

Steam Traction Operator Certification and Examination Guide



Effective: June 2021

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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 Steam Traction Operator Examination.

1. ACT AND REGULATION:

The candidate is expected to be able to locate information relating to the plant registration and operator certification, operation, maintenance, inspection, and testing of the steam traction plant and its equipment resourcing the *Technical Standards & Safety Act*, the *Operating Engineers Regulation* and the *Boilers and Pressure Vessels Regulation*.

2. SAFETY:

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

3. FUNDAMENTALS OF THERMODYNAMICS:

- a. Saturated and superheated steam, water, condensate, types of heat, temperature, BTU, pressure and its effect.

4. BOILER DESIGN AND TYPES:

- a. Components of Locomotive and Vertical style boilers, superheaters.
- b. Types of riveted joints and advantages of welded seams.
- c. Types and location of stays, methods of fitting boiler tubes.
- d. Difference between water and firetube boilers, advantages and disadvantages of watertube boilers and their primary safety differences.

5. BOILER OPERATION AND MAINTENANCE:

- a. Principles and causes of boiler explosions.
- b. Starting, shutting down, maintaining and laying up boilers.
- c. Safe boiler operation including low water, priming and foaming.
- d. Boiler cleaning and inspection requirements: fireside and waterside.
- e. Corrosion and fault locations on the fire and watersides, procedures of identifying and testing.
- f. Thermal stress, crack detection, hydrostatic tests, tightening of components under pressure.
- g. Effect of hills and grades on traction boiler operation, concerns and actions.

6. BOILER AUXILLIARY COMPONENTS:

- a. Safety valves, safety valve setting and sealing, fusible plugs, pressure gauges.
- b. Gauge glass, water column, pet cocks.
- c. Blowdown valves, steam and water stop and check valves, whistles, hand and manholes.
- d. Grates, arches, ash pans and dampers.

7. COMBUSTION:

- a. Principles of combustion, types of fuels and composition.
- b. Coal, wood, and oil firing methods, draft requirements and types.



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- c. Soot, ash and clinker formation, removal.
- d. Safety concerns - purging, furnace explosions.

8. BOILER WATER TREATMENT:

- a. Scale causing impurities, types of scale and scale control, pH values.
- b. Boiler water testing: test requirements, different tests to be performed, and proper procedure to do testing.
- c. Test result analysis.
- d. Boiler water chemical treatment, types of chemicals used and their application.
- e. Dangers and safety concerns when handling boiler water chemicals.

9. STEAM INJECTORS AND FEED PUMPS:

- a. Principles of pumping water, types of injectors and injector components.
- b. Simplex and duplex pumps, duplex pump slide valve setting.
- c. Starting, operation, stopping and maintenance requirements.

10. STEAM ENGINES:

- a. Principles of operation of simple and compound engines, engine components.
- b. Valve gears: Stephenson & Walshaert, gear components, setting the Stephenson valve gear.
- c. Types of governors, governor components, principles of governor operation.
- d. Indicator diagrams, indicated and brake horse power and how calculated.
- e. Lubrication: types and application, operation of the hydrostatic lubricator.
- f. Starting, operation, stopping, maintenance and lay-up requirements.
- g. Dangers and safety concerns.

11. PIPING AND VALVES:

- a. Pipe fittings: types and application.
- b. Valves: types, construction and application.
- c. Gaskets: types and applications.

Certification Information

Qualifying Experience Time:

Qualifying experience time served shall be on a plant that is attended by a Steam Traction Operator. 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 steam traction certification is **160 hours** as a trainee on a stream-powered traction plant.
- The practical operating time requirement for steam traction certification is **120 hours** for candidates who have successfully completed a full-time TSSA "approved-for-time-reduction" steam traction training 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 boilers at least of the type and capacities indicated on Table 3 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, signed by the Traction Engine Operator, indicating, the engine type, engine manufacturer, engine pressure, capacity in Kilowatts or Boiler Horsepower and when the



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experience was gained (dates). The Traction Engine Operator must indicate their certificate number and classification, as well as their contact information (i.e. telephone number, email address, etc.).

Examination Information

There is one examination that must be written that is 2½ hours in duration.

- The examination will consist of 100 multiple choice 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 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

The following texts, as well as many other related resource materials dealing with steam traction engines and boilers, are available through various Steam Traction & Railway Locomotive Publications & Suppliers, your local library, Colleges or Universities.

- “Technical Standards and Safety Act”, the “Operating Engineers Regulation with associated Directors Orders” and the “Boilers and Pressure Vessels Regulation with associated Directors Orders” are posted on the TSSA Web site at www.tssa.org.
- “Modern Steam Engines” by Joshua Rose, call 1-800-678-4883 (Topeka, KS)
- “Steam Engine Design” by Lindsay Publications, call 1-800-678-4883 (Topeka, KS)
- “Case Steam Engine Manual” by Case, call 815-741-2240 (Joliet, Illinois)

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 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