HEATING, VENTILATION & AIR CONDITIONING MECHANIC

APPENDIX A

O*NET CODE 49-9021.01

This training outline is a minimum standard for Work Processes and Related Instruction. Changes in technology and regulations may result in the need for additional on-the-job or classroom training.

WORK PROCESSES

Approximate Hours

A. Safety Devices and Practices **600**

1. Staging; ladders: rigging; ventilation
2. Handling, storage and disposal of chemicals and of refrigerant drums.
3. Familiarization with electrical equipment and circuits; proper groundings; short circuit protection fusing; starter and contactor overloads motor.
4. Relief valves; high pressure temperature switches; fusible plugs; low pressure temperature switches.
5. Recovery of chlorofluorcarbon refrigerant gases.
6. Identification of potential in-place asbestos materials and procedures for avoidance and notification of certified Asbestos Handler.

B. Installation **800**

1. Setting and mounting equipment; hanging methods.
2. Fittings; tubing; pipe
3. Vibration elimination; evacuation; venting.
4. Insulation.
5. Welding; soldering; brazing.
6. Tanks and piping
7. Heat recovery systems
8. Air and water filters

C. Controls **700**

1. Themostatic switches: low and high-pressure switches; low-oil cutoffs

2. Humidistats
3. Analog controls: direct digital controls (DDC); microprocessor controls; solid-state controls.
4. Starters; contactors; relays; safeties
5. Pneumatic systems-damper
6. Oil burner controls (thermostats, aquastats, limit controls, primary controls) as used in steam, hot water, warm air and vaporizing burners.
7. Calibrate controls: balance air distribution systems and maintain proper air temperature.
8. Electronic and pressure controls; transducers.
9. Operation of central and auxiliary computers which monitor, test, control and operate boilers, auxiliary systems and energy management systems (optional)

D. Valves **500**

1. Expansion valves-capillary tubes
2. Solenoid valves
3. Evaporator-liquid compressor regulating valve
4. Service valves

E. Evaporators **600**

1. Gravity-forced air; low side float; high side float, flooded/dry
2. Low temperature; high temperature; fin-type; plates; water cooling
3. Double refrigerant types; flash; air-conditioning
4. Chilled water-coolers and coils

F. Compressor **750**

1. Characteristics of various types refrigerants
2. Rotary; reciprocating; semi-sealed belt drive
3. Electric motors-familiarization with characteristics
4. Lubrication; valve adjustment
5. Shop repair and overhaul

G. Condensers **700**

1. Condenser-Received: installation and service
2. Air-cooled; water-cooled; water towers

3. Evaporator condenser
4. Remote type: controls, pumps; fans

H. Air Conditioning **800**

1. Aerodynamics; distribution; air flow; sizing
2. Cleaning; dehydrating; cooling; heating
3. Insulating valves
4. Heat recovery
5. Motors: fans, pumps, compressors
6. Air purification
7. Humidifiers

I. Testing, Charging, Starting and Adjusting Systems **700**

1. Testing for leaks: pressure test; vacuum test; indicator test; color; odor; fumes
2. Cleaning and drying: pumping dry air or dry nitrogen through systems.
3. Charging with refrigerants: making charging connections; charging gas; charging liquid; preparing and charging secondary refrigerants.
4. Starting and adjusting systems: installing necessary gauges and instruments; adjusting refrigerant metering controls; adjusting pressure, temperature and electric controls; adjusting condensing medium controls.
5. Maintaining proper environmental conditions indoors; speed of arm duct, maintaining proper humidity in home and/or office.

J. Installation & Servicing of Oil and Gas Burners **600**

1. High-pressure gun burners
2. Low-pressure atomizers
3. Rotary burners
4. Vaporizing burners
5. Gas burners: pulse flame, regular gas burner grate
6. Pilotless ignitions
7. Combustion testing
8. Steam and hot water boilers; firing, cleaning, shut down of system

K. Servicing-Testing and Adjusting **600**

1. Nozzles
2. Ignition
3. Pumps; regulating valves
4. Smoke and soot
5. Noise
6. Excessive fuel consumption

L. Service Methods and Shop Work **650**

1. Familiarization with machine shop tools and methods.
2. Familiarization with characteristics of general circuits.
3. General troubleshooting.

