

Refrigeration Operator Class “A” Certification and Examination Guide



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Refrigeration Operator A Certification and Examination Guide

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.

- Paper **RA** is essay style and will reflect on the candidate's practical operating experience, refrigeration systems familiarity, and the management of a refrigeration compressor plant.

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.

Examination Centres provide all the necessary formulae booklets, Acts, Regulations, Codes, refrigeration tables, etc., candidate is to bring writing / drawings items and a calculator; no other materials are allowed to be brought in.

Examination candidates are eligible to submit a formal request for a review of their essay examination result within 60 days from the issuance of the formal correspondence issued by TSSA. Candidates who wish to obtain a review of their essay examination, must submit a written request to TSSA, via certandexams@tssa.org, with the administrative fee of \$50.00 + HST (\$56.50). Note the following:

- The purpose of the review is to assist the candidate when preparing to rewrite the examination.
- As a result of the review, the Operating Engineers Examiner will contact the candidate via telephone to discuss the strengths and weaknesses of the examination. Be advised that specific examination questions will not be discussed with the candidate.
- If the Operating Engineers Examiner finds justification to re-score the examination, a revised result will be issued to the candidate.

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



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period, the candidate may apply to TSSA for their “**Certificate of Qualification**” by forwarding:

- a completed ‘*Application for an Ontario Certificate of Qualification as an Operating Engineer or Operator*’
- completed Form 1 entitled ‘**Testimonial of Qualifying Experience**’
- **Cheque** (please view the **OE Fee schedule** from the Operating Engineers web page, under Forms & Fees, for initial certificate payment amount) made payable to “Technical Standards and Safety Authority” or to “TSSA” *and forward to:*

Technical Standards and Safety Authority – Operating Engineers Program
345 Carlingview Drive
Toronto, ON M9W 6N9

NOTE: The above-required forms are available from the Operating Engineers web page (under Forms).