

Compressor Operator Certification and Examination Guide



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Syllabus

The topics that follow are intended to be a study guide, and in no way implies that additional knowledge obtained from experience is not needed to successfully challenge the Compressor Operator Examination.

1. FUNDAMENTALS:

- a. Fully explain the theory of air/gas compression.
- b. Describe how altitude and moisture affects the compression of air.
- c. Describe the principles of operation of positive displacement and dynamic compressors.
- d. Define air compression terminology such as absolute and gauge pressures, compressor
- e. Displacement and compressor capacity, free air, volumetric efficiency, single and double acting, single and multi-stage.
- f. Given relative data, perform basic calculations to solve for compressor displacement and compressor volumetric efficiency.

2. RECIPROCATING COMPRESSORS:

- a. State and describe the different types of single and multi-stage reciprocating compressors, state the function of the various compressor parts, including valves.
- b. Describe the methods employed to cool air or gas during compression.
- c. List and describe the different types of prime movers used for compressors.

3. ROTARY COMPRESSORS:

Fully describe the principles of operation, their application, volume and pressure capabilities, methods of regulation, advantages and disadvantages of the following types of (positive displacement) rotary compressors:

- a. sliding vane
- b. the lobe type
- c. roots type
- d. screw
- e. liquid-sealed

4. CENTRIFUGAL AND AXIAL COMPRESSORS:

- a. Describe the design and operation of the volute and diffuser type centrifugal compressors.
- b. Describe the design and operation of the single-stage double-flow and the four-stage centrifugal compressors.
- c. Fully describe the design and operation of an axial flow compressor.
- d. State the causes and remedies of compressor surging.

5. COMPRESSOR SYSTEM AUXILIARIES:

- a. Describe the design and operation of intercoolers and aftercoolers; state their location within the system, describe the maintenance requirements of these components.
- b. State the need for air receivers, their preferred location, and the inspection and maintenance requirements as per Code.
- c. Describe the use of air filters, list and provide a description of the different types commonly used.



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6. OPERATION, CONTROL AND MAINTENANCE:

- a. Explain the following methods employed to control compressor output:
 - I. Start/stop, dual control
 - II. Variable-speed
 - III. Suction line valve
 - IV. Suction or discharge valve
 - V. Adjustable stroke
 - VI. Variable clearance volume
- b. List and describe the operation of the various types of controllers and safety devices used in a compressed air system. Describe how these devices can be tested while system is in operation.
- c. Describe the internal and external methods of compressor lubrication.
- d. State the various operational checks done by an operator on both the compressor(s) and the compressed air/gas system to ensure safe and efficient operation.
- e. State the preventive maintenance requirements of compressors, auxiliaries, piping and receivers.
- f. State the probable causes of compressed air/gas compressor, receiver or pipeline explosions.

7. 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 B51: Boiler, Pressure Vessels and Piping Code

8. SAFETY:

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

9. OPERATION:

The candidate is expected to be able to answer examination questions as they relate to the operation, maintenance and the management of the compressor system.

Certification Information

Eligibility to Write

There are no pre-requisites, however it is expected that the candidate has started their training, either in a plant and/or in a course of study, before attempting to write the examination.

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

Practical operating time served shall be in a plant that is required to be attended by an Operator or Operating Engineer. Please refer to Table 5 of the Operating Engineers Regulation for plant rating/capacity.

- practical operating training requirement is **9 months** if you have not attended full-time schooling or have experience as an installer, servicing and/or repair of compressors whose capacity is such that they require operators when in operation.
- practical operating time requirement is **8 months** for candidates having successfully completed a full-



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- time TSSA “approved-for-time-reduction” Compressor Operator program at a training facility.
- practical operating training requirement is **3 months** for persons having extensive experience in the installation and/or servicing registered plant compressor installations.
- practical operating training requirement is **2 months** for those having extensive experience in the installation and/or servicing compressor installations and also having successfully completed a TSSA “approved-for-time-reduction” training program at a training facility.

Examination Information

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

- Paper **CO** will consist of 150 multiple choice 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.

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.

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

While there are numerous other text materials available that deal with air/ gas compressors (resource local libraries, Colleges, Universities, bookstores and publishers), the following text materials, along with practical knowledge, provides sufficient information to challenge the required examinations

- ‘**Compressor Operator**’: Available from PanGlobal Publishing at **Toll Free** 1 866-256-8193
- **CSA B51: Boiler, Pressure Vessels and Pressure Piping Code**: available from CSA (416) 747-4000
- **CSA Extract** available from PanGlobal Publishing at **Toll Free** 1 866-256-8193
- The **Technical Standards and Safety Act** and the **Operating Engineers Regulation** are posted on TSSA Website (www.tssa.org) and can be printed at no cost for referencing.

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:

- a completed ‘*Application for an Ontario Certificate of Qualification as an Operating Engineer or Operator*’
- completed Form 1 entitled ‘**Testimonial of Qualifying Experience**’



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- **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) or the local MTCU Centre.

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