrs 30'	2hrs 55'	
15.	Perform wire crimping	30'	2hrs	2hrs 30'	
16.	Insulate live	20'	1hrs 30'	1hrs 50'	

	wire				
17.	Sketch electrical circuit diagram	1hr	2hrs 30	3hrs30'	

➤ **Domestic refrigeration and air-conditioning**

1.	Estimate required material for installation	30'	2.0hrs	2hrs 30'	
2.	Drill holes in wall/floor	20'	1hrs 30'	1hrs 50'	
3.	Lay out pipe lines	15'	1hr 45'	2hr	
4.	Install outdoor unit	20'	2hrs	2hrs 20'	
5.	Install in door unit	20'	2hrs	2hrs 20'	
6.	Perform nitrogen pressure test	30'	2hrs 30'	3hrs	
7.	Check leakage using lead detector	25'	1hrs 15'	1hr 40'	
8.	Dismantle outdoor unit	15'	2hrs	2hrs 15'	
9.	Dismantle indoor unit	15'	2hrs	2hrs 15'	
10.	Install refrigerator	25'	1hrs 45'	2hrs 10'	
11.	Install gas drier by flaring	30'	2hrs 15'	2hrs 45'	
12.	Install gas filter by flaring	25'	2hrs 10'	2hrs 35'	
13.	Install gas filter by swaging	25'	2hrs 10'	2hrs 35'	
14.	Install gas drier by swaging	25'	2hrs 10'	2hrs 35'	
15.	Test pressure in compressor	30'	2hrs	2hrs 30'	
16.	Charge refrigerant in system	20'	2hrs	2hrs 20'	
17.	Trouble shoot h ermetic compressor	20'	1hr 45'	2hrs 05'	
18.	Replace	15'	2hrs	2hrs 15'	

	refrigerator compressor				
19.	Dismantle semi hermetic compressor	20'	2hrs 15'	2hrs 35'	
20.	Check performance of refrigerator	20'	2hrs 30'	2hrs 50'	
21.	Replace A/C fan	15'	1hr 45'	2hrs	
22.	Clean A/C unit	20'	2hrs	2hrs 20'	
23.	Check spike in printed circuit board (PCB)	20'	1hr 15'	2hrs 35'	

➤ **Commercial refrigeration and air-conditioning**

1.	Plan work schedule	30'	1hr 30'	2hrs	
2.	Test condition of mechanical parts by noise	20'	1hr 45'	2hrs 05'	
3.	Check compressor oil level in commercial refrigerator	15'	1hr 15'	1hr 30'	
4.	Clean oil filter	20'	2hrs	2hrs 20'	
5.	Replace oil filter	15'	2hrs	2hrs 15'	
6.	Check oil pressure	25'	2hrs 15'	2hrs 40'	
7.	Replace oil seal	20'	2hrs	2hrs 20'	
8.	Pump-down refrigerant	15'	2hrs	2hrs 15'	
9.	Seal open end of tube	20'	1hrs	1hrs 20'	
10.	Change compressor oil in commercial refrigeration system	20'	2hrs 15'	2hrs 35'	
11.	Replace solenoid valve	25'	2hrs	2hrs 25'	
12.	Install sight glass	20'	2hrs 30'	2hrs 50'	
13.	Reed valve plate	20'	2hrs	2hrs 20'	
14.	Replace	15'	3hrs	3hrs 15'	

	connection rod				
15.	Replace bush bearing	15'	3hrs	3hrs 15'	
16.	Replace antifriction bearing	15'	2hrs 30'	2hrs 45'	
17.	De-scale water cool condenser	25'	3hrs15'	3hrs 40'	
18.	Clean air duct grill	20'	1hrs 45'	2hrs 05'	