

GUIDELINES FOR APPLICATION FOR REGISTRATION AS SPECIALIST PROFESSIONAL ENGINEER IN PRESSURE VESSEL ENGINEERING

Introduction

1. A PE in mechanical engineering may apply to be registered as a specialist professional engineer in pressure vessel engineering if he has a valid practicing certificate and meets one of the following sets of conditions as specified in the Fourth Schedule of the PE Rules as follows:

Set (A)

- (i) the applicant is approved by the Commissioner for Workplace Safety and Health under section 33 of the Workplace Safety and Health Act as an authorised examiner for the purpose of carrying out any prescribed examination or test of any pressure vessel; and
- (ii) the application for registration as a specialist professional engineer is submitted before 18 January 2018.

Set (B)

- (i) the applicant has not less than 5 years (in aggregate) of such experience in pressure vessel engineering or in any field related to pressure vessel engineering (whether in Singapore or elsewhere) as may be acceptable to the Board, of which at least 3 years of that experience was obtained whilst practising as a registered professional engineer in Singapore; and
- (ii) the applicant has sat for and passed a specialist registration examination on pressure vessel engineering conducted by the Board.

Examination

2. One of the requirements as mentioned in para 1 above is that a Set (B) applicant must sit for and pass a specialist registration examination on pressure vessel engineering conducted by the Board. The specialist registration examination on pressure vessel engineering conducted by the Board is an oral examination and will be conducted together with the professional interview for registration as specialist PE in pressure vessel engineering in a single session. The syllabus for the examination is as specified in Annex A below.

Report

3. An application by a Set (B) applicant shall be accompanied by a report on practical experience that describes in particular the experience that the applicant has acquired in pressure vessel engineering or in any related field. It should include the tasks that the applicant has been involved in, the levels of his responsibilities, the identification of special engineering problems encountered and the demonstration of the use of engineering knowledge, experience and judgment to resolve them etc. The Report shall be about 2,000 words and must not be a mere inventory of work done.
4. The report shall be typewritten and 5 copies shall be submitted (i.e. 1 original and 4 photostat copies). The report must be signed by the applicant himself/herself and verified by his/her employers or any registered Professional Engineer in Singapore. Verification by an employer should be accompanied by a stamp with name, designation and name of company. Verification by a professional engineer should be accompanied by the professional engineer's stamp.

Interview

5. The Board would require a Set (B) applicant to undergo an interview. The interview would cover the following:
 - a) to determine the type and duration of practical experience in pressure vessel engineering or in any related field;
 - b) to assess the basic understanding, and scope and depth of the applicant's practical experience in pressure vessel engineering or in any related field, in particular, to establish the level of responsibility – i.e. whether the applicant's nature of work is at subordinate level or at the level of making technical decisions and to establish whether his experience is sufficient to enable him to act and take technical decisions independently.
6. The applicant could be queried on his involvement in one or more phases of a project such as planning, design & analysis, construction, and operation & maintenance in relation to pressure vessel engineering or in any related field.
7. An applicant is required to demonstrate that he has substantial practical experience and knowledge as to be competent in core areas of pressure vessel engineering or in any related field mentioned above. In addition, the conduct, attitude and professionalism that the applicant displays during the interview would also be considered.
8. When registering a professional engineer in the specialised branch of pressure vessel engineering, the Board may impose such conditions as it thinks fit.

Fees

9. The fees for an application by a Set (B) applicant to sit for the specialist registration examination in the branch of pressure vessel engineering is \$450. The fees for an application by a Set (A) or Set (B) applicant to register as a specialist professional engineer in pressure vessel engineering is \$300.

Submission

10. An application to sit for the specialist registration examination and/or register as specialist professional engineer in the branch of pressure vessel engineering shall be submitted in person and made on prescribed forms issued by the Professional Engineers Board, Singapore. The application must be legibly written in ink or type-written and 5 copies shall be submitted.

