Report

Examiners' report 2011

The examiners' reports are to be read with reference to the April 2011 question paper available from the Institution of Structural Engineers' website.

Chartered Membership Examination 2011

Questions

1. Theatre
2. Exhibition centre
3. Farm access bridge
4. Hotel building
5. Town centre car park
6. Lifeboat station building
7. New link bridge between two offshore platforms
8. Office retrofit

Overview

Chartered Membership Examination	2011
Total Candidates	755
UK candidates	389
UK pass-rate	38.8%
Non-UK candidates	384
Non-UK pass rate	34.1%
Overall pass-rate	36.5%

The Institution aims to help candidates to pass the Chartered Membership and Associate Membership examinations. The Institution will provide, on request and during the designated period following the exam, personal feedback to unsuccessful candidates, including the marks awarded and comments from the Examiners, which it is hoped will assist candidates in preparing for their next exam. The Institution will continue to review general exam performance in the annual report, which follows.

The Examiners draw future candidates' attention to some common themes that recur each year:

- Poor management of time during the exam: candidates should attempt to answer all the sections of their chosen question. Section 2e is regularly the most poorly-attempted section of the exam. It offers 10 marks which can often be obtained more efficiently than in other sections.
- Candidates must identify the key problems in their chosen question that must be solved in order to gain a pass. Candidates must communicate their understanding of these key issues and demonstrate how to address them in their chosen solutions;
- Copying standardised texts obtained from preparation courses or sample answers, where irrelevant to the question, simply highlight a candidate's lack of understanding and are likely to lose marks;
- Candidates must answer the question set and not modify its requirements;

- Candidates must provide correct calculations for the crucial structural elements to gain good marks. They should not spend too much time on less important items;
- The drawings and details must show the important structural elements clearly and effectively in order to gain good marks. Candidates lose marks by producing poor and confusing drawings and sketches.

Question 1, Theatre

The question was designed to challenge candidates' knowledge of structural framing systems and for them to assess the most appropriate manner of spanning the theatre space without compromising the spatial aspects of the basement. Many candidates chose to span the short direction but often without considering the design requirements fully. Transfer structures were either massive and eroded the headroom of the structure to the extent that it was no longer a viable space or placed over-optimistic spans that failed to accommodate the loads. Candidates offering longitudinally spanning structures generally fared a lot better.

For longitudinal transfer trusses, it was straightforward to use the rehearsal studio depth, or the two-storey height office floors, or all of these, to install a Vierendeel girder. Vierendeel trusses were not generally well done, and if they are to be used in the exam it is recommended that candidates gain an appreciation of approximate methods to size the sections. There were other possibilities: Warren trusses are more economical to fabricate and construct, suffer less deflection and (importantly in an examination condition) are easier for a candidate to design and submit in their script. One aspect that could potentially assist the candidate in deriving a long span solution was that the height of the building was not limited, meaning that an economic Warren truss or trusses could be used for the transfer structure in the long-span direction, at least on Gridline 2. However, this was by no means universally recognised and most candidates chose to span the shorter direction.

Vertical deflections were an issue with the 20 m span structures, with few candidates suggesting pre-cambering solution to deal with the deadweight deflections.

For the provision of lateral stability, most candidates opted for braced steel frame or reinforced concrete shear wall cores, and these were dealt with generally satisfactorily. Some candidates offered combinations of concrete shear walls and sway frames; it should be remembered that there is likely to be an incompatibility between these in their lateral deflections.

The majority of candidates correctly took into account the upward loading on the basement floor slab, although too many did not consider economically appropriate support to the floor slab. Many used piles to support the slab, even though ‘rock’ was only 2m below, and when the thickness of any screed / damp-proofing / floor slab / blinding was taken into account, there would only be a metre to rock and the clay would be capable of supporting a presumed bearing pressure of 150kN/m2.

Calculations were mixed: candidates often struggle in this area and many need to develop a better feel for simple analysis to check their results. This is a skill that is vital for assessing the validity of software models and so must be a key part of the designer's armoury.

Drawings were variable. Many candidates attempted split-level plans which is convenient from a time management point of view but can be very confusing when considering the lateral force-resisting structures. Some good scripts showed drawings for both options in Part 1a, which is not necessarily always the best use of time. Those scripts that relied on drawings for Part 1a without a reasonable written explanation of load transfer and stability were at risk of being marked down - the Examiners need to know that the candidate has understood the requirements.

