Introduction to the Institution and the Supplementary Examination

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The Institution of Structural Engineers is the world’s largest professional body dedicated to structural engineering.

We have led the profession worldwide for over 100 years.
The Institution’s foundations

Founded in 1908 as the Concrete Institute
Founder architect Edwin Sachs
Members included architects, engineers, surveyors, chemists and manufacturers
Royal Charter 1934
Looking to the future

• We now have over 27,000 members from 105 countries of which over 12,000 are Chartered members
• Over 600 members in Singapore
The Institution undertakes a broad range of technical activities which keeps it at the forefront of worldwide structural engineering practice.

The Institution is recognised as the world’s leading professional body for structural engineering.
Supporting our members

- *The Structural Engineer*
- Technical publications
- Technical meetings, CPD, training, facilities
- 30 regional groups spread across the world
- Links with other professional organisations
The Institution’s technical publications provide essential technical and regulatory information on basic structural design concepts through to design guidance, reports, manuals and codes including the latest developments in Eurocodes.

Visit [www.istructe.org/publications](http://www.istructe.org/publications) for a full list of publications.

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Structural Awards

• The most prestigious structural engineering award ceremonies in the world
• A worldwide celebration of engineering
• Honouring the best structural engineers

The structural awards are a coveted distinction and the ultimate recognition of ability for professional structural engineers. Only members can enter their projects for consideration.
Structural engineering is a global profession

Membership of the Institution provides access to

• The world’s leading design engineers
• Technical resource materials
• Informed opinion and best practice guidance
• A worldwide professional qualification that will open doors wherever you wish to practice
“A Global Institution for a Global Profession”
Direct entry via Supplementary Examination route
1. Routes to Chartered Membership (MIStructE)
   • Academic qualifications
   • Training
   • Professional Review Interview
   • 7-hour CM Exam

2. Supplementary Exam (based on Professional Qualification with PEB)
   • Academic qualifications
   • Supplementary Exam 1 hour 30 minutes
   • Interview
Eligibility and Application Process

• Candidates must have an Institution accredited degree or approved equivalent
• Candidates must have passed the PEB FEE(Civil) and PEE(Civil) examinations and interview.
• Application form must be submitted with
  • CV
  • Certified copies of degree certificates/transcripts
  • Application fee of £200
• Application form must include signatures from three Supporters
The Examination

- 90 minutes long followed by an interview of approximately an hour.
- A choice of three questions; normally including a bridge and two more conventional structures.
- You have to:
  - select one question and prepare two distinct and viable schemes,
  - present to your examiners,
  - discuss a client change or other requirement,
  - sketch some details,
  - discuss a programme or a similar document and lastly………
  - pass!
Sample question

• Let’s look at a sample question
SITE PLAN

SECTION A-A

FLOOR PLAN AT GALLERY LEVEL 1

NOTE: All dimensions are in metres

FIGURE Q1
Question 1. Library and Exhibition Centre
Client’s requirements

1. A library and exhibition centre to be constructed in a city centre; see Figure Q1.
2. The client has stipulated that cross bracing is not permitted within the interior of the building.
3. A fully glazed structurally independent staircase and lift/elevator shaft is to be located outside each corner of the building.
4. Columns are permitted in the external elevations. Internal columns are to be located at a minimum of 8.0m centres and at least 8.0 m from an external wall. A maximum of three rows of internal columns are permitted on the two Display Levels in the north/south direction.
5. At the atrium level, an unobstructed column free space of 24.0 m width is required with a 18.0 m column free opening up to roof level, as shown on section A-A, figure Q1. The roof over the atrium is to be glazed.
6. The north and south elevations are to be glazed, the east and west walls are to be clad in masonry.
7. Clear floor heights of 3.7 m are required for all gallery levels and 4.2 m for all display levels. The minimum clear height at the Atrium level under the Gallery Floors is 5.2 m.

Imposed Loading
8. Roof 5.0 kN/m²
   Gallery, Display Floors 5.0 kN/m²
   Atrium Floor Loading 1.0 kN/m²
   Loadings include an allowance for partitions, finishes, services and ceilings where appropriate.

Site Conditions
9. The site is level and located in a city centre. Roads run past the north and south faces of the building. Vacant sites are present on the east and west. Basic wind speed is 40 m/s based on a 3 second gust; the equivalent mean hourly wind speed is 20 m/s.

