113-07 Refrigerating System Operating Engineer Training Courses

(a) Scope. This section sets forth the minimum hours of classroom instruction and topics required for *Department* accreditation of training courses for *certificate of qualification* for refrigerating system operating engineer.

(b) General Provisions

(1) General accreditation requirements. Refrigerating system operating engineer training courses shall comply with the general training school accreditation procedures, standards and requirements set forth in R113-04.

(c) Required Hours and Topics of Instruction

(1) Training courses shall, at a minimum, provide not less than 200 hours of instructional training, of which not less than 25 hours shall consist of practical skill exercise/hands-on demonstration in which each student must personally perform the functions set forth in R113-07(c)(2)(U).

(2) Training courses shall provide instruction in the following topics:

(A) Definitions and terminology

(*1*) British thermal unit

(*2*) Specific heat

(*3*) Latent heat

(*4*) Sensible heat

(*5*) Refrigeration effect

(*6*) Humidity

(*7*) Absolute zero

(B) Calculations with refrigeration formulas

(*1*) Refrigeration effect

(*2*) Compressor displacement/capacity

(*3*) Compression ratio

(*4*) Horsepower requirements

(*5*) Refrigerant circulation requirements

(C) Thermodynamics principles of refrigeration

(*1*) Temperature scales

(*2*) Nature of heat and heat flow

(*a*) Conductors and insulators

(*3*) Effects of heat energy

(*4*) Molecular theory of heat

(*5*) Temperature and heat

(*6*) Pressure-temperature relationships

(*7*) Physical changes of state

(*8*) Calculations for heat conduction

(D) Basic refrigeration cycles

(E) Absorption systems

(*1*) Ammonia systems

(*2*) Lithium bromide systems

(*3*) Purgers

(*4*) Two stage steam absorption

(F) Steam jet and thermocouple systems

(G) Compression systems

(H) Multiple systems

(*1*) Cascade

(*2*) Multi-temperature

(I) Refrigerants

(*1*) Primary and secondary

(*2*) Qualities and properties

(*3*) Tables and data

(*4*) CFC and environmental issues

(J) Evaporators

(K) Metering devices and automatic controls

(*1*) High and low-side floats

(*2*) Automatic expansion valves

(*3*) Thermostatic expansion valves

(*4*) Manual expansion valves

(L) Condensers

(*1*) Construction and operation of air-cooled condensers

(*2*) Theory, operation and maintenance of water-cooled condensers

(M) Receivers and accessories

(*1*) Filters and driers

(*2*) Vibration isolators

(*3*) Distribution headers

(N) Cooling towers, and spray ponds

(O) Compressors

(*1*) Reciprocating

(*a*) Open type

(*b*) Serviceable and non-serviceable hermetic units

(*c*) Vertical and horizontal ammonia compressors

(*d*) High Speed freon compressors

(2) Rotary

(*3*) Centrifugal

(*a*) Hermetic and non-hermetic types

(*b*) Capacity control

(P) Prime movers

(*1*) Steam turbines

(*2*) Electric motors

(*3*) Absorber generators

(*a*) Steam powered

(*b*) Direct fired—combustion principles

(Q) Operation of valves and gauges

(R) Refrigerating systems oils and lubrication

(*1*) Qualities and characteristics

(*2*) Methods of compressor lubrication

(*3*) Lubricating system components

(*a*) Filters

(b) Pumps

(S) Secondary refrigerating systems

(*1*) Holdover tanks

(*2*) Congealing tanks

(*3*) Circulating pumps

(*4*) Operation and maintenance of brine system

(*5*) Significance of pH

(T) Regulatory and safety requirements

(*1*) *Department permit* and operator requirements, including FC606

(*2*) *Building Code* and *Mechanical Code* requirements, including ASHRAE Standard 15

(*3*) Clean Air Act Amendments and United States Environmental Protection Agency regulations

(*4*) *OSHA* regulations

(*5*) Impact of Local Law Nos. 5 of 1973, 16 of 1984, 41 of 1978, 58 of 1987, 26 of 2004 and 26 of 2008 on the operation of refrigerating systems

(*6*) Amendments to any of the foregoing

(U) Refrigerating system servicing (practical skills exercise/hands-on demonstrations)

(*1*) Selection and use of tools for diagnosis and servicing

(*a*) Gauges

(*b*) Thermometers

(*c*) Charging containers

(*d*) Vacuum pumps—system evacuation

(*2*) Charging and testing

(*a*) Critical charges

(*b*) Correct low and high-side operating pressure

(*c*) Use of gauge manifolds

(*3*) Moisture

(*a*) Its effects

(*b*) Removal of blotting and/or evacuation

(*c*) Use of desiccants and driers

(*4*) System troubleshooting and diagnosis procedures

(*5*) Leak repair and component replacement

(*a*) Copper tubing—cut, bend, sweat and flare

(*b*) Copper tubing and pipe, solder and braze

(*6*) Open type compressors

(*a*) Replace compressor valves and gaskets

(*7*) Hermetic compressor-motor units

(*a*) Testing hermetic-motor units for grounds, shorts, open windings

(*b*) Testing power pack components—overload protectors, relays

(*c*) Testing wiring harnesses

(V) Building operation, maintenance and recordkeeping. *Building Code*, Fire Code and *rule* requirements for building operation, maintenance and recordkeeping, as set forth in R113-12(c)(2).

(d) Course Administration and Completion

(1) The ratio of students to instructors in the practical skills exercise/hand-on demonstrations shall not exceed 8-to-1.

(2) Students must attend at least 25 hours of practical skills exercise/hands-on demonstrations, and not less than 95% of other required instructional training, to be eligible to take the training course final written examination.