It was pleasing to see that method statements for construction of the basement were on the whole reasonable for the majority of scripts, although addressing the longitudinal-spanning transfer structures was less well dealt with.

Question 2, Exhibition Centre

The question required selection of a suitable framing method to surround the 6m x 12m central hole in the upper floor. Columns could be placed only around the perimeter, restricting feasible solutions to portal frames or trusses. The subway constrained the positioning of vertical supports at the edges of the building, and the ground floor slab needed to span over the subway without imposing loads on the side walls. The ground conditions varied widely between the two boreholes so different foundations were needed for each situation. The letter was designed to test candidates’ understanding of how a hole in the roof would affect the wind and snow loading on the structure, and required a proposal for framing around the hole.

Many superstructure schemes proposed were conventional but some unusual ones were suggested including masonry walls and external inclined members. Impractical solutions included the use of hangers to support the first floor, uneven or large column spacings leading to uneconomic solutions, thick and heavy slabs, and large reinforced concrete beams with impractically heavy reinforcement. The roof covering was required to be concrete tiles, which typically require a minimum roof slope of 12 degrees, but some candidates proposed flat roofs.

Candidates varied in their interpretation of the ground conditions. Many assumed rock was present at 6m depth in Borehole 1, although this was not stated in the question, and only one candidate suggested further ground investigation should be undertaken to confirm the conditions. Most schemes proposed deep beams or trusses to span 18m, but the calculations of loads on these elements produced widely differing results with some candidates making it more difficult for themselves by overestimating loads. A diagonal grid was a viable option and would have reduced the spans. Most candidates proposed piled foundations. Consideration of the subway varied: some took pains to avoid surcharging it but others barely took it into account. A few candidates proposed internal columns: this was a clear breach of the client’s requirements.

Many candidates seemed to be working to a set method in responding to the first part of the question, which they had perhaps learned on a preparation course. Candidates should use such methods with caution – while helpful as a guide, responding appropriately to the requirements of the question is more important.

In writing the letter many candidates assumed that when the client “did not want a roof”, some glazing was to be provided instead, which was not necessarily the intention. Glazing could have been offered as an option for the client to consider. The structural implications of the hole were generally well-appreciated. For most candidates the technical solution was straightforward but unfortunately the presentation was disappointing and very few of the letters would have been acceptable in practice.

Only a few candidates produced satisfactory calculations in sufficient quantity and detail. Most were able to list the calculations that were needed, but many then failed to produce them. Key issues were sometimes ignored, such as the deflection of the main beams or trusses. Only a few candidates produced drawings with sufficient details and data for estimates to be produced. Many candidates ran out of time when they reached section 2e, and only a very few produced more than a bare minimum. The method statements generally ignored the temporary support needed for the slab over the existing subway when the concrete was poured.

Question 3, Farm access bridge

The bridge question was simple and straightforward, requiring the calculation of the influence line for a train of loads. Numerous solutions were feasible: multiple spans could have been used to overcome the depth restriction and would have reduced the complexity of the imposed loading, but were proposed by very few candidates. Many offered single-span Warren or Vierendeel trusses, or deep half-through plate girders. Some candidates struggled with the form of deck superstructure, suggesting multiple types joined together (e.g., concrete box or voided slab connected to precast beams). More unusual suggestions included the launching or lifting and placing of RC box girders. Alternative solutions proposing only a change of material (e.g. steel to concrete) are not sufficiently distinct: the characteristic properties of each material must also be taken into account in suggesting spans and details. Stating that “all construction will be monolithic” is not sufficient to make the solution ‘robust’ without further explanation, especially if the proposed solution is in steel.

The site and soil conditions were ideal for bank seats on top of bored cast in-situ piles so that the new road embankment would be subjected to minimal disturbance. This simple approach was preferred by only a few candidates. Some proposed deep pad foundations while others suggested piled foundations with a deep abutment or a pile cap at a much lower level, requiring deep excavation over a large area. Some candidates considered multiple spans but the 500mm thick concrete canal wall offering 100kN/m vertical load bearing capacity was apparently deemed insufficient as a support and new foundations were proposed in or very close to the restricted 3m zone at the farm side or even through the newly-built road embankment. Some candidates who took intermediate support from the canal walls did not appreciate it could carry only vertical loads.

In the letter, candidates were expected to address the reduced headroom caused by the rise in water level. Mention of design fees, extensions of time etc. could be relegated to a very brief sentence at the end. Some candidates discussed the effect of rising water level on the canal wall (not part of the brief), while others proposed temporary closure of the canal to deal with the problem.

