

## **BOARD OF ENGINEERS MALAYSIA**

### **APPLICATION TO SIT FOR PROFESSIONAL ASSESSMENT EXAMINATION**

#### **REQUIREMENTS & PROCEDURE**

1. A registered Graduate Engineer is only eligible to be a candidate for PAE after he has fulfilled the requirements of Regulation 22 of the Registration of Engineers Regulations 1990 (Amendment 2015) on practical experience.
2. The application to appear for PAE may be submitted at any time.
3. Application Form PAE is to be submitted together with the prescribed fee of RM500.00 (examination fee) and RM100.00 (processing fee) and the reports (Training and Technical) endorsed by a Professional Engineer in the same discipline. The documents shall be accompanied by a completed BEM/Form/PAE/02.
4. On approval of the application, BEM shall appoint a Principal Examiner who in turn shall appoint a Second Examiner. The Examiners shall be either of the same or approved allied discipline as that of the candidate.
5. If the application is rejected, the candidate will be informed immediately and the examination fee will be refunded in full.
6. The candidate whose application is approved will be informed of the name and address of the Principal Examiner within three months of the date of receipt of his application.
7. The Principal Examiner shall write to the candidate advising the date for the Examination, the place and time of the Examination.
8. PAE will consist of professional interview, followed by essay writing.
9. In the professional interview, the practical experience of the candidate will be assessed by the Examiners both on time and quality basis.
10. The Examiners shall test the candidate during the interview on the following aspects:
  - o Understanding of the application of engineering principles to the solution of problems arising from the investigation, planning, design, construction, operation or maintenance of engineering works; or on the subject of his research; and
  - o The ability to communicate.
11. The candidate is required to write two essays, one each from Section A and Section B. Section A is for an essay related to the candidate's training and experience as stated in his report. Essay for section B will be on the Code of Professional Conduct.
12. The candidate will be required to choose one out of two questions from Section A. The candidate is also required to answer a question from two alternative questions selected by the examiners on code of Professional Conduct (Section B).

13. 1½ hours will be allowed for each written paper.
14. The essays are intended primarily to test the candidate's ability to marshal his knowledge and thoughts and to express them in words in a clear and concise manner.
15. The candidate who has sat for the Examination shall be informed of the result of the Examination within six months of the date of Examination.
16. Every unsuccessful candidate shall be informed of the reasons for the failure. The prescribed fee will not be refunded to any candidate who has failed in the Examination.
17. The unsuccessful candidate may within 21 days of being informed of the result, appeal to BEM for a review of his result.
18. Upon receipt of such an appeal, BEM shall cause a review of the assessment of the Examiner's report and then decide on the appeal. The decision of BEM on the appeal shall be final.
19. Every appeal shall be accompanied by a payment of RM150.00 which shall be refunded in the event that the appeal is successful.
20. A candidate who has failed in the Examination may submit his application to re-sit for the Examination. However, he will not be allowed to sit for the Examination until after twelve months from the date of the last Examination.
21. A candidate who has failed in the Examination shall not be examined by the same Examiners at any subsequent Examinations.
22. Where a candidate who fails to sit for the PAE within a period of one year on the notification by the Principal Examiner, the prescribed fee will be forfeited, and the candidate will be informed accordingly. The candidate may then submit a fresh application at any time to sit for the PAE in accordance with these guidelines.

## **PREPARATION OF DOCUMENTS FOR PROFESSIONAL ASSESSMENT EXAMINATION (PAE)**

### **A - GENERAL REQUIREMENTS**

1. Every candidate for the Examination shall submit the following documents.
  - Two copies of a report, giving an account of his training and experience;
  - Two copies of project / technical design / drawing report.
2. Every drawing and document shall be certified by a Professional Engineer who is in a responsible position under whom it was prepared. In the case of overseas experience, experience under a PE of a different discipline, or experience in an organization without a PE, the drawings and documents may be signed by a Professional Engineer (same discipline) who has personal knowledge of the experience.
3. The Professional Engineer must certify on BEM/Form/PAE/02 that the documents and drawings submitted are the work of the candidate.

4. If only a portion of the documents is prepared by the candidate, this must be clearly indicated and initialed by the Professional Engineer.
5. It is essential that the drawings and documents submitted shall be related to the work of the candidate in the ordinary course of his employment.
6. Drawings and documents prepared as exercises during university or college courses are not admissible.
7. All reasonable care will be taken of drawings, sketches, photographs, and other documents which will be returned to the candidate, normally immediately after the Examination. However BEM will accept no responsibility for these documents in the event of loss.

### **Submission of the Report**

1. The report on training and experience should be of length 1500 - 2000 words printed on A4 paper.
2. The report shall include organisations in which the candidate has worked (in chronological order) together with the positions held.
3. The duties and responsibilities in each organisation together with the works done/projects undertaken and training undergone should be stated.
4. The actual involvement of the candidate in the projects undertaken and experience gained is to be emphasized.
5. At the end of the report, the candidate should give a summary of the total time spent (since registration as a Graduate Engineer) in months on the following aspects:
  - office/design work,
  - site/field experience,
  - planning/management, and
  - others (research, teaching etc.).

