LIMITED POWER ENGINEER’S (FIREMAN’S) SYLLABUS

GENERAL INFORMATION

This Syllabus is intended to assist candidates in their preparation for writing a fireman’s examination. It contains the recommended body of knowledge required. It is strongly advised that, before undertaking this Examination, the candidate completes an appropriate study course and is familiar with operation of boilers in general. These courses are offered by various educational institutions in Saskatchewan.

EXAMINATION INFORMATION

Exam Type: 70 question multiple choice
Writing Time: 1.5 hrs
Exam Materials: The Boiler and Pressure Vessel Act, 1999
The Boiler and Pressure Vessel Regulations (effective Jan 1, 2007)
CSA B51-03 Boiler, Pressure Vessel and Pressure Piping Code
Non programmable calculator
Passing Grade: 65%

To apply to write this examination the following forms must be filled in as complete as possible and submitted to the Authority with the fee required 21 days prior to the scheduled sitting.

- LIB-2010 Application for Power Engineering Exams
- LIB-0003 Client Authorization Payment Form

The most current and up to date forms can be found on the Authority’s website at the link below:

http://www.tsask.ca/Boiler-and-Pressure-Vessel-Safety-forms

The forms and payment can be faxed, mailed, or dropped off in person to the addresses below. If mailing please ensure it’s received by our offices 21 days prior to the scheduled sitting.

Manager of Examination & Certification
Boiler and Pressure Vessel Safety
330 – 1855 Victoria Avenue
REGINA, SK S4P 3T2

Manager of Examination & Certification
Boiler and Pressure Vessel Safety
952 – 122 3rd Avenue N
SASKATOON, SK S7K 2H6

Please be aware that candidates failing to obtain a passing grade will be required to wait 30 days before they will be eligible to reapply for examination.
SYLLABUS INFORMATION

The Boiler and Pressure Vessel Act & Regulations and Reference Codes
1. A general knowledge of The Boiler and Pressure Vessel Act and Regulations.
2. Operator staffing requirements for both high and low pressure boilers.
3. Duties of an operator or owner as specified by The Boiler and Pressure Vessel Act.
4. An awareness of the purpose and importance of the CSA and ASME Codes.

Boiler Design
1. Boiler terminology (defining common boiler terms).
2. Various boiler types (cast-iron sectional, modular, fire tube, water tube, and electric boilers).
3. Applications and operation of the various types.
4. Advantages and disadvantages of the various types.

Boiler Fittings
1. General application of boiler fittings, their construction, use and operating principles for steam heating boilers (steam pressure gauge, safety valve, water gauge glass, water column, feed water, steam and blow-off connections).
2. General application of boiler fittings, their construction, use and operating principles for hot water heating boilers (pressure gauge, thermometer, safety relief valve, pressure-temperature relief valve, expansion tank, stop valve, and drain valve).
5. Pressure gauge-testing procedures.
6. Code requirements.

Fuels and Combustion
1. Principles of combustion and heat transfer.
2. Types and characteristics of common fuels.
4. Flue gas analysis, process and application.
5. An understanding of the operating principle of oil-burning systems and the various burner types (storage, atomization, electric ignition, filters).
6. An understanding of the operating principles of the various types of gas burners (combination; ring; atmospheric and refractory burners; types of pilot lights).

Automatic boiler controls
1. Steam heating boiler feed water controls (various arrangements, low water fuel cut-offs with combined function, Hartford loop, condensate tank level controls).
2. Heating boiler operating controls (on/off, modulating, and high limit controls; low and high gas cut-off; other control switches; testing and maintenance).
3. Heating boiler combustion controls (thermocouples; flame rods; photo-electric cells; testing methods).
4. Knowledge of the various types of low water fuel cut-off devices, maintenance requirements and testing methods (code requirements, steam and hot water boiler applications; cause of low water; float; magnetic and probe types).


**Boiler Water Treatment**

1. Impurities and sources, chemical symbols, suspended matter, reasons for water treatment.
2. Causes of corrosion, scale, foaming, and priming.
3. Methods of external water treatment (filters; softeners; demineralizers).
4. Methods of internal water treatment (scale prevention; sludge conditioning; prevention of foaming; pH control; caustic embrittlement prevention; corrosion prevention).
5. Chemical feeder types.
7. Water and steam sampling methods.
8. Various testing procedures and terminology (reagents; indicators; titration; colorimetry).

**Boiler Operation and Maintenance**

1. Start up and shutdown procedures (abnormal conditions; uneven expansion; thermal shock; cutting in additional boiler).
2. Operating and maintenance procedures (operating logs; low and high water levels; flame failure; routine operating checks).
3. Boiler cleaning, inspections, repair and prolonged lay-up (fireside and waterside cleaning; external and internal inspection procedures; hydrostatic test; mechanical and chemical cleaning; dry and wet lay-up; tube plugging and replacement procedures; detection of cracks).
4. Boiler, furnace and pressure explosions (definitions; causes; Boiler Act requirements).

**Pumps, Valves, and Piping**

1. Theory of pumping, definitions and common terms.
2. Types of pumps, their characteristics, and applications (reciprocating; centrifugal; rotary; turbine).
3. Pump operation and maintenance (priming; cavitation; flexible couplings; mechanical seals; gland packing procedures; general operations; trouble shooting).
4. Piping materials and methods of connection.
5. Methods of providing for pipe expansion, support, and insulation.
6. Installation, purpose of, and types of steam traps.
7. Valve types, their composition, application, and servicing; pressure reducing, check, plug, ball, butterfly, needle, globe and gate valves).
8. Water hammer (definition, causes, and remedies).

**Heating Systems Arrangements and Components**

1. Steam heating equipment (radiators; convectors; unit heaters; ventilators; air vents; condensate and vacuum pumps).
2. Operating principles, maintenance procedures, and the components of various types of steam heating systems.
3. Operating principles of various types of hot water heating systems (gravity; loop; one pipe; two pipe direct and reverse; multiple zone systems).
4. Operation and maintenance of hot water heating system equipment (pump and expansion tank location; converter systems; balancing fittings; flow control valves; air vents and separators; diverters; cleaning; filling and starting systems; use of anti-freeze).
5. Electric controls (terms, thermostats, on/off or modulating, three-way valves, and motor operated valves).
6. Comparison of hot water heating to steam heating (advantages and disadvantages).
High Pressure Boilers
1. Types of low capacity high-pressure boilers and their application.
2. High-pressure boiler fittings.
3. High-pressure boiler operation and maintenance.
4. Pressure reducing station fittings.
5. Blow-down tanks and valves.
6. Code requirements for high-pressure boilers.

Building Services
1. Water supply systems (pneumatic tank system; hot water system; direct and indirect hot water heaters; temperature regulation and pressure-temperature relief valves).
2. Humidification principles and equipment (various humidifier types, air washers, humidifier controls).
3. Air compression principle, equipment, operating and maintenance (types of compressors; intercoolers and after coolers; receivers; dryers; installation; operating controls).

Building Safety
1. Electrical safety.
2. Elementary knowledge of artificial respiration, choking treatment manoeuvres, and prevention of shock.
3. Fire prevention and protection (classification of fires; extinguisher types; application and operation; sprinkler systems; fire and smoke alarms).

Electricity
1. Electrical theory.
2. Reading and understanding metering devices and basic calculations (volts; amps; watts; kilowatt-hours).
3. Trouble shooting (short circuits; grounds; static electricity; motor problems).
4. Electrical equipment (fuses; circuit breakers; motors; transformers; approved appliances).

End

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