Only a few candidates provided appropriate calculations as required by the question. Consideration of non-vertical loads and the effect of longitudinal inclination of the deck superstructure was required in the substructure calculations. Some candidates spent precious time analysing and designing deck slabs which are mostly standard for bridges unless any special circumstances arise. Some proposed solutions might have caused instability to the existing site configuration, but very few managed to justify its integrity with calculations and most did not appreciate the necessity for verification.

A few candidates produced neat and appropriate drawings, with enough information for pricing. Many candidates were happy to copy standard details from sample answers even though they were not relevant to the question, and thereby lost marks.

Only a few candidates were able to demonstrate their understanding of safe construction over water. Traffic management on the existing road was ignored by most candidates. Some proposed cast in-situ slabs over the navigable canal without using permanent formwork.

Question 4, Hotel building

This question required the design of a 6-storey hotel building with a basement and an inclined frontage. A 2-storey atrium was required at the front of the building.

Many candidates proposed the use of inclined columns at the front of the building, and good candidates appreciated the resulting horizontal tension force component arising in the floors from the inclined member and designed for it. Candidates are recommended to include annotated sketches to show the intended layout of the proposed schemes and the load paths. Some proposed designs ignored the client's brief, especially with respect to the transfer beam at the front of the building, which typically supported the transverse transfer beam, where maximum light into the building was required. Schemes were not sufficiently distinct in many cases. Only a few candidates recognized that using the stairwells for lateral support places a significant offset between the centre of the wind loads and the centre of rigidity in the transverse direction, and could explain the implications.

For the basement design it was expected that lateral earth and water pressures would be taken into account. It was expected that, for large-span structural elements, such as a transfer beam, the deflection will be checked and that an adjustment made to the allowable span-depth ratio in cases where the span exceeds 10m.

When choosing their preferred scheme to be designed in Section 2, some candidates could find only positive points for the scheme they preferred to design, and only negative things to say about the scheme they would prefer not to design. This is very transparent to the Examiners, and it leads to the suspicion that the real reason for selecting one scheme over the other is that the candidate is incapable of designing the rejected scheme. Candidates should bear in mind that if the non-preferred scheme has no positive attributes that can be noted, it is probably not a viable scheme in the first place and should not have been proposed.

Letters varied from good to awful. Candidates are advised to consider the engineering challenges presented by adding a 4.5m-deep second and lower basement below the water table and methodically address those challenges. Suggesting that the client finds some other place for storage, or noting that the proposal will cost more and must be resubmitted for review, thereby delaying completion, gains no marks.

In Section 2 many candidates did not properly address the transfer structure: suggestions included walls which were over a storey tall without provision of door openings through the wall at the corridor. Other solutions proposed beams which were too shallow and would have led to excessive deflections. Some designs of transfer beam did not include all the loads. Some candidates did not consider the concentrations of loads caused by the transfer beams when laying out their foundation schemes. Frequently, members which were designed were grossly oversized or grossly undersized.

The quality of drawings was often poor and not enough plans and sections were given. Candidates were often attempting to place all their framing plans on a single drawing, but when a foundation plan, a ground level plan, a first level (transfer level) plan, a typical upper level plan and a roof plan are needed, it is impossible to show them all on a single drawing and address all of the key elements of each level. Examiners are willing to review multiple levels on a single plan, but can award marks only for elements shown. On this building it would require at least two, if not three, plans rather than a single one to show the required "structural elements and critical details for estimating".

A few candidates gained high marks for selecting the appropriate critical details: marks were lost for drawing non-critical (typical) details instead.

Method statements were insufficiently detailed. The statement should make reference to the temporary works needed for the construction of a basements and large-span structure, and should include mention of the environmental and safety aspects of the project. The programme should reflect the points mentioned in the method statement. It should cover the construction of the whole building, and not just the completion of the structural frame. The likelihood of buoyancy during construction was frequently ignored.

Question 5 Town centre car park

The question required a town centre car park on a steeply-sloping site, near to the sea, with a shop unit included in the structure. No levels for the car park were given except for the shop level and the entrance level. Candidates needed to consider how cars would circulate in the car park, so ramp and column locations should have been considered. Some candidates ignored the usability of the car park and did not include ramps and split levels.