### **Submission of the Drawings/Documents**

1. (a) At least two and not more than four working drawings related to the candidate's own role, calculations, and / or specifications prepared by him relating either to one of the aforesaid drawings, or to other drawings which must also be submitted.  
  
(b) A candidate may submit an additional drawing not necessarily prepared by him, to illustrate his experience in engineering works.  
  
OR
2. (a) A feasibility study report involving functional and economic comparison of the preliminary designs of an engineering system, or a comprehensive report of a major engineering project, or a system design of a major engineering works.

(b) The above documents should include the following:

- At least one relevant drawing showing essential features of details of the project or system;
- Preliminary stress or system analysis, where applicable, and / or;
- Quantities, cost analysis or economic analysis as appropriate.

OR

3. (a) In the case of a candidate whose experience is in the installation or operation or maintenance of an engineering plant or engineering system or any other engineering work a detailed description must be submitted.

(b) In his submission, he should clearly indicate his contribution which shows application of sound engineering principles.

(c) A critical appraisal of the design of the engineering system which may not necessarily be the work of the candidate, should be included where appropriate.

(d) Details of modifications, if any, made to the existing system as a result of the work of the candidate should also be submitted where appropriate.

OR

**4. FOR CANDIDATES ENGAGED IN RESEARCH & TEACHING**

(a) In the case of a candidate engaged in research and teaching, two copies of a report of not more than 4000 words in evidence of the research carried out by him should be submitted.

(b) This report should include a brief summary of the candidate's research work, stating the subject matter and objectives, together with a shop list of any papers he has published.

(c) A thesis prepared for a higher degree is not acceptable but the candidate may include the matter of this thesis together with the new matter.

(d) Evidence must also be provided that the candidate has at least one year industrial experience as detailed out in application form and Training & Experience Report.

**B - EXAMPLES FOR EXPERIENCE IN DESIGN FOR VARIOUS ENGINEERING BRANCHES**

The following are examples on submission of documents for various engineering branches for candidates having significant design experience. However these examples are not exhaustive and serve only as a guide:

## 1. **Aerospace**

Drawings and calculations for the design, in whole or in part, of an aircraft or guided missile, or the estimation of the performance of its engines or its structure, maintenance schedules for commercial airlines or the armed services; and

Notes or records such as wind tunnel tests on models of aircraft or on parts thereof; flights trials; strength tests on wings or other components; vibration and stiffness tests; methods of construction and joining parts.

## 2. **Agricultural**

Drawings and calculations for the design, in whole or in part, of an item of work related to agricultural engineering such as agricultural machinery, agricultural operations, irrigation schemes, drainage schemes and flood mitigation works; and

Notes or records on operation and maintenance of agricultural equipment, planning of agricultural operations, feasibility report on drainage, irrigation or flood mitigation project.

## 3. **Chemical**

Drawings and calculations for the design, in whole or in part, of an item of work relating to chemical or process engineering, e.g. heat exchangers; absorption towers; distillation plant; liquor filters; plant layouts; and

Notes or records such as the operation and/or testing of chemical plant and items of equipment; the preparation of process flow sheets showing heat and mass balances; maintenance and planning coordination; the economic assessment of alternative schemes; the instrumentation and automatic engineering techniques.

## 4. **Civil**

Drawings and calculations for the design of a civil engineering work:

The specialised areas by which the civil engineer wishes to be examined may be in one or more of the following:

- **Drainage, Irrigation and Flood Mitigation;**

- Drawings and calculations for the design of a Drainage, Irrigation or Flood Mitigation System; and

- Records of Field Work in Drainage, Irrigation or Flood Mitigation Works.

- **Water Resources;**

- Drawings and calculations and quantities for the design of an item of work relating to hydrology, e.g. river gauging stations, lysimeters or percolation gauges, climatological stations; test wells; and

Records of fieldwork in surface of ground water hydrology; statistical analysis of hydrological data leading to the evaluation of water resources; methods of flood and drought forecasting.

○ **Geotechnical, Soil & Rock Mechanics;**

Drawings and calculations for the design of a project involving soil or rock mechanics, such as the stability of a dam and the adjoining valley; the stability and anticipated settlement of buildings; retaining walls, railway embankments, etc; and

Notes and records from site investigations; field and laboratory test; trial sections etc. for the purpose of the foregoing.

○ **Public Health and Environmental;**

Drawings and calculations for the design of a works related to any branch of public health engineering. e.g. water supply treatment, sewerage and sewerage treatment; land drainage and river improvement; refuse disposal plants, noise pollution, dust pollution, radiation pollution; and

Notes and records of a field study for a public health and environment engineering project.