10. Ground conditions:
    Borehole 1  Ground level – 1.5m made ground
         1.5 m – 5.0 m Firm to stiff fissured clay C = 75 kN/m²
         Below 5.0 m Rock – allowable safe bearing pressure 1000 kN/m²
    Borehole 2  Ground level – 1.0m made ground
         1.0 m – 4.0 m Firm to stiff fissured clay C = 75 kN/m²
         4.0 m – 6.0 m Stiff to very stiff clay C = 125 kN/m²
         Below 6.0 m Rock – bearing pressure 1000 kN/m²

Omit from consideration
11. Detailed design of stairs and independent lift/elevator shafts.
Essential Points

- The boundaries and vacant sites,
- Constraints on column locations,
- Stability – glazed elevations,
- No bracing inside the building,
- The soil profile – piled or similar solution likely,
What to Include

• Make sure that you come to the interview with –
  – Sufficient sketches
  – Basic feasibility calculations
  – Notes to help your presentation
  – Remember that two distinct and viable solutions means just that!
OPTION 1
Reinforced concrete
Lateral stability - East-West external elevations - sway frames with
designs to take regard of eccentric loading effects
when wind load N-S.
- North-South - concrete shear walls noting eccentrically
   applied load

OPTION 2
STEEL FRAME
LIGHT WEIGHT CONC. COMPOSITE SLAB
'X' BRACING IN E.V.T. ELEVATORS
WALKWAY DECK designed to transfer lateral
wind loads between external walls.
OPTION 1
REINFORCED CONCRETE
Lateral stability as above.

OPTION 2
STRUCTURAL STEEL

ATRIUM LEVEL - STRUCTURE ABOVE SHOWN.
Lateral stability as above.
OPTION 1
REINFORCED CONCRETE
Lateral stability as above.

OPTION 2
STEELWORK
Lateral stability as above.
GROUND PROFILE

MADE GROUND

FIRM TO STIFF FISSURED CLAY
C = 35 kN/m²

STIFF TO VERY STIFF CLAY
C = 125 kN/m²

ROCK
SAFE ASSUMED
BEARING PRESSURE = 1000 kN/m²
Columns at 8 m /c but only 3 lines as noted in question.

Alternative solution.
Another question

• Let’s look at another sample question
Question 2. Headquarters extension

Client’s requirements
1. An existing office building is to be extended to accommodate additional offices and a dining area. See Figure Q2. The exterior of the new building is to be clad with a patent glazing system that requires supports at 2.0m centres vertically and horizontally.
2. The dining area is to be 15m wide and 30m long. The clear height is to be 3m. Only two columns with a maximum size of 1m square are permitted in this area. No other structural members are permitted within this volume or in the free space above the dining area.
3. The office areas are to be 10m wide and 30m long. The clear height is to be 3m. No columns or other structural members are permitted inside the office areas.
4. The building is to be linked by pedestrian bridges at each floor level. No horizontal loads are allowed to be transmitted to the existing building via the bridges. To meet fire regulations, non-structural external stairs will be used.
5. There are no restrictions on the structure outside the building envelope. No bracing or walls are permitted inside the office spaces or within the dining area.

Imposed loading
6. Roof loading
   0.5kN/m²
7. Floor loading
   5.0kN/m²
8. Bridge loading
   5.0kN/m²

Site conditions
7. The site is located in a coastal location. Basic wind speed is 46m/s based on a 3-second gust; the equivalent mean hourly wind speed is 23m/s.
8. Ground conditions:
   Borehole 1 at Level 1
   0.0m – 0.5m: Top soil
   0.5m – 2.0m: Sand, N=10
   2.0m – 5.0m: Gravel, N=30
   Below 5.0m: Rock, allowable bearing pressure 500 kN/m²
   Borehole 2 at 3m below Level 1
   3.0m – 4.0m: Loose clayey sand
   4.0m – 7.0m: Gravel, N=30
   Below 7.0m: Rock, allowable bearing pressure 500 kN/m²

Ground water was found at 4m depth from ground level.

Omit from consideration
9. Detailed design of link bridges and external stairs.
NOTE: All dimensions and levels are in metres

FIGURE Q2
ROOF TRUSS SUPPORTED BY INTERNAL COLUMN. GLAZING COULD SPAN HORIZONTALLY OR VERTICALLY.

FIGURE Q2 - 4

MOMENT FRAME. FLOORS HUNG FROM FRAME

FIGURE Q2 - 5
So in summary;
- Select and read the question carefully,
- Spend time on two solutions that really are distinct and viable,
- Prepare some sketches as I have shown – don’t forget the foundations!
- Think about the client’s change and the other documents,
- Sketch boldly, think laterally and……………
- Good luck!
Thank You

Any Questions?