The car park was located next to a busy high street and was between two existing buildings. It was therefore necessary to consider how damage to the existing buildings could be avoided in designing the retaining structures and foundations: this was satisfactorily undertaken by only a few candidates. The transfer of loads was not adequately described in many scripts, and particularly how the out-of-balance earth pressures could be taken to the foundations. Several candidates simply presented an identical grid layout for the two alternative options with the only difference being a change of material from in-situ concrete to steel: this is not sufficiently distinct unless the different properties of the materials are taken into account to modify layouts appropriately.

Only a few letters were satisfactory, and many did not address the important structural issues, such as the transfer of loads where appropriate, and the requirement to change the slab level from the original design. Few candidates adequately considered the modified waterproofing requirements necessary for the change in use.

While some candidates provided satisfactory designs, calculations were particularly poor in some cases for the foundations, with a few candidates under-designing the foundations by a factor of 2 while others provided over-sized foundations.

The drawings tended to reflect shortcomings indicated by Part 1(a), and few candidates were comfortable with the different foundation levels. Method statements reflected the variation in understanding or lack of it regarding the problems presented by the adjacent buildings and the road. Pleasingly, suggested programme times were generally realistic.

Question 6 Lifeboat station building

The question required the design of a two-storey lifeboat station on a corner plot of a sloping site. This was a small development of almost domestic scale, but many candidates did not appreciate this and proposed solutions that were grossly over-engineered. The Examiners were looking for solutions that were both economical as well as functional.

Viable schemes included steel or concrete frames, or load-bearing masonry. Some solutions offered were entirely of concrete with reinforced walls: these solutions, although viable, were considered to be uneconomical. Viable foundation options included a raft, pad or strip footings, or small-diameter piles. Candidates who offered large-diameter piles had failed to recognise the small size of the building and the site constraints.

In order to fit the building on to the site, retaining walls were required to support the site boundary. There was sufficient space for a temporary slope behind the proposed building footprint and an in-situ retaining wall, allowing conventional foundations to be constructed for the building. Alternatively, where the solution adopted was contiguous or secant piling or sheet piling, these could have been made part of the permanent works. Within the lifeboat housing there was a requirement for an overhead crane, but this was not addressed by many candidates.

The letter required candidates to suggest ideas for adding floor area. The obvious solution was to use the roof space above the amenities and workshop. Most candidates gave this advice although many failed to address how access would be achieved. Marks were available for the quality of writing, but unfortunately few gained them: letters were often little more than notes. While redesign costs and additional time can be mentioned, these are secondary and are not expected to form the dominant part of a structural engineer's letter.

Calculations were expected for all key elements including a typical column and floor beam, the foundations, the retaining walls, the crane rail, the roof structure, and the bracing or other means of providing lateral stability. Calculations for simple members were expected to be comprehensive and should include bending, shear and deflection checks as appropriate. Retaining wall designs should include bearing capacity, sliding and stability checks as well as design of the wall elements. Many candidates did not address the crane beam design in any way. Calculations were often provided in too much detail but for only a few key elements, omitting important ones, or showed a lack of basic skills in sizing up members.

Drawings were expected for foundations, the first floor, sections and typical elevations. Generally candidates attempted to show these, but the standard of drafting was often very poor and comprised only freehand sketches with few notes or dimensions. Drawings must be neatly presented and show adequate details and member sizes for estimating, and will be marked against this standard.

The proposed programme was expected to be 9-12 months subject to weather conditions and the extent of off-site fabrication. Candidates offered programmes from 6 to 18 months.

Method statements were often very brief indicating that candidates had a lack of appreciation of construction techniques or had begun to run out of time.

Aspects to include were:

- realistic construction programme taking account of weather and sea conditions together with Health & Safety and statutory procedures.
- verification of ground conditions particularly with a sloping site, installation and modification of services, and protection and monitoring of the existing retaining wall;
- traffic management and temporary works;
- construction sequence of installation of key elements, any need for fabrication shop inspections before site delivery, and any lack-of-fit issues.

Question 7, New link bridge between two offshore platforms

Candidates were required to design a new bridge linking an existing utilities platform with a new living quarters platform. The bridge had to conform to specified dimensional requirements of a 65m span with a mismatch in the height of the steelwork provided on the two supporting platforms: this can occur because of the more stringent requirements for new platforms, which are subject to 10,000-year abnormal wave criteria and/or subsidence experienced by some platforms during their service life. A further crucial aspect of the brief was the accommodation of in-line and lateral relative platform movements such as could be caused by wave loading on the supporting platforms.