○ **Permanent Way;**

Drawings and calculations for the detailed design of a major junction layout with a schedule of material; details of timbering and programme for carrying out the work; and

Notes or records such as the survey for and setting out of a layout; investigation into the strength or stability of tracks, assessment of permissible speeds.

○ **Roads, Highway and Transportation;**

**Highway**

Drawings, calculations and quantities to show adequate knowledge of the practical application of the theory of civil engineering design in relation to highway engineering e.g. the design of bridges, retaining wall, earthworks, paving and drainage.

and

Notes or records on highway capacity standards in relation to estimated traffic volumes with particular reference to junction layout; highway materials and pavement design; road location in urban or rural areas.

○ **Transportation**

Drawings, diagrams and appropriate calculations to show adequate knowledge of the application of the principles of transportation engineering to practical problems and of the use of current techniques in the analysis and planning of transport systems; and

Statistical analysis of data derived from traffic studies; economic factors in relation to a transportation scheme; the functional design of terminal facilities for road, rail or air transport; design and operation of traffic management schemes; the function design of road or rail networks; the design of traffic signal systems.

○ **Town Planning;**

Drawings and maps, written statement, and report of the surveys which have been prepared for submission to the appropriate authority in the form of a Development Plan under the Town and Country Planning Act, or similar legislation; and

Notes on the factors governing the proposals for population densities, zoning, communications, and basic layout.

**5. Electrical, Electronic and Communications**

Drawings, charts, calculations for the design, installation, construction and operation in whole or in part of a system or an item of work related to electrical engineering, for example, utilization of electric plant and equipment such as generating plant, switchgear, transformers, substations, transmission and distribution, electric drive, lighting systems; and

Notes or records on operation, maintenance, testing of electrical plant and equipment or telecommunication equipment; generation, transmission and distribution of power; application of electricity to transport, industry, radio broadcasting, commercial and domestic premises, etc.

**6. Energy**

Drawings and appropriate calculations, including basic considerations for design of an item of work related to energy engineering, e.g. gas work plant in general; gas transmission or distribution system; boosting, storage and control equipment; gas-consuming units - domestic, commercial or industrial; and

A record of some particular practical work in the field, such as the operation of a gas-making plant and the evaluation of any special features; the installation of a gas-transmission pipeline; the performance of a gas-fired industrial furnace for a specific duty.

**7. Marine**

Drawings and calculations for the design in whole or in part, of an item of work related to marine engineering, such as steam or internal combustion propulsion; or auxiliary machinery, such as electrical generating sets; and

Notes or records, such as the operation or testing of one or more of the foregoing.

**8. Mechanical**

Drawings and calculations for the design of an item of work related to mechanical engineering, such as machinery or machine parts; power-house or machine-shop equipment; factory or workshop layouts; earth moving and quarry plant, compressed air

equipment, diesel traction units, pumps, engines, air conditioning systems, fire fighting systems, other building services, etc. and

Notes or records on methods of machinery: accuracy, workmanship, tolerances; testing properties of materials; performance of tests on plant and machines; workshop organisation; maintenance; work study, etc.

## 9. **Manufacturing**

Drawings and calculations for the design of an item of work related to production engineering, e.g. machine tool engineering; factory layout and material handling; work analysis; manufacturing system, automations, etc. and

Notes or records such as design for production; forming processes; quality and reliability; techniques of operational research; production cost analysis; human aspects and industrial safety consideration.

## 10. **Mining**

Drawings and calculations relating to a mining or metallurgical project such as shaft design; winding or haulage systems; design of underground or open pit working; gravel pump and dredge operations; a major ventilation survey; items of metallurgical plant connected with crushing or dressing or extractive metallurgy; coal preparation plant; and

Notes or records on the operation or testing of mining or metallurgical plant and equipment, such as power loaders; high-speed tunneling equipment; fire-fighting ranges and equipment; pumping equipment; crushing and floatation equipment; furnaces, electro-metallurgical and hydro- metallurgical plant.

## 11. **Naval Architecture**

Drawings and calculations for an item of work relating to a design study for a modern ship; the launching of a large ship; a typical ship system, e.g. oil fuel, ballast, fresh and salt water, ventilation and air-conditioning; cargo handling; and

Notes or records such as estimate of ship performance including model tests and propeller design; trials at sea, e.g. propulsive performance, sea keeping, vibration, planning, production; and quality control applied to shipbuilding.

## 12. **Petroleum**

Drawings and appropriate calculations, including basic considerations for design of an item or work related to petroleum engineering, e.g. petroleum production plant in general; petroleum distribution system; production enhancement process; reservoir planning; storage and control equipment; petroleum consuming units; and

Notes or records of some particular practical work in the field such as the operation of petroleum production platform; installation of petroleum distribution pipeline; performance of oil-fired equipment and reservoir operations.

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E&Q Committee (17.8.2020)