

# Ice Facility Operator Certificate of Competency examination syllabus

Effective: June 2000

## Application to undertake examination

A candidate must submit an application and the prescribed fee at least 30 days before the date of the examination. The examination consists of one paper, 3 ½ hour duration and 150 multiple-choice questions. Currently, the candidate is provided with the following items in the Examination room, but in the near future the candidate may be required to obtain their own items in the list:

- Safety Standards Act and Power Engineers, Boiler, Pressure Vessel and Refrigeration Safety Regulation.
- C.S.A. B-52.
- A non-programmable calculator.

**Note:** *If the items referenced above become the responsibility of the candidate, the candidate must show the items to the Examiner for approval. Mathematical Tables will be provided. No other reference material will be allowed. The candidate must show picture I.D. at the examination.*

## Pass mark

Ice Facility Operator Candidates are required to obtain 65% minimum grade in order to receive a passing mark.

### **1. B.C. Refrigeration Safety Legislation and Code Knowledge: (10% -15 questions)**

- Safety Standards Act and applicable regulations;
- Responsibilities of an ice facility operator's certified person;
- Responsibility of a plant safety committee;
- General Plant Safety; types of accidents and accident prevention, safety measures, WorkSafeBC guidelines;
- Reporting of accidents and incidents;
- CSA 852 general code knowledge; and
- Log books and records, why signed and dated, and their use.

### **2. Basic Arithmetic and Applied Mathematics: (5% ~ 8 questions)**

- Basic introduction to arithmetic, addition, subtraction, multiplication, division, percentages, averages, simple equations;

- Basic refrigeration and plant operation calculations needed to solve volume, horsepower ratings, kW hours, joules, system tonnage, BTU's capacity; and
- Types of calculations required to complete the day to day operations in an artificial ice-making plant. (SI or Imperial units acceptable)

**3. Basic Principles of Refrigeration, (Identify and explain basic refrigeration terms and fundamentals) (15% - 23 questions)**

- Temperatures; ambient temperature, dew point, flash point, temperature measurement tools and tables;
- Pressure, absolute, gauge, pressure measurement tools and tables;
- Energy, BTU's, calories;
- Heat transfers; latent heat, enthalpy;
- Composition of the primary refrigerants common in artificial ice operations, refrigerant tables;
- Composition of the secondary refrigerant, how the freezing point is controlled and why the pH must be controlled; and
- How does the system work and adjustments that may be made on the pressure and temperature of the components.

**4. Refrigeration System Components: (50% - 75 questions)**

- Types of refrigeration systems; indirect, double indirect, direct expansion, (compression, positive displacement and centrifugal systems);
- Refrigeration Components: identify all components and describe their purpose including the location of valves and floats;
- Compressor; basic types and basic operational properties, functions of compressors, reciprocating and screw compressor components and standard operating parameters, preventative maintenance of compressors and troubleshooting common problems of compressors;
- Evaporator: basic types, functions of evaporator, direct expansion and flooded evaporator components and standard operation parameters, preventative maintenance for evaporators/chillers, and troubleshooting common problems of evaporators;
- Condenser: functions of the condenser, surface type and evaporative condensers, water-cooled, glycol loop and air-cooled condensers components and operating parameters, preventative maintenance for condensers, and troubleshooting common problems of condensers;
- Expansion valve (EV) metering device: functions of expansion valves, automatic EV, thermostatic EV, and hand operated EV components and operation parameters, preventative maintenance for EV, and troubleshooting common problems of expansion valves;
- Pumps and motors: functions of pumps and motors used in refrigeration systems, (brine, water, oil pumps and motors that drive the pumps), types of pumps, (components and operation parameters), types of motors, (components and

- operating parameters), preventative maintenance for pumps, and troubleshooting common problems with pumps;
- Operating controls and safety devices: (functions and components of operating controls and safety devices commonly found in a refrigeration plant), high side float, low side float, oil pressure failure switches, relief valves, shut off valves, thermostats, safety controls and resets, cooling water valves, solenoid valves, temperature controls, preventative maintenance for floats and valves, and troubleshooting common problems with high and low side floats, valves and safety devices.
  - Refrigeration Accessories and Controls: (functions and components of the following accessories commonly found in a refrigeration plant), filtration systems, humidity systems, king valve, emergency discharge and procedures, purging and charging valves, oil separators, pressure gauges, strainers, sight glasses, heat exchangers, crankcase heaters and oil coolers;
  - Piping; Identify the standards of piping required in a refrigeration plant.
  - Refrigeration Oil and the system; lubricants used in the system, and oil management within the primary refrigerant loop.
  - Direct Digital Control (DOC) Systems; computer control systems and management of plants, remote access; limitations of DOC systems, benefits of DOC systems, and review of common programs used.

#### **5. Floor Systems: (5% - 7 questions)**

- Design and construction of floor cooling systems; sand-based, concrete, no sub heating, and sub heating.
- Subflooring heating systems, standard operating parameters.
- Troubleshooting common problems with arena slab floors.

#### **6. Electrical: (5% - 7 questions)**

- Identify the use and function of the following; circuit breakers, fuses, electrical switches, cut-outs;
- Identify the dangers inherent with working with electrical equipment and motors.
- Identify the care and safety procedures required when working with electrical equipment and motors.

#### **7. Safety; Equipment, Procedures and Precautions in a refrigeration plant: (10% -15 questions)**

- Eye, ear, head, respiratory devices, drench showers, eyewash stations, steel-toed boots, hazards of wearing jewelry,
- Classes of fires and fire protection equipment;
- Emergency breathing apparatus,
- Safety Procedures and safe work practices associated with working around refrigeration equipment including; compressors, condensers, evaporators, receivers, primary and secondary refrigerants and electrical equipment;

- Identify precautions to be taken to minimize or prevent dangers associated with operating a refrigeration plant;
- Identify precautions to be taken when working with primary and secondary refrigerants, review WHMIS and relevant first aid;
- Emergency shut down procedures, emergency shut down devices and safety alarms;
- Safety controls, purpose and location; and
- Evacuation procedures.