**APPENDIX A**

**WORK PROCESS SCHEDULE**

**HEATING AND AIR CONDITIONING MECHANIC AND INSTALLER**

###### O\*NET-SOC CODE: 49-9021.01 RAPIDS CODE: 0637

 This schedule is attached to and a part of these Standards for the above identified occupation.

 **1.** **TERM OF APPRENTICESHIP**

The term of the occupation shall be four (4) years with an OJL attainment of not less than 8000 OJL hours supplemented by the required hours of related instruction.

 **2.** **RATIO OF APPRENTICES TO JOURNEYWORKERS**

 One (1) apprentice may be employed in each shop department, and/or jobsite employing a qualified journeyworker. This ratio will be defined as no more than one (1) apprentice for every one (1) journeyworker.

 **3. APPRENTICE WAGE SCHEDULE**

 Apprentices shall be paid a progressively increasing schedule of wages and fringe benefits based on a percentage of the current journeyworker wage rate.

**4-Year Term Time-based:**

1st 6 months + OJL hours - 50% 5th 6 months + OJL hours - 70%

2nd 6 months + OJL hours - 55% 6th 6 months + OJL hours - 75%

3rd 6 months + OJL hours - 60% 7th 6 months + OJL hours - 80%

4th 6 months + OJL hours - 65% 8th 6 months + OJL hours - 85%

1. **SCHEDULE OF WORK EXPERIENCE**

 **(See attached Occupation Schedule)**

The Sponsor may modify the work processes to meet local needs prior to submitting these Standards to the appropriate Registration Agency for approval.

1. **SCHEDULE OF RELATED INSTRUCTION**

 **(See attached Course Outline)**

**WORK PROCESS SCHEDULE**

**HEATING AND AIR CONDITIONING MECHANIC AND INSTALLER**

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 **APPROXIMATE HOURS**

1. General trade orientation 350
	1. Use and care of tools
	2. Test and measurement devices
	3. Types and sizes of piping, tubing, and fittings
	4. Introduction to refrigeration system components
	5. Safety procedures and first aid
	6. Equipment records and reports
2. Fabrication of system components 550
	1. Cut, thread, flare, bend, and shape piping and tubing
	2. Install fittings
	3. Solder, braze, and tin fittings and components
	4. Care and use of oxy-acetylene and air-acetylene torches
	5. Silver and soft soldering
3. System installation and connection 1600
	1. Electrical supply lines and cables
	2. Electrical connections
	3. Water service lines
	4. Air supply lines
	5. Steam lines
	6. Steam return lines
	7. Steam traps and strainers
	8. Pressure reduction, expansion, evaporator, stop valves
	9. Suction and discharge lines
	10. Gauges
	11. Dehydrators
	12. Filters and strainers
	13. Controls
4. Equipment installation 950
	1. Install condensers
	2. Prepare compressor and motor bases
	3. Install and align compressors and motors
	4. Install evaporators and other cooling coils
	5. Install and align centrifugal pumps and bases
	6. Safe equipment moving - slings, lines, blocks and falls, chain hoists, rollers, dollies, and skids
5. System maintenance 1050
	1. Troubleshoot field systems
	2. Test pressure, flow, etc.
	3. Check liquid levels
	4. Check repair leaks (refrigerants, liquids)
	5. Purge, dehydrate, and charge systems
	6. Repair, align, and adjust fans and blower sections
	7. Align pulleys, bearing blocks, belt tension
6. Equipment repair 2900
	1. Disassemble and clean, repair, perform shop tests and run-in compressors
	2. Repair, pressure test, dehydrate evaporators
	3. Repair, acidize condensers, and roll condenser tubes
	4. Remove, replace, disassemble, test, clean, calibrate, and renew defective parts on controls of all types including: pneumatic, electrical, electro-pneumatic, thermostatic, humidity, pressure, vacuum
7. Machine shop practice 300
	1. Use of grinders, drill presses, lathes
	2. Tool and drill sharpening
8. Miscellaneous 300
	1. Orientation
	2. Housekeeping
	3. Safety
	4. Activities not otherwise listed

TOTAL HOURS 8,000

**ADVANCED TRAINING PROGRAM – OPTIONAL**

1. Installation and maintenance of steam and hydronic heating systems 1,000
2. Power and industrial process piping 200
3. High and low pressure boilers 250
4. Estimating 150
5. Supervisory training 100
6. Business administration 200
7. Solar 100

**TOTAL HOURS 2,000**

**RELATED INSTRUCTION OUTLINE**

**HEATING AND AIR CONDITIONING MECHANIC AND INSTALLER**

###### O\*NET-SOC CODE: 49-9021.01 RAPIDS CODE: 0637

**1st Year**

SUBJECT SUGGESTED TIME

## Introduction to the Trade, Tools and Safety 40 Hours

Systems and Components 16 Hours

## Basic Electricity 24 Hours

Mathematics 16 Hours

Basic Thermodynamics 12 Hours

Refrigeration Cycle 20 Hours

Maintenance and Inspection 10 Hours

Systematic Problem Solving 10 Hours

Energy Efficiency 8 Hours

**TOTAL HOURS 156**

**RELATED INSTRUCTION OUTLINE**

**HEATING AND AIR CONDITIONING MECHANIC AND INSTALLER**

###### O\*NET-SOC CODE: 49-9021.01 RAPIDS CODE: 0637

**2nd Year**

**SUBJECT SUGGESTED TIME**

Refrigeration Cycle 8 Hours

Compressors, Condensers, Metering Devices and Accessories 32 Hours

Evacuation, Charging and Refrigerant Handling 26 Hours

Heating and Cooling Equipment 12 Hours

Electricity and Electrical Troubleshooting 20 Hours

Motors 16 Hours

Control Systems 14 Hours

Psychrometrics 16 Hours

Basic Sizing 12 Hours

**TOTAL HOURS 156**

**RELATED INSTRUCTION OUTLINE**

**HEATING AND AIR CONDITIONING MECHANIC AND INSTALLER**

###### O\*NET-SOC CODE: 49-9021.01 RAPIDS CODE: 0637

**3rd Year**

**SUBJECT SUGGESTED TIME**

Servicing and Troubleshooting Systems 20 Hours

Testing and Balancing Systems 14 Hours

Energy Efficient Mechanical Systems 10 Hours

Fluid Handling Systems 8 Hours

Electrical Problem Solving 20 Hours

Refrigeration System Problem Solving 16 Hours

Troubleshooting with the Psychrometric Chart 10 Hours

Cooling Towers and Evaporative Condensers 10 Hours

Commercial Air Conditioning and Refrigeration Systems 12 Hours

Water Treatment 10 Hours

Indoor Air Quality 16 Hours

Blueprint Reading 10 Hours

**TOTAL HOURS 156**

**RELATED INSTRUCTION OUTLINE**

**HEATING AND AIR CONDITIONING MECHANIC AND INSTALLER**

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**4th Year**

**SUBJECT SUGGESTED TIME**

Refrigeration Cycle and Heat Pumps 16 Hours

Heat Pump Components, Motors, Compressors and Specific Defrost 32 Hours

Electrical Schematics and Blueprint Reading 16 Hours

Installation, Maintenance and Service 24 Hours

System Sizing and Design 12 Hours

Air Source Heat Pumps 10 Hours

Geothermal Heat Pumps 36 Hours

Energy and Efficiency Calculations 10 Hours

**TOTAL HOURS 156**