

Refrigeration Operator Class “A” Certification and Examination Guide



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General

In addition to the Syllabus that follows, the examination knowledge for Refrigeration Operator Class “A” is also a continuation of the knowledge required of the “B” level. The candidate is advised to review the “B” examination material especially the topics relating to Psychrometrics, Air Conditioning Principles and Systems, Centrifugal Chiller Systems, Environmental Issues, Heat Pumps and Screw Compressors & all Refrigeration system types along with their associated technologies and accessories.

Syllabus

The topics that follow are intended to be a study guide, and in no way imply that additional knowledge is not needed to successfully challenge the Refrigeration Operator “A” Examination.

1. ACT, REGULATIONS AND CODES:

The candidate is expected to be able to locate information relating to the staffing, operation, maintenance, inspection, and testing of the compressor plant and its equipment resourcing the:

- a. *Technical Standards & Safety Act, 2000*
- b. *Operating Engineers Regulation and Directors Orders*
- c. *Boilers and Pressure Vessels Regulation*
- d. *CSA B52: Mechanical Refrigeration Code*
- e. *CSA B51: Boilers & Pressure Vessels Code*
- f. *SA Z94.4 Selection, Care and Use of Respirators*
- g. *CEPA E2 Environmental Emergency Regulations*

2. SAFETY:

The candidate is expected to be able to fully explain the dangers associated with the operation of a refrigeration plant and state the precautions to be taken to minimize or prevent such dangers.

3. OPERATION:

The candidate is expected to be able to answer examination questions as they relate to the operation, maintenance and the management of the refrigeration system. Including auxiliaries, pumps and compressors. Basic electricity and calculations. Lubricating principles.

4. REFRIGERANTS, PROCESSES AND SYSTEMS:

The candidate is expected to be able to state the application, list, explain, describe, and/or sketch the following:

- a. The Halocarbons, Organic/Inorganic Compounds and Azeotropes classes of refrigerants, types and applications.
- b. Refrigeration processes: dry ice, freezing mixtures, volatile mixtures.
- c. Refrigeration systems: steam-jet, air-cycle, absorption, hermetic design of centrifugal machine.

5. INDUSTRIAL SYSTEMS AND SYSTEMS OPERATION:

The candidate is expected to be able to state the application, list, explain, describe, and/or sketch the



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following:

- a. Multi-stage and cascade refrigeration systems.
- b. Purge systems, oil stills.
- c. Liquid receivers, coolers.
- d. Operating troubles encountered by the following:
 - I. oil, moisture or water in the system.
 - II. condensers, evaporators and regulators.
 - III. refrigerant content (high or low).
 - IV. by high/low compressor discharge temperatures.
- e. The lubrication requirements and problems (that may be encountered) for plants using anhydrous ammonia, carbon dioxide and freon.

6. THERMODYNAMICS OF REFRIGERATION AND CALCULATIONS:

The candidate is expected to be able to:

- a. Explain the thermodynamics of vapour compression, the reversed Carnot Cycle, the Pressure-Enthalpy Chart.
- b. Perform calculations to solve for:
 - I. Coefficient of performance (COP) for heat engines, refrigerating machines and heat pumps.
 - II. Refrigerating effect, mass of refrigerant circulated (flow rate).
 - III. Piston displacement, theoretical power.
 - IV. Heat removed and/or ice made in a given time period.
 - V. Compressor capacity expressed as tonnes of refrigeration.

Note: Since recommended text material is in SI units, the examination will be in SI. Candidate is allowed to convert from SI to Imperial units.

Certification Information

Eligibility to Write

Be in possession of either a Refrigeration Operator “B” or a 3rd Class Operating Engineer Certificate.

Practical Time Requirements: *(effective June 27, 2001, as per new OE Regulations)*

- You will be eligible to obtain the “A” certification after successfully completing the required examination and obtaining a **minimum of 12 months** operating experience as an Refrigeration Operator Class ‘B’ or as a 3rd Class Operating Engineer in a Refrigeration “A” Plant. *Refer to Table 6 of the Operating Engineers Regulation for plant rating/capacity, and also Table 6 in the Director’s Order.*
- ‘or’
- You will be eligible to obtain the “A” certification after successfully completing the required examination and obtaining a **minimum of 11 months** operating experience as an Refrigeration Operator Class ‘B’ or a 3rd Class Operating Engineer in an attended plant Coded as a Refrigeration “A” Plant and having successfully completed a Refrigeration Operator Class ‘A’ course of study at a training facility that has been TSSA ‘approved-for-time-reduction’.



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Examination Information

There is one examination that must be written that is 3 ½ hours in duration.

- The examination will consist of essay response type questions.

Minimum passing mark for each examination is 65%, rewrites are allowed after 60 days.

Examinations may be written at either MTCU Exam Centres **or** at TSSA in Toronto. To locate nearest centre, refer to “Examination Centres” listing on our web page, www.tssa.org. To write at TSSA or the MTCU Centres please call (416) 734-3300.

A SOPEEC binder, non-programmable scientific calculator and pencils are provided by the examination centre, examination candidates are not permitted to bring their own materials.

Important: Candidates for any class of certification as an Operating Engineer or Operator who have passed the required examinations, or any parts thereof, MUST obtain their certificate of qualification within five (5) years of such passing or re-writing of the examination will be required.

Recommended Study Materials

The text materials required for Refrigeration Operator ‘B’ should be reviewed.

- **Refrigeration Operator “A”** text materials: available from PanGlobal Publishing at **Toll Free** 1 866-256-8193
- **CSA B52: ‘Mechanical Refrigeration Code’**: available from CSA (416) 747-4000
- **CSA B51: ‘Boilers and Pressure Vessels Code’** available from CSA (416) 747-4000
- **CSA B51 & B52 Extracts** available from PanGlobal Publishing at **Toll Free** 1 866-256-8193
- The **Technical Standards and Safety Act** and the **Operating Engineers Regulation and Directors Orders** are posted on the TSSA Website (www.tssa.org) and can be printed (at no cost) for your studies.

Additional engineering text and reference materials are available from a broad range of authors and publishers and no specific text or reference material beyond the Act, Regulations and Codes should be considered as official.

Obtaining Certificate

Upon successful completion of the examination and the completion of the required practical operating training period, the candidate may apply to TSSA for their “**Certificate of Qualification**” by forwarding the following information to TSSA:

- A completed ‘*Application for an Ontario Certificate of Qualification as an Operating Engineer or Operator*’
- Completed Form 1 entitled ‘**Testimonial of Qualifying Experience**’
- Application fee: please view the **OE Fee schedule** from the Operating Engineers web page