

Steam Traction Operator Certification and Examination Guide



Effective: April 2017

Document Uncontrolled if Printed

This document replaces all previous versions
Revisions/updates to this document are reflected by a change in the above date



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.



Steam Traction Operator Certification and Examination Guide

- 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

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 training time requirement is 160 hours on a certified steam traction plant of over 5 BHP, of which at least 50% of the time shall be while plant is under steam and in operation, the remainder of the required time may include maintenance, fit out or lay-up of the steam traction plant.
- The above practical time can be reduced by 40 hours by successfully completing a 24-hour TSSA "approved-for-time-reduction" course. Check the "Trainer Provider List" at www.tssa.org, or call toll free 1.877.682.8772 for an update of the approved providers.

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.



Steam Traction Operator Certification and Examination Guide

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 1-877-682-8772.

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

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 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
Examination and Certification
345 Carlingview Drive
Toronto, Ontario
M9W 6N9

Revision 2
Date Effective: April 2017
Page 4 of 4