Candidates generally selected either modified Warren or Pratt truss solutions using rectangular or triangular forms. Other solutions offered included plated (box girder) or portal frame (vierendeel truss) arrangements, although portal frames for this span would be unsuitable because of the extreme bending moments at the beam/column connections. Candidates are reminded that two distinct and viable solutions are required, and that the structural behaviour of both solutions must be properly explained using words and diagrams. In justifying their preferred solution, good candidates gave due regard to the in-place and temporary conditions (loadout, transportation, lift and set-down), recognising that all these conditions influence the framing and member sizing of offshore structures. Marks were lost by candidates who neglected the specified bridge support requirements.

The letter asked the candidates to look at the implications of adding a large laydown platform on top of the south end of the bridge. Extensive modifications to the bridge geometry were generally unnecessary. Most candidates identified the consequential increases in dead, imposed and wind loads and the increased reactions at the south in-place bridge supports. Most candidates also recognised that the location of the laydown platform would affect the lift weight and centre of gravity, and would probably interfere with the south lift rigging. Candidates are encouraged to produce simple sketches to illustrate the problems and their structural resolution.

Candidates were expected to present sufficient calculations to establish the form and sizing of the principal structural elements and connections, including the permanent supports and lift points. Insufficient attention was given to the sizing of the main structural elements. In many instances dead and wind loads were poorly derived. Candidates are reminded that the magnitude of these loadings will govern the member sizing of the main structural elements, and these loadings should be determined in a rational and clearly-understandable manner. Candidates are encouraged to reconcile their initial dead load estimate with a final designed weight to confirm their calculations remain valid. Candidates must also allocate sufficient time to consider design of the supports for the in-place and temporary conditions.

For an offshore link bridge, the critical details required were the in-place support arrangements to tolerate the relative platform displacements, the lift points and member connection details where access is limited (especially valid for bridges with a triangular cross section). Candidates are reminded of the importance of good quality sketches, drawn to scale, to clarify their design submissions and to identify the detailing necessary to maintain a viable arrangement. Single line diagrams are not as useful, as joint eccentricities are not apparent and sensible design proportions cannot be verified by simple visual checks. Candidates must endeavour to prepare drawings consistent with the calculations presented in part 2(c).

In the method statement it was unnecessary to include aspects of the bridge construction and loadout as these did not form part of the question, and some candidates devoted valuable time to these subjects with no gain in marks. An important procedure to be incorporated would be continuing weather forecasting and monitoring, weather being the principal constraint on commencement of the sailaway and lift operations. An understanding of offshore installation is necessary as bridges of this span have to be lifted by a Heavy Lift Vessel, engaged on a primary installation guidance system, rotated into a set down position before being finally positioned by fine guides to achieve the required installation tolerances. Candidates are encouraged to produce simple sketches to illustrate all significant issues during bridge installation, especially the bridge guidance system and location on to the in-place supports. These operations have a significant bearing on all offshore structural solutions and may be the dominant design condition for the main frame members.

Question 8, Office retrofit

This question was intended as a retrofit question, with the primary requirement being for candidates to consider options for modifying an existing building. The existing structure was deemed to be sub-standard and required the candidate to determine the most efficient manner of bringing the structure up to the required design level. Information was provided about the existing structure to enable candidates to assess the building if required, but (sensibly!) no candidates attempted to do this as the simpler way forward was to provide a completely new lateral force resisting system.

Candidates had the options of using braced frames, additional moment frames and energy-dissipating devices. Shear walls were effectively ruled out by the need to maintain a glazed perimeter.

The building also had an irregular shape which required attention and understanding by candidates; the time required to deal with this was offset by the absence of the need to consider foundation effects as these were deemed to satisfy previous assessments.

Candidates' efforts were variable, with some good understanding of the seismic issues shown by some of the candidates. Each year, question 8 is attempted by some candidates with no real knowledge of seismic design, and this year was no different. Schemes were presented as expected but a number of candidates did not provide the level of detail presented. Storey drifts were not always assessed, but there was good appreciation of the irregular building layout. The letter required the candidate to recognise the effects of greater building eccentricity and a loss of bracing. Although most candidates identified the issues, the descriptions of the re-design were not consistent with the problems needing to be solved.

Drawings were generally poorly produced, with insufficient details being given and not enough consideration of how the new structure might be attached to the existing. Method statements were also on the thin side with candidates often not recognising that building renovation can be a time- consuming task.

