ABSA
the pressure equipment safety authority

REFERENCE SYLLABUS

For

FIFTH CLASS
POWER ENGINEER'S

CERTIFICATE of COMPETENCY EXAMINATION

AB-55

Edition 1, Revision 2, 2022-11

REFERENCE SYLLABUS
For
FIFTH CLASS
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EXAMINATION

GENERAL INFORMATION

Introduction:

The Standardization of Power Engineers Examination Committee (SOPEEC) has developed a Fifth Class Power Engineer's Syllabus (SOPEEC Syllabus) which has been approved by the Association of Chief Inspectors (ACI) to be used across Canada.

As provided for under the *Power Engineers Regulation*, the Administrator in the pressure equipment discipline has established this Syllabus to identify the examination subjects for Fifth Class Power Engineer's Certificate of Competency examinations. The subjects described in this Syllabus are identical to the subjects in the SOPEEC Syllabus.

This Syllabus is intended to assist candidates studying for the Fifth Class Power Engineer's Certificate of Competency Examination.

The requirements to qualify for a Fifth Class Power Engineer's Certificate of Competency examination are outlined in the Power Engineers Regulation.

Recommended Study Program:

It is mandatory, that before undertaking a Fifth Class Engineer's examination, the candidate must complete a Fifth Class Power Engineering course offered through a technical institute.

In addition to the foregoing course, it is recommended that the candidate becomes familiar with the publications listed in the "Reference Material for Power Engineering Students and Examination Candidates" which is obtainable from the various technical institutes or from the SOPEEC website. (www.sopeec.org)

Application to Undertake Examination:

A candidate must submit an application and the prescribed fee at least 5 days before the date of examination.

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GENERAL INFORMATION

Examination Instructions:

The examination consists of one (1) examination paper with 100 multiple-choice questions, 3 hours duration.

To pass a 5th Class Power Engineer's certificate of Competency examination, a candidate must obtain at least 65% of the total marks allotted.

A candidate is allowed to use the following items in the examination room:

- The Safety Codes Act and Regulations under the Safety Codes Act;
- CSA B51, Boiler, Pressure Vessel and Pressure Piping Code;
- CSA B52, Mechanical Refrigeration Code;
- Extract for CSA B51 and CSA B52 Codes;
- ASME Boiler & Pressure Vessel Codes except for Sections VI and VII;
- The 2007 ASME Boiler & Pressure Vessel Code Academic Extract and Supplement produced by PanGlobal Training Systems;
- ASME/ANSI B31.1 Pressure Piping Code and B31.3 Process Piping Code;
- Handbook of Formulae and Physical Constants, Steam Tables and Refrigeration Tables are normally provided;
- A non-technical English language dictionary;
- Pens and pencils;
- Non-programmable calculator and
- Drawing instruments and drawing templates.

Note:

- The candidate must provide picture ID to the Examiner prior to the examination.
- No cell phone or any electronic communication devices are allowed to be brought into the examination room.
- The items referenced above must be shown to the Examiner for approval.
- No other reference material is allowed.
- The information in the 1983 Edition of the ASME Boiler and Pressure Vessel Code Academic Extract is outdated. Using this 1983 Edition of the ASME Extract for any power engineering examination is not recommended. Besides using the 2007 Edition of the ASME Academic Extract and Supplement, candidates may use the current edition of the ASME Code.

