

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. COMPRESSOR TYPES:

- a. Reciprocating Compressors
 - i. State and describe the different types of single and multi-stage reciprocating compressors, state the function of the various compressor parts, including valves.
 - ii. Describe the methods employed to cool air or gas during compression.
 - iii. List and describe the different types of prime movers used for compressors.
- b. Rotary Compressors
 - i. 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:
 - sliding vane
 - lobe type
 - roots type
 - screw
 - liquid-sealed
- c. Centrifugal and Axial Compressors
 - i. Describe the design and operation of the volute and diffuser type centrifugal compressors.
 - ii. Describe the design and operation of the single-stage double-flow and the four-stage centrifugal compressors.
 - iii. Fully describe the design and operation of an axial flow compressor.
 - iv. State the causes and remedies of compressor surging.

3. 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, air dryers, list and provide a description of the different types commonly used.
- d. Air tools



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4. OPERATION, CONTROL AND MAINTENANCE:

- a. Explain the following methods employed to control compressor output:
 - ii. Start/stop, constant speed, dual control
 - iii. Variable-speed
 - iv. Suction line valve
 - v. Suction or discharge valve
 - vi. Adjustable stroke
 - vii. 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.

5. 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

6. PLANT SAFETY:

- a. The dangers associated with the operation of a compressor plant and all its components and the precautions to be taken to minimize or prevent such dangers.
- b. General plant safety.

Certification Information

Qualifying Experience Time:

Qualifying experience time served shall be in a plant that is attended by a Compressor Operator or 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 compressor operator certification is **1,440 hours** as a trainee in a compressor plant.
- The practical operating time requirement for compressor operator certification is **1,280** hours for candidates who have completed a full-time TSSA "approved-for-time-reduction" Compressor Operator program.

Qualifying Experience attained in a Canadian Jurisdiction outside Ontario

Qualifying experience time toward Operating/Power Engineering attained in a Canadian jurisdiction outside Ontario must be attained in the operation and management of compressors at least of the type and capacities indicated on Table 5 of the Operating Engineers Regulation, Ontario Regulation 219/01. 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 compressors trained on, the compressors types, compressors manufacturer, compressors (s) pressure, capacities in Kilowatts or Brake Horsepower and when the

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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.).

Examination Information

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

- The examination will consist of 150 multiple choice questions.

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

When answering examination questions on the scantron sheet provided, the candidate must use a pencil and shade in the “bubble” completely. Should candidates not complete the scantron application correctly, they will be advised that there could be a delay in processing or a grade of zero (0) assigned to them.

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

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 prepare for 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 the following

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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