

Fire Code Section 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

(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.