3 Hours
Multiple Choice Examination

A. **Administration and Mechanical Drawing**

i. Log Books, technical communication and plant diagrams

B. **Act and Codes**

i. An understanding of the Safety Codes Act and applicable regulations

ii. Introduction to CSA and ASME Codes for Power and Heating Boilers

C. **Applied Science**

i. Areas and volumes of solids

ii. Simple machines

iii. Introduction to mechanics

iv. Introduction to thermodynamics

v. Thermodynamics and properties of steam

vi. Thermodynamics and properties of refrigeration

D. **Safety**

i. Fire safety: classes of fires, types and operation of extinguishers

ii. Building and occupant safety

iii. Confined space entry

iv. Safe storage of flammables

v. WHMIS classification of controlled products
   a. Labeling of Controlled Products
   b. Material Safety Data Sheets

vi. Personal safety equipment

vii. Occupational health and safety legislation

viii. Housekeeping

ix. Artificial respiration/acceptable methods; CPR; treatment for electric shock

x. Safe work systems

E. **Welding and Plumbing**

i. Welding terms and inspection

ii. Hot water heaters: operation and maintenance

iii. Building water supply systems: operation, maintenance, safety

iv. Sanitary drainage systems: repair, safety

F. **Pumps, Piping and Valves**

i. Types of Pumps

ii. Pump components

iii. Pump operation and maintenance

iv. Piping materials and connections

v. Piping: expansion, support, insulation and drains

vi. Types and operation of steam traps

vii. Introduction to valves: types and applications

G. **Boiler Details**

i. Materials used in construction

ii. Basic boiler terminology

iii. Watertube, tubular, firetube, cast-iron sectional and modular heating boilers

iv. Electric boilers

v. High pressure boilers: components, operation, maintenance, repair, inspections, knowledge of power plant auxiliary equipment

3 Hours
Multiple Choice Examination

H. **Boiler Fittings**

i. Basic fittings for steam heating boilers

ii. Operation and testing of boiler safety valve, boiler gauge glass and water column

iii. Basic fittings for hot water boilers

I. **Fuels and Combustion**

i. Types of fuels, combustion principles, draft and flue gas analysis

ii. Gas burners for boilers

iii. Oil burners for boilers

iv. Draft: natural, induced and forced

v. Boiler and furnace explosions

J. **Boiler Controls**

i. Low water fuel cutoffs; operation and testing

ii. Heating boiler feedwater controls

iii. Heating boiler operating controls

iv. Heating boiler combustion controls

v. Boiler programmable controls and safety interlocks

K. **Boiler operation, maintenance and water treatment**

i. Hot water heating boilers: start-up, operation and shut-down

ii. Steam heating and power boilers: start-up, operation, shut-down

iii. Testing safety devices

iv. Cause and prevention of boiler explosions

v. Boiler maintenance and preparation for inspection

vi. Replacement of tubes and stays

vii. Boiler cleaning

viii. Boiler lay up

ix. Boiler water treatment basic chemistry, monitoring and testing

x. Boiler hydrostatic testing and safety precautions

L. **Heating Systems and Human Comfort**

i. Heat gains and losses

ii. Steam heating equipment

iii. Steam heating systems and operation

iv. Hot water heating systems equipment and operation

v. Steam to hot water convertor

vi. Ventilation fans and air filters

vii. Infrared and electric heating

viii. Humidification

ix. Electric controls for heating systems

M. **Refrigeration and Air conditioning; Systems and Auxiliaries**

i. Refrigerants; CSA B-52, safety

ii. Compression Refrigeration Systems

iii. Refrigeration compressors

iv. Heat exchangers for refrigeration systems

v. Cooling towers

vi. Refrigeration system auxiliaries

vii. Elementary air conditioning systems and auxiliaries

3 Hours
Multiple Choice Examination

N. **Refrigeration and Air conditioning Controls**

i. Refrigeration cycle controls

ii. Compression refrigeration system pre start-up checks

iii. Compression refrigeration system operation and shut-down

iv. Refrigeration system metering devices and capacity controls

O. **Air Compression**

i. Types of air compressors

ii. Components of air compressors

iii. Auxiliaries used with air compressors

iv. Operation and maintenance of air compression systems

v. Thermoil Systems

vi. Micro-turbine Co-generation

P. **Electricity**

i. Emergency generators: start-up, operation, shut-down, safety

ii. Introduction to electricity

iii. Lighting systems: incandescent, fluorescent

iv. Electrical safety, simple circuits, switches and fuses