Approximate Total Hours **8,000**

Apprenticeship work processes are applicable only to training curricula for apprentices in approved programs. Apprenticeship work processes have no impact on classification determinations under Article 8 or 9 of the Labor Law. For guidance regarding classification for purposes of Article 8 or 9 of the Labor Law, please refer to https://dol.ny.gov/public-work-and-prevailing-wage

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APPENDIX B

RELATED INSTRUCTION

Safety

1. Fundamentals (4 hours, 1st year)
2. Trade Safety (12 hours, 1st year – including identification, handling and disposal of hazardous chemicals, CFC and identification and non-disturbance of asbestos)
3. DEC Certified Pesticide License (Optional)
4. Confined Space Certification
5. Asbestos Awareness – minimum 4 hours (see attachment)
6. First Aid (6.5 hours every 3 years)
7. Sexual Harassment Prevention Training – must comply with section 201-g of the Labor Law

Industrial History and Labor Relations (20 hours)

1. History and Background (6 hours)
2. Current Laws and Practices (14 hours)

Blueprint Reading, Drawing and Sketching

1. Elementary Blueprint Reading and Sketching
2. Blueprint Reading for Electrical Trades
3. Electrical Circuit Diagrams
4. Schematic Diagrams

Mathematics

1. Fundamentals
2. Mathematics for Electricians
3. Mathematics for Refrigeration

Trade Theory

1. Fundamentals of Building Construction
2. Fundamentals of DC
3. Fundamentals of AC
4. Fundamentals of Motors
5. Fundamentals of Refrigeration

6. Refrigeration Cycle
7. Physical Properties of Refrigerants
8. Basic Physics as Applied to Compressibles and Non-Compressibles
9. Heat Loss/Heat Gain
10. Energy Conversation Methods

Trade Science

1. Tools and Equipment
2. Terminology
3. Building Code and Underwriters Standards
4. Bulbs, Switches, etc.
5. Controls
6. Thermo couples
7. Solenoids
8. Circuit Breakers
9. Characteristics of Pulley and Belt Ratios
10. Basic Soldering
11. Testing
12. Trouble Shooting
13. Welding
14. Brazing
15. Pneumatic Controls

Organizational Skills and Recordkeeping

Other Related Courses as Necessary

A Minimum of 144 Hours of Related Instruction is Required for Each Apprentice for Each Year.

Appendix B topics are approved by New York State Education Department.

ATTACHMENT TO APPENDIX B

Asbestos Awareness

This course must be delivered by one of the following:

1. A provider currently approved by the New York State Department of Health to deliver asbestos safety training.
2. A person holding a current Asbestos Handler certificate from the New York State Department of Labor in the title of: Inspector, Supervisor, Project Monitor, Management Planner, or Project Designer.
3. Anyone otherwise approved by the New York State Education Department.

Minimum course contents must include the following:

1. Definition of asbestos
2. Types and physical characteristics
3. Uses and applications
4. Health effects:
    a. Asbestos-related diseases
    b. Risks to families
    c. Cigarette smoking
    d. Lack of safe exposure level
5. Employer-specific procedures to follow in case of potential exposure, including making a supervisor or building owner immediately aware of any suspected incidental asbestos disturbance so that proper containment and abatement procedures can be initiated promptly.

Notwithstanding the above course requirement, employers are advised that they must also be in compliance with New York State Department of Labor Industrial Code Rule 56 at all times.

Employers are further advised, and must advise all apprentices, that completion of the above course requirement does not authorize any person to remove, encapsulate, enclose, repair, disturb, or abate in any manner, any friable or non-friable asbestos, asbestos containing material, presumed asbestos containing material, or suspect miscellaneous asbestos containing material.