

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

Qualifying Experience Time:

Qualifying experience time served shall be in a plant that is attended by an Operating Engineer. Please refer to Table 8 of the Operating Engineers Regulation for plant rating/capacity, Table 8 in the Director's Order, or the Alternate Table 8 in the Minister's Order.

- The practical operating training requirement for refrigeration operator A certification is **1,920 hours** for a Class A refrigeration A plant or Class B refrigeration plant.
- The practical operating time requirement for certification is **1,760 hours** for candidates who have successfully completed a full-time TSSA “approved-for-time-reduction” refrigeration A training program.

Qualifying Experience attained in a Canadian Jurisdiction outside Ontario

Qualifying experience time toward Operating attained in a Canadian jurisdiction outside Ontario must be attained in the operation and management of refrigeration compressors at least of the type and capacities indicated in Table 6 of the Operating Engineers Regulation, Ontario Regulation 219/01 and the Directors Order. The following information must be demonstrated to TSSA in a request for certification:

- A letter addressed to the candidate, on company letterhead and signed by the Chief Operating/Power Engineer, indicating the number of refrigeration compressors trained on, the refrigeration compressor types, refrigeration compressor manufacturer, refrigeration compressor pressure, capacities in Kilowatts and when the experience was gained (dates). The Chief Operating/Power Engineer must indicate their certificate number and classification, as well as their formal position and contact information (i.e. telephone number, email address, etc.).



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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.

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

Note: effective June 14, 2021, Operating Engineers/Operators will have the option to pursue exams and meet the experience requirements concurrently or at their own pace.

When answering examination questions, the candidate is expected to give sufficient information to warrant the marks assigned. For questions involving calculations, the candidate is expected to state the formula, insert given data, work through the steps and state their answer with the correct units in an appropriate closing statement.

The examination candidate is expected to write legible, neat, and in pen. Sketches or drawings are to be in pencil and properly labeled. Rulers and (drawing) templates are to be used as neatness is considered in the marking scheme.

Examinations may be written at either a Ministry of Labour, Training and Skills Development exam centre or at a TSSA approved examination centre. To locate nearest centre, refer to “Register for an Exam” listing at www.tssa.org.

Examination security will be strictly enforced. The examination administrator or invigilator reserves the right to revoke an examination at any time if the examination candidate is found to be in violation of the TSSA examination or Ministry of Training, Colleges and Universities procedures. The examination candidate will be subject to further investigation, which may result in the revocation of an authorization or restrictions may be applied to all future examinations.

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



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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