Associate-Membership Examination 2011

Questions

1. Student accommodation block
2. Sculpture platform and visitor centre
3. Watertight tanks
4. Viewing tower

Overview

Associate Membership Examination	2011
Total Candidates	32
Overall pass-rate	62.5%

This year the Associate Membership Examination was attempted by 32 candidates, a similar number to last year. Twenty candidates (62.5%) passed the examination, a slight decrease for the pass rate from last year. The Examiners, though, are encouraged by the fact that a similar percentage of candidates pass this examination each time. It is also felt that the majority of candidates seem well-prepared and understand what they have to provide in order to pass. The Denis Matthews prize was recommended for this year to the candidate who passed with the highest aggregate of marks for Sections one and two.

For the 2011 Associate Membership Examination, candidates were required to answer one from a choice of four questions. It was notable that the majority of candidates (27 from 32) favoured question 1, the student accommodation block. Below are set out the key features of each question, together with general feedback on the various sections.

Question 1. Student Accommodation Block

This question called for the design of a new 4-storey block situated on an open campus site, providing student accommodation comprising student bedrooms, store rooms, study/dining room and common areas. Each floor required 30 bedrooms and 2 store rooms. Each bedroom and store room was to have an overall plan area of 6m long by 4m wide. For access a 2m-wide corridor was required. No columns were permitted within any bedroom, the study/dining room nor the common areas. The overall height of the building was not to exceed 16m, while each floor was to have a clear floor-to-ceiling height of 2.6m. A 150mm raised floor void was required for services. The external cladding to the building was to be of cavity wall construction, while the roof was to have plain clay tiles on battens with insulation, supported by timber rafters.

Question 2. Sculpture Platform and Visitor Centre.

A visitor centre was required for the 2012 London Olympic Games. The building was also required to support a monumental sculpture. The visitor centre was to be in the shape of an equal sided pentagon in plan. The roof had to be designed to support the sculpture which was placed centrally. The sculpture included an integral rigid plinth which imposed a vertical load, a lateral wind force and an overturning moment on the roof structure. To keep the visitor centre as open as possible, only one internal column was allowed, and this had to fit inside a 500mm internal diameter circular casing. A clear headroom of 4m and a services zone of 0.5m were required. Also the bottom of the sculpture base plinth was required to be no more than 7.5m above ground, so that the sculpture itself did not extend beyond the 40m height limit.

Question 3. Watertight Tanks

A pair of watertight tanks were required, constructed in reinforced concrete. The tanks were part of a drainage system in which water flowed along a channel into the selected tank and out again at the far end. One or other of the tanks could be selected using a pair of gates. It was possible that, during maintenance, one tank could be completely emptied while the other tank remained full. A large paved area surrounded the inlet channel and tanks to provide access for maintenance plant and equipment.

Question 4. Viewing Tower

The question required the design of a viewing tower to overlook an exposed coastal site. The tower was to have an observation area located at a height of 12m, accessed by a spiral staircase. A roof was required over the observation area. The sides of the observation area were to be constructed with the minimum of obstructions. The staircase was to be provided with a weatherproof envelope to protect the users.

Feedback

Section 1a

Most candidates offered a reasonable structural solution. In a few cases, the stability aspects were vague, or difficult to follow. It was apparent that those candidates who failed attained low marks because of giving insufficient attention to design detail.

Section 1b

This section introduced a specific client change that involved an additional structural engineering challenge. It is important that candidates recognise this challenge and deal with the structural engineering implication of the client change. Several candidates did not clearly outline the full structural implication, or how the client's request might be achieved.

Section 2c

Generally candidates made reasonable attempts at all the key areas of design. However, as in previous years, some candidates incorporated insufficient calculations to establish both form and size of all the principal structural elements. Thus candidates need to consider how their proposed solution is sub-divided into principal structural elements. Those candidates that gained low marks in both sections needed better preparation, and improved time management and exam technique.

Section 2d

Again this year, there was a reasonable standard of drawing, with a few of the enlarged details being good and well presented. However, a few candidates did not supply what was clearly asked for in the question – plans, sections, elevations and two specified enlarged details. It is important that sufficient views dimensions and disposition of structural elements are given, along with comprehensive detailing, to meet this requirement and allow for adequate cost estimating.

Section 2e

Although the content of the method statement and construction programme were adequate in some cases, some showed a poor understanding of the logical construction sequence or even safety issues. Others were inadequate because insufficient time was allowed for this section and they often omitted essential information. Candidates are again reminded that marks can be gained by ensuring that this final section is given appropriate attention.