SYLLABUS FOR SPECIALIST REGISTRATION EXAMINATION IN PRESSURE VESSEL ENGINEERING

Workplace Safety and Health Legislations and Guidelines Related to Pressure Vessel Engineering

1. Ministry of Manpower's Guidelines on Registration of Pressure Vessels
2. Ministry of Manpower's Guidelines on Steam Piping
3. Workplace Safety and Health Act
4. Workplace Safety and Health (Confined Spaces) Regulations
5. Workplace Safety and Health (General Provisions) Regulations
6. Workplace Safety and Health (Risk Management) Regulations

Codes and Standards Related to Pressure Vessel Engineering

The applicant shall have an in-depth understanding of the relevant local and international codes and standards used in design, fabrication, and inspection, of pressure vessels, including but not limited to the following:

1. ASME Section I, Rules for Construction of Power Boilers
2. ASME Section II, Materials
3. ASME Section IV, Rules for Construction of Heating Boilers
4. ASME Section V, Nondestructive Examination
5. ASME Section VIII, Rules for Construction of Pressure Vessels
6. ASME IX, Welding and Brazing Qualifications
7. ASME PCC-2, Repair of Pressure Equipment and Piping
8. ASME PCC-3, Inspection Planning Using Risk-Based Methods
9. ASME B31.1, Power Piping
10. ASME B31.3, Process Piping
11. API 510, Pressure Vessel Inspection Code
12. API RP 520, Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries
13. API 570, Piping Inspection Code
14. API RP 571, Damage Mechanisms affecting Equipment in Refining Industry
15. API RP 572, Inspection of Pressure Vessels
16. API RP 573, Inspection of Fired Boilers and Heaters
17. API RP 576, Inspection of Pressure-Relieving Devices

18. API RP 577, Welding Inspection and Metallurgy
19. API 579-1 / ASME FFS-1, Fitness-For-Service
20. API RP 580, Risk-Based Inspection
21. API RP 581, Risk-Based Inspection Methodology
22. API STD 598, Valve Inspection and Testing
23. Code of Practice on WSH Risk Management
24. Common pressure vessel design codes from EN standards, BS Codes, DIN standards, and JIS standards are also included.
25. SS 510: Code of Practice for Safety in Welding And Cutting (and Other Operations Involving The Use Of Heat)
26. SS 567: Code of Practice For Factory Layout – Safety, Health and Welfare Considerations

Other Relevant Areas in Pressure Vessel Engineering

The applicant shall be knowledgeable in the following areas:

1. Working principles of pressure vessels and its related systems
2. Design aspects and principles of pressure vessels and its related systems
3. Essential parts and components of pressure vessels and its related systems
4. Conduct of inspection (including visual examination, running test, functional checks on system parameters and alarms, pressure test - assisted or otherwise, testing of safety and relief devices)
5. Types and definitions of maintenance inspections
6. Types of process corrosion and deterioration
7. Modes of mechanical, thermal and high temperature deterioration
8. Pressure vessel materials and fabrication problems
9. Welding on pressure vessels
10. Corrosion and minimum thickness evaluation
11. Estimated remaining life
12. Inspection interval determination and issues affecting intervals
13. Safety and relief devices
14. Maintenance inspection safety practices
15. Inspection records and reports
16. Repair/Alteration to pressure vessels

17. Rerating pressure vessels
18. Boiler control system
19. Pressure testing involving water, air, or water mixed with air medium (during first installation, periodic inspection, 10 yearly inspection, after repair, alteration or rerating)

Thickness Measurements, Inspection Intervals and Vessel Integrity

The applicant shall be knowledgeable in the following areas:

1. Corrosion rates and inspection intervals
2. Joint efficiencies
3. Static head
4. Internal pressure
5. Pressure testing
6. Impact testing
7. Weld size for attachment welds at openings
8. Nozzle reinforcement

Welding and Non-Destructive Testing (NDT)

The applicant shall be knowledgeable in the following areas:

1. General principles of NDT
2. Typical welding methods
3. Welding process knowledge
4. Welding metallurgy
5. Typical welding faults and its identification
6. Welding codes and standards (Including ASME Codes, AWS Standards, API Standards)
7. Uses and limitations of various NDTs
8. In depth knowledge of various NDTs

Metallurgy and Damage Mechanisms

The applicant shall be knowledgeable in the following areas:

1. Material strength and properties
2. Classification and engineering properties of metals, as well as composites
3. Various damage mechanisms
